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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	0370.2901C/974812-US.01

CONFIRMATION NO. 3368

POA ACCEPTANCE LETTER

99499
Edell, Shapiro, & Finnan, LLC
9801 Washingtonian Blvd.
Suite 750
Gaithersburg, MD 20878

OC00000012274512

Date Mailed: 01/21/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/14/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/afessehaye/

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL974812)

CONFIRMATION NO. 3368

58898
Lempia Summerfield Katz LLC
20 South Clark
Suite 600
CHICAGO, IL 60603

POWER OF ATTORNEY NOTICE

OC000000122745057

Date Mailed: 01/21/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/14/2021.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/afessehaye/

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
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.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	13/560,767
Filing Date	07-27-2012
First Named Inventor	Hakon SKRAMSTAD
Title	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
Art Unit	2656
Examiner Name	RAMAKRISHNAIAH, MELUR
Attorney Docket Number	0370.2901C/974812-US.01

SIGNATURE of Applicant or Patent Practitioner

Signature	/D. Andrew Floam/	Date (Optional)	2021-01-14
Name	D. Andrew Floam	Registration Number	34597
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
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

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 99499

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Cisco Technology, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Dan Lang/	Date (Optional)	November 9, 2017
Name	Dan H. Lang		
Title	Vice President and Assistant Secretary, Cisco Technology, Inc.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	41648792
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	58898
Filer:	D. Andrew Floam/Grace Chaparro
Filer Authorized By:	D. Andrew Floam
Attorney Docket Number:	10203-14091A (CPOL974812)
Receipt Date:	14-JAN-2021
Filing Date:	27-JUL-2012
Time Stamp:	16:36:48
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	Assignee showing of ownership per 37 CFR 3.73	aia0096-2901C.pdf	123063 8defdcd292d269a033251f01ec18f5ccfb8eb9a2	no	3

Warnings:

Information:					
2	Power of Attorney	CiscoExecutedPOA-2901C.pdf	316926 20dceeda15ed67fb8ad7655f9fa200668825331e	no	3

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

Total Files Size (in bytes):	439989

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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: CISCO TECHNOLOGY, INC.

Application No./Patent No.: 13/560,767 / 8,941,708 Filed/Issue Date: 07-27-2012 / 01-27-2015

Titled: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

CISCO TECHNOLOGY, INC., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 029130, Frame 0865, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). 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 1.11 and 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/D. Andrew Floam/	2021-01-14
Signature	Date
D. Andrew Floam	34597
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	01/27/2015	8941708	10203-14091A (CPOL974812)	3368

58898 7590 01/07/2015

Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 200 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Hakon SKRAMSTAD, Oslo, NORWAY;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

58898 7590 09/18/2014
Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this correspondence is being transmitted via the Office Electronic Filing System on the date shown below.

/Ryan Gleitz/	(Depositor's name)
Ryan Gleitz	(Signature)
December 16, 2014	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL 974812)	3368

TITLE OF INVENTION: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	12/18/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
RAMAKRISHNAIAH, MELUR	2656	348-014010

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Lempia Summerfield Katz LLC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Cisco Technology, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): San Jose, CA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)

☐ A check is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 503866 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Ryan Gleitz/ Date December 16, 2014

Typed or printed name Ryan Gleitz Registration No. 62,164

Petitioner Exhibit 1002
Page 12 of 285

Electronic Patent Application Fee Transmittal

Application Number:	13560767
Filing Date:	27-Jul-2012
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Filer:	Ryan M. Gleitz
Attorney Docket Number:	10203-14091A (CPOL974812)

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	20981016
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	58898
Filer:	Ryan M. Gleitz/Amanda Knapp
Filer Authorized By:	Ryan M. Gleitz
Attorney Docket Number:	10203-14091A (CPOL974812)
Receipt Date:	16-DEC-2014
Filing Date:	27-JUL-2012
Time Stamp:	17:44:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$960
RAM confirmation Number	4834
Deposit Account	503866
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Issue_Fee.pdf	196281 6e5d1962c2a9e5df6a794799246607adcd8df086	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30941 e7f9eaadf6bdced749ee06788fc9845b1f20ef24	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	227222		

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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

58898 7590 09/18/2014

Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

EXAMINER
RAMAKRISHNAIAH, MELUR

ART UNIT	PAPER NUMBER
2656	

DATE MAILED: 09/18/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL974812)	3368

TITLE OF INVENTION: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	12/18/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

58898 7590 09/18/2014
Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL 974812)	3368

TITLE OF INVENTION: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	12/18/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
RAMAKRISHNAIAH, MELUR	2656	348-014010

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Petitioner Exhibit 1002
Page 18 of 285

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL974812)	3368

58898 7590 09/18/2014

Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

EXAMINER	
RAMAKRISHNAIAH, MELUR	

ART UNIT	PAPER NUMBER
2656	

DATE MAILED: 09/18/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/560,767	Applicant(s) SKRAMSTAD, HAKON	
	Examiner MELUR RAMAKRISHNAIAH	Art Unit 2656	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *7-15-14*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☐ The allowed claim(s) is/are *1-11 and 13-20 (now renumbered 1-19)*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MELUR RAMAKRISHNAIAH/
Primary Examiner, Art Unit 2656

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3368

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/560,767	07/27/2012	348	2656	10203-14091A (CPOL974812)

APPLICANTS

INVENTORS

Hakon SKRAMSTAD, Oslo, NORWAY;

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

This appln claims benefit of 61/513,190 07/29/2011

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

08/07/2012

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /MELUR RAMAKRISHNAIAH/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NORWAY	7	14	3

ADDRESS

Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602
UNITED STATES

TITLE

METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

FILING FEE RECEIVED	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
1800		

WEST Search History for Application 13560767

Creation Date: 2014090714:49

Prior Art Searches

Query	DB	Op.	Plur.	Thes.	Date
(select$ near1 layouts and user near1 interface) same (videoconfer$ or video near1 confer$) and @ad<20110729	PGPB, USPT	OR	YES		04-05-2014
(modify$ near1 layout) and (user near1 interface and (videoconfer$ or video near1 confer$ or multimedia near1 confer$))and @ad<20110729	PGPB, USPT	OR	YES		04-09-2014
(predefin$ near1 layouts) same (confer$ and select$) and @ad<20110729	PGPB, USPT	OR	YES		09-07-2014

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
	Examiner	Art Unit
	MELUR RAMAKRISHNAIAH	2656

CPC- SEARCHED		
Symbol	Date	Examiner
H04N 7/15, 7/14, 9/67, 7/152, 7/142	4-9-14	mrk

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
348	14.01-14.16	4-9-14	mrk
715	765	4-9-14	mrkmrk
Search updated		9-7-14	

SEARCH NOTES		
Search Notes	Date	Examiner
WEST database	4-9-14	mrk
WEST database	9-7-14	mrk

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
All classes & subclasses listed in the searched area.		9-7-14	mrk

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
	Examiner	**Art Unit**
	MELUR RAMAKRISHNAIAH	2656

CPC						
Symbol					**Type**	**Version**
H04N		7	/	15	F	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/MELUR RAMAKRISHNAIAH/ Primary Examiner.Art Unit 2656	9-7-14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
	Examiner	**Art Unit**
	MELUR RAMAKRISHNAIAH	2656

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
348	14.01	H 0 4 N / 7/14	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
348	14.08	14.09			

NONE	Total Claims Allowed:	
(Assistant Examiner) (Date)	19	
/MELUR RAMAKRISHNAIAH/ Primary Examiner.Art Unit 2656 9-7-14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner) (Date)	1	5

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
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	MELUR RAMAKRISHNAIAH	2656

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

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	6	17												
10	2	7	18												
11	3	8	19												
2	4	9	20												
12	5														
13	6														
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14	8														
3	9														
16	10														
17	11														
	12														
18	13														
19	14														
4	15														
5	16														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/MELUR RAMAKRISHNAIAH/ Primary Examiner.Art Unit 2656	9-7-14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
	Examiner	**Art Unit**
	MELUR RAMAKRISHNAIAH	2656

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

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

CLAIM		DATE								
Final	Original	04/09/2014	09/07/2014							
1	1	✓	=							
10	2	O	=							
11	3	O	=							
2	4	O	=							
12	5	✓	=							
13	6	✓	=							
15	7	✓	=							
14	8	✓	=							
3	9	O	=							
16	10	✓	=							
17	11	✓	=							
	12	O	-							
18	13	O	=							
19	14	O	=							
4	15		=							
5	16		=							
6	17		=							
7	18		=							
8	19		=							
9	20		=							

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8

CONFIRMATION NO. 3368

105218
Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

POWER OF ATTORNEY NOTICE

OC000000069647222

Date Mailed: 07/18/2014

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/15/2014.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/mabebe/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	10203-14091A (CPOL974812)

CONFIRMATION NO. 3368

58898
Lempia Summerfield Katz LLC
One North LaSalle Street
Suite 2900
CHICAGO, IL 60602

POA ACCEPTANCE LETTER

OC000000069647268

Date Mailed: 07/18/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/15/2014.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/mabebe/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
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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.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 58898

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 58898

OR

☐	Firm or Individual Name		
	Address		
	City	State	Zip
	Country		
	Telephone	Email	

Assignee Name and Address: Cisco Technology, Inc.
170 W. Tasman Dr.
San Jose, CA 95134

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Dan Lang	Date	9-27-2012
Name	Dan Lang	Telephone	(408) 526-4000
Title	Vice President & Assistant Secretary		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

Electronic Acknowledgement Receipt

EFS ID:	19579223
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	105218
Filer:	Ryan M. Gleitz/Amanda Knapp
Filer Authorized By:	Ryan M. Gleitz
Attorney Docket Number:	401318US8
Receipt Date:	15-JUL-2014
Filing Date:	27-JUL-2012
Time Stamp:	14:50:55
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	Assignee showing of ownership per 37 CFR 3.73.	373c.pdf	118375 747a52554b3a68cb27b07cf0e87e6dc0085b81a3	no	3

Warnings:	
Information:	

2	Power of Attorney	POA_80.PDF	99302 fdfc47f6d0c5d6499ebc9e89d9bcf8cdd13beded	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	217677

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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Cisco Technology, Inc.

Application No./Patent No.: 13/560,767 Filed/Issue Date: July 27, 2012

Titled: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

Cisco Technology, Inc., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 029130, Frame 0865, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by37 CFR3.73(b). The information is required toobtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentialityis governed by35 U.S.C. 122and 37 CFR1.11 and1.14. Thiscollection is estimated to take 12 minutes to complete, including gathering, preparing, and submittingthe 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 tothe 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Ryan Gleitz/	July 15, 2014
Signature	Date
Ryan Gleitz	Attorney for Assignee
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that yoube given certain informationin connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, pleasebe advised that: (1) the general authority forthe collection of thisinformation is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and(3) the principal purpose forwhich the information isused by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent applicationor patent. If you do not furnish the requested information,the U.S. Patent and Trademark Office may not be able to process and/or examineyour submission,which may result in termination of proceedings or abandonment of the applicationor expiration of the patent.

The informationprovided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the informationin order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an InternationalApplication filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, arecord may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from thissystem of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Certificate Under 37 CFR 1.8

I hereby certify that this correspondence is being electronically transmitted to the U.S. Patent and Trademark Office, Commissioner for Patents, via the EFS on July 15, 2014.

/Ryan Gleitz/
Ryan Gleitz, Reg. No. 62,164

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Hakon Skramstad	
Appln. No.:	13/560,767	Examiner: RAMAKRISHNAIAH, MELUR
Filed:	July 27, 2012	Group Art Unit: 2656
For:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL	Confirmation No. 3368
Attorney Docket No:	10203-14091A (CPOL974812)	

RESPONSE TO OFFICE ACTION DATED APRIL 15, 2014

Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the non-final Office Action dated April 15, 2014, please consider the following:

Amendments to the claims, which begin on page 2; and

Remarks, which begin on page 9.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method comprising:

providing, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams;

associating a plurality of predefined layouts for plurality of video conference streams with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis; and

composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

2. (Currently Amended) ~~The method according to claim 1, wherein the step of composing further includes~~ A method comprising:

providing, on a display, an object configured to be moved by a user along an axis;

associating a plurality of predefined layouts with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis;

identifying an interval among the intervals within which the position is lying; ~~and~~

selecting the layout associated with the interval; and

composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval among the

Petitioner Exhibit 1002
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intervals within which the position is lying.

3. (Original) The method according to claim 2, further comprising:

providing the selected layout to a video composing unit, which composes the composite image and which is configured to receive a plurality of video conference streams and output a composite video signal comprising one or more of the received video conference streams based on a layout.

4. (Currently Amended) The method according to claim 1, wherein

the composite video signal includes a spatial mix of the ~~one or more~~ plurality of video conference streams, and

the layout defines one or more frames for containing the plurality of video conference streams,

the method further comprising:

providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a ~~the~~ size and position of one or more frames of a respective layout associated with the interval, and

calculating, in response to the detecting of the user action, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.

5. (Currently Amended) The method according to claim 2 [[1]], further comprising:

displaying the composite video signal on the display, the display being of a video conference terminal.

Petitioner Exhibit 1002
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6. (Original) The method according to claim 5, further comprising:

displaying the object on a display of a control device, which is connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal.

7. (Currently Amended) The method according to claim 2 [[1]], further comprising:

displaying the object on the display, which is of a video conference terminal.

8. (Original) The method according to claim 6, further comprising:

updating one of the composite video signal and the replica in real time as the object is moved by the user.

9. (Original) The method according to claim 1, further comprising:

associating M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals;

identifying, in response to the detecting of the user action, a sub-interval among the sub-intervals within which the position is lying;

selecting a layout, of the plurality of predefined layouts, associated with the sub-interval; and

composing the composite video signal using the selected layout.

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Page 40 of 285

10. (Currently Amended) A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method, the method comprising:

providing, on a display, an object configured to be moved by a user along an axis;

associating a plurality of predefined layouts with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis;

selecting a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position on the axis is lying; and

composing, in response to the detecting of the user action, a composite video signal using the ~~a~~ layout, of the plurality of predefined layouts, associated with the ~~an~~ interval among the intervals within which the position on the axis is lying.

11. (Currently Amended) An apparatus comprising:

a processing unit configured to

provide, on a display, an object configured to be moved by a user along an axis,

associate a plurality of predefined layouts with respective intervals along the axis, and

detect a user action on the object indicating a position on the axis; and

a video composing unit configured to compose, in response to the user action being detected by the processing unit, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying, wherein the processing unit is further configured to

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identify an interval among the intervals within which the position is lying,

select the layout associated with the interval, and

provide the selected layout to the video composing unit.

12. (Cancelled)

13. (Currently Amended) The apparatus according to claim 11, wherein

the composite video signal includes a spatial mix of one of more video conference streams,

the layout defines one or more frames for containing the video conference streams, and

the processing unit is further configured to

provide, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a ~~the~~ size and position of one or more frames of a respective layout associated with the interval, and

calculate, in response to the user action being detected, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.

14. (Original) The apparatus according to claim 11, wherein

the processing unit is further configured to

associate M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals,

identify, in response to the user action being detected, a sub-interval among the

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Page 42 of 285

sub-intervals within which the position is lying, and

select a layout, of the plurality of predefined layouts, associated with the sub-interval; and

the video composing unit is configured to compose the composite video signal using the selected layout.

15. (New) The method of claim 1, further comprising:

identifying the interval among the intervals within which the position is lying.

16. (New) The method of claim 1, further comprising:

wherein

the composite video signal includes a spatial mix of one or more video conference streams, and

the layout defines one or more frames for containing the video conference streams.

17. (New) The method of claim 16, further comprising:

providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval.

18. (New) The method of claim 17, further comprising:

calculating a layout wherein the size and position of each frame of the layout is based on the relationship and the position.

Petitioner Exhibit 1002
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19. (New) The method of claim 1, further comprising:

providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval.

20. (New) The method of claim 1, further comprising:

calculating, in response to the detecting of the user action, a layout wherein a size and position of each frame of the layout is based on the relationship and the position.

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Page 44 of 285

REMARKS

I. Status

Claims 1-11 and 13-20 are pending in the application. Claim 12 is cancelled. Claims 1, 2, 4, 5, 7, 10, 11, and 13 have been amended. Claims 15-20 are new. No new matter is presented. Support for the amendments and new claims may be found in the claims as originally presented and the Specification. In accordance with 37 C.F.R. § 1.111, Applicants respectfully request reconsideration of the claim rejections set forth in the non-final Office Action dated April 15, 2014 (the "Office Action").

II. Allowable Subject Matter

Applicants thank Examiner Ramakrishnaiah for the indication that claims 2-4, 9, and 12-14 would be allowable if rewritten in independent form including the limitations of the base claim and any intervening claims. Claim 2 has been rewritten in independent form. Claim 12 has been incorporated into independent claim 11. Accordingly, claims 2, 3, 5-8, 11, and 13-15 should be allowed.

III. Interview Summary

Applicants thank Examiner Ramakrishnaiah for the telephonic interview extended on July 15, 2014. During the interview, potential amendments to claim 1 were discussed. General distinctions between the prior art at the potential amendments were agreed upon, but no agreement was reached for claim language. The following remarks provide additional summary of the interview.

IV. Claim Rejections – 35 U.S.C. § 102

Claims 1, 5-8, 10 and 11 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Application Publication No. 2010/0333004 ("Kristiansen").

Petitioner Exhibit 1002
Page 45 of 285

Claim 1 recites "providing, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams; associating a plurality of predefined layouts for the plurality of video conference streams with respective intervals along the axis; detecting a user action on the object indicating a position on the axis; and composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying."

Kristiansen describes a method and system for modifying a composite video signal of a video conference. *See* abstract. A personal computer and touch screen displays a graphical representation of the composite video signal layout. *See* [0032]. The graphical representation may include an outline of persons, a photograph, or text corresponding to the content of the video. *See* [0033]. The user may arrange objects in the graphical representation by dragging and dropping objects so that two objects switch places or so that objects move to arbitrary positions. *See* [0035]-[0036]. The user may resize object by a gesture such as a pinching motion. *See* [0037].

No other techniques for changing layouts are described in Kristiansen. However, the Office Action states that Kristiansen teaches "an object configured to be moved by a user along an axis" and "associating a plurality of predefined layouts with respective intervals along the axis." Applicants respectfully submit that neither dragging and dropping graphical objects nor resizing graphical objects can reasonably be considered equivalent to "an object configured to be moved by a user along an axis" and "associating a plurality of predefined layouts with respective intervals along the axis."

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In addition, claim 1 has been amended to recite "providing, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams." Kristiansen is completely silent regarding an axis that extends across video for a plurality of video conference streams.

For at least these reasons, Kristiansen does not anticipate each and every feature of claim 1. Accordingly, Applicants respectfully request that the rejection of independent claim 1 and corresponding dependent claims be withdrawn.

Claim 10 has been amended to include portions of allowable claim 12. Claim 10, as amended, recites "providing, on a display, an object configured to be moved by a user along an axis; associating a plurality of predefined layouts with respective intervals along the axis; detecting a user action on the object indicating a position on the axis; selecting a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position on the axis is lying; and composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval among the intervals within which the position on the axis is lying."

As described above, Kristiansen describes systems and methods for changing the layout of a video conference. Panes of the video that correspond to various participants may be rearranging using a drag and drop gesture via a touch screen. *See* Fig. 4. However, nothing in Kristiansen teaches "an object configured to be moved by a user along an axis" or associating a plurality of predefined layouts with respective intervals along the axis."

For these reasons, Applicants request reconsideration of the rejection of claim 11.

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V. Conclusion

For at least the reasons presented above, the Applicants respectfully submit that the pending claims are in condition for allowance.

The Examiner is respectfully requested to contact the undersigned in the event that a telephone interview would expedite consideration of the application.

Respectfully submitted,

/Ryan Gleitz/
Ryan Gleitz
Registration No. 62,164
Attorney for Applicants

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(312) 854-8369

Electronic Acknowledgement Receipt

EFS ID:	19582344
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	105218
Filer:	Ryan M. Gleitz/Amanda Knapp
Filer Authorized By:	Ryan M. Gleitz
Attorney Docket Number:	401318US8
Receipt Date:	15-JUL-2014
Filing Date:	27-JUL-2012
Time Stamp:	14:52:09
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	Transmittal_rnfoa_07-15-14.pdf	22701 505c66a3f51b7a6c48bd8ea2f12510e08bfb4ed3	no	1

Warnings:	
Information:	

2		10203-14091A_CPOL974812_Response_to_OA_of_4-15-14.pdf	56317 a322d0d4c589b0424e6de770dae4111528a39c55	yes	12

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	8
Applicant Arguments/Remarks Made in an Amendment	9	12

Warnings:	
Information:	
Total Files Size (in bytes):	79018

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.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: July 15, 2014 Name: Ryan Gleitz (Reg. No. 62,164) Signature: /Ryan Gleitz/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Hakon Skramstad	
Appln. No.:	13/560,767	Examiner: RAMAKRISHNAIAH, MELUR
Filed:	July 27, 2012	Group Art Unit: 2656
For:	Method, Computer-Readable Storage Medium, and Apparatus for Modifying the Layout Used by a Video Composing Unit to Generate a Composite Video Signal	Confirmation No. 3368

Attorney Docket No: 10203-14091A (CPOL974812)

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

TRANSMITTAL

Sir:

Attached is/are:

☒ Response

☐ Return Receipt Postcard

Fee calculation:

☒ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 C.F.R. § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 C.F.R. § _____.

☐ An additional filing fee has been calculated as shown below:

						Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra		Rate	Add'l Fee	or	Rate	Add'l Fee
Total		Minus		0		x $40=			x $80=	
Indep.		Minus		0		X210=			x $420=	
First Presentation of Multiple Dep. Claim						+$390=			+ $780=	
						Total	$		Total	$

Fee payment:

☐ A check in the amount of $_____ is enclosed.

☐ Please charge Deposit Account No. 50-3866 in the amount of $____.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 50-3866.

July 15, 2014
Date

Respectfully submitted,
/Ryan Gleitz/
Ryan Gleitz (Reg. No. 62,164)

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 13/560,767	Filing Date 07/27/2012	☐ 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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT **07/15/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***3	= 1	X $420 =	420
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	**420**

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ 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.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** 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.

LIE
/CAROLYN COFER/

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.

Document code: WFEE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8	3368

105218 7590 04/15/2014

Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

EXAMINER	
RAMAKRISHNAIAH, MELUR	
ART UNIT	PAPER NUMBER
2656	

NOTIFICATION DATE	DELIVERY MODE
04/15/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
ahudgens@oblon.com

Office Action Summary	Application No. 13/560,767	Applicant(s) SKRAMSTAD, HAKON	
	Examiner MELUR RAMAKRISHNAIAH	Art Unit 2656	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7-27-12*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-14* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,5-8,10 and 11* is/are rejected.

8)☒ Claim(s) *2-4,9 and 12-14* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *3-11-13*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

2. ***Claim Rejections - 35 USC § 102***The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 5-8, 10, 11, are rejected under 35 U.S.C 102(e) as being anticipated by Kristiansen et al. (US 2010/0333004A1, filed 6-23-10, hereinafter Kristiansen).

Regarding claim 1, Kristiansen discloses: A method comprising: providing, on a display, an object configured to be moved by a user along an axis (paragraphs: 0008, 0022-0026; 0039-0041, figs. 1, 5-6); associating a plurality of predefined layouts with respective intervals along the axis; detecting a user action on the object indicating a position on the axis (paragraphs: 0008, 0022-0026; 0039-0041, figs. 1, 5-6); and composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying (paragraphs: 0008, 0022-0026; 0039-0041, figs. 1, 5-6).

Regarding claim 10, Kristiansen discloses: A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a

method, the method comprising: providing, on a display (reads on touch screen 41, fig. 3), an object configured to be moved by a user along an axis (paragraph: 0032-0035); associating a plurality of predefined layouts with respective intervals along the axis; detecting a user action on the object indicating a position on the axis; and composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying (paragraphs: 0008, 0022-0026; 0039-0041, figs. 1, 5-6).

Regarding claim 11, Kristiansen discloses: (reads on touch screen 41, fig. 3), An apparatus comprising: a processing unit configured to provide, on a display , an object configured to be moved by a user along an axis (paragraph: 0032-0035), associate a plurality of predefined layouts with respective intervals along the axis, and detect a user action on the object indicating a position on the axis; and a video composing unit configured to compose, in response to the user action being detected by the processing unit, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying (paragraphs: 0008, 0022-0026; 0039-0041, figs. 1, 5-6).

Regarding claims 5-8, Kristiansen further discloses: displaying the composite video signal on the display, the display being of a video conference terminal (fig. 1; paragraph: 0023), further comprising: displaying the object on a display of a control device, which is connected to the video conference terminal,

together with a replica of the composite video signal currently displayed on the display of the video conference terminal (paragraphs: 0031-0032), further comprising: displaying the object on the display, which is of a video conference terminal (paragraph: 0033), further comprising: updating one of the composite video signal and the replica in real time as the object is moved by the user (paragraph: 0039).

4. Claims 2-4, 9, 12-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

--(2013/0200661A1) to Mock discloses reserved space in a video conference layout which teaches: Reserving a space in a videoconference layout. The videoconference layout may be displayed at a first participant endpoint and may include images of a plurality of participants during the videoconference. A first portion of the videoconference layout may include a plurality of portions for the plurality of participants. A second portion of the videoconference layout may be used for an active speaker of the plurality of participants. When a first participant displayed in a first portion of the plurality of portions becomes an active speaker in the videoconference, the first participant may be displayed in the second portion of the videoconference layout and the first portion of the plurality of portions may be reserved for the first participant.

--(7,634,340) to Ivashin et al. discloses presenter view control system and method which teaches: In a method for providing partial layout synchronization in a teleconferencing system, a conference client application enters a presenter participant mode and accepts a layout modification from a local user. The layout modification alters a selection or arrangement of conference components in a user interface. The conference client determines whether the layout modification is a significant layout modification or an insignificant layout modification and transmits a command to a conference server containing a representation of the layout modification only when the layout modification is a significant layout modification.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MELUR RAMAKRISHNAIAH whose telephone number is (571)272-8098. The examiner can normally be reached on 9 Hr schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curt Kuntz can be reached on (571) 272-7499. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MELUR RAMAKRISHNAIAH/
Primary Examiner, Art Unit 2656

Notice of References Cited	Application/Control No. 13/560,767	Applicant(s)/Patent Under Reexamination SKRAMSTAD, HAKON	
	Examiner MELUR RAMAKRISHNAIAH	Art Unit 2656	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2010/0333004	12-2010	KRISTIANSEN et al.	715/765
*	B	US-2012/0200661	08-2012	Mock, Wayne E.	348/14.09
*	C	US-7,634,540	12-2009	Ivashin et al.	709/204
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	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
	13560767	SKRAMSTAD, HAKON
	Examiner	Art Unit
	MELUR RAMAKRISHNAIAH	2656

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

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

CLAIM		DATE								
Final	Original	04/09/2014								
	1	✓								
	2	O								
	3	O								
	4	O								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	O								
	10	✓								
	11	✓								
	12	O								
	13	O								
	14	O								

Form PTO 1449 (Modified) — U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT

ATTY DOCKET NO.	SERIAL NO.
401318US8	13/560,767
APPLICANT: Hakon SKRAMSTAD	
FILLING DATE: July 27, 2012	GROUP: 2656

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	2010/0333004 A1	12/30/2010	Ivan Marius KRISTIANSEN, et al.			
	AB	2008/0316295 A1	12/25/2008	Keith C. KING, et al. (corr. to US 2008/0316296 A1, US 2008/0316297 A1, US 2008/0316298 A1, and corr. to US 2012/0327182 A1)			
	AC	2008/0316296 A1	12/25/2008	Keith C. KING, et al.			
	AD	2008/0316297 A1	12/25/2008	Keith C. KING, et al.			
	AE	2008/0316298 A1	12/25/2008	Keith C. KING, et al.			
	AF	2012/0327182 A1	12/27/2012	Keith C. KING, et al.			
	AG	2007/0211141 A1	09/13/2007	Bernd CHRISTIANSEN			
	AH	7,321,384 B1	01/22/2008	Duanpei WU, et al. (corr. to US 2008/0068449 A1 and US 2011/0205333 A1)			
	AI	2008/0068449 A1	03/20/2008	Duanpei WU, et al.			
	AJ	2011/0205333 A1	08/25/2011	Duanpei WU, et al.			
	AK	2011/0043600 A1	02/24/2011	Rajat GOPAL, et al.			
	AL	2010/0103245 A1	04/29/2010	Eran DECKER, et al.			
	AM	2011/0115876 A1	05/19/2011	Gautam KHOT, et al.			
	AN						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	AO	WO 2007/103412 A2 A3	09/13/2007	WIPO (corr. to US 2007/0211141 A1)		
	AP	EP 1 868 348 A2 A3	12/19/2007	EUROPE		
	AQ	EP 2 288 104 A1	02/23/2011	EUROPE (corr. to US 2011/0043600 A1)		
	AR					
	AS					
	AT					
	AU					
	AV					

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	International Search Report and Written Opinion issued January 22, 2013, in PCT/US2012/048594 filed July 27, 2012.
	AX	
	AY	
	AZ	

☐ Additional References sheet(s) attached

Examiner: /Melur Ramakrishnaiah/ — Date Considered: 04/09/2014

*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; 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. /MR/

WEST Search History for Application 13560767

Creation Date: 2014040907:28

Prior Art Searches

Query	DB	Op.	Plur.	Thes.	Date
(select$ near1 layouts and user near1 interface) same (videoconfer$ or video near1 confer$) and @ad<20110729	PGPB, USPT	OR	YES		04-05-2014
(modify$ near1 layout) and (user near1 interface and (videoconfer$ or video near1 confer$ or multimedia near1 confer$))and @ad<20110729	PGPB, USPT	OR	YES		04-09-2014

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3368

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/560,767	07/27/2012	348	2656	401318US8

APPLICANTS

INVENTORS

Hakon SKRAMSTAD, Oslo, NORWAY;

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

This appln claims benefit of 61/513,190 07/29/2011

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

08/07/2012

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /MELUR RAMAKRISHNAIAH/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NORWAY	7	14	3

ADDRESS

Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314
UNITED STATES

TITLE

METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

FILING FEE RECEIVED		
1380	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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13560767	SKRAMSTAD, HAKON
	Examiner	Art Unit
	MELUR RAMAKRISHNAIAH	2656

CPC- SEARCHED		
Symbol	Date	Examiner
H04N 7/15, 7/14, 9/67, 7/152, 7/142	4-9-14	mrk

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
348	14.01-14.16	4-9-14	mrk
715	765	4-9-14	mrk

SEARCH NOTES		
Search Notes	Date	Examiner
WEST database	4-9-14	mrk

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8

CONFIRMATION NO. 3368

105218
Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

POA ACCEPTANCE LETTER

OC000000067469526

Date Mailed: 04/02/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/25/2014.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/sleutchit/

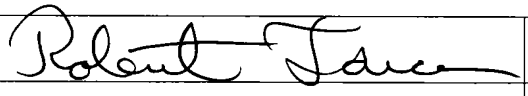
Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	13/560,767
Patent Number	
Filing Date	July 27, 2012
Issue Date	
First Named Inventor	Hakon SKRAMSTAD
Title	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
Art Unit	2656
Examiner Name	CURTIS A. KUNTZ
Attorney Docket Number	401318US8

SIGNATURE of Applicant or Patent Practitioner

Signature		Date	March 25, 2014
Name	Robert Tarcu	Telephone	703-413-3000
Registration Number	64,622		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

■ *Total of 1 forms are submitted.

POWER OF ATTORNEY BY APPLICANT

(ASSIGNEE, LEGAL REPRESENTATIVE OR PERSON WHO OTHERWISE SHOWS SUFFICIENT PROPRIETARY INTEREST)

I hereby revoke all previous powers of attorney given in the application identified in the attached Transmittal for Power of Attorney form.

■ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter:

105218

Please recognize or change the correspondence address for the above-identified patent to:

■ The address associated with the above-mentioned Customer Number.

I am the Applicant:

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

■ Assignee or Person to Whom the Inventor is Under an Obligation to Assign and am authorized to act on behalf of all assignees

☐ Person Who Otherwise Shows Sufficient *Proprietary* Interest (*e.g.*, a petition under 37 CFR 1.46 (b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature	Dan Lang	Date	9/27/2012
Name	Dan Lang	Telephone	
Title and Company	Vice President & Assistant Secty. Cisco Technology, Inc.		

NOTE: Signature - This form must be signed by the applicant or applicant's representative in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below*.

■ *Total of _____ forms are submitted.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: CISCO TECHNOLOGY INC.

Application No./Patent No.: 13/560,767 Filed/Issue Date: July 27, 2012

Entitled: METHOD COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

CISCO TECHNOLOGY INC. (Name of Assignee) Corporation (Type of Assignee, e.g., corporation, partnership, government agency, etc.)

States that it is:

1. ■ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
   The extent (by, percentage) of its ownership interest is _____%

in the patent application/patent identified above by virtue of:

■ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 029130, Frame 0865, or for which a copy therefore is attached.

■ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Robert Tarcu — Signature

3/25/2014 — Date

Robert Tarcu — Printed or Typed Name - Attorney of Record

703-413-3000 — Telephone Number

64,622 — Registration Number

Electronic Acknowledgement Receipt

EFS ID:	18579923
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	105218
Filer:	Bradley Davis Lytle/Kim Rouse
Filer Authorized By:	Bradley Davis Lytle
Attorney Docket Number:	401318US8
Receipt Date:	25-MAR-2014
Filing Date:	27-JUL-2012
Time Stamp:	17:22:49
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		401318USpoa.pdf	149101 0623f2c3d346cecdc2ce3e59e86124d2fa4336d8	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Power of Attorney	2	3
	Assignee showing of ownership per 37 CFR 3.73.	4	4
Warnings:			
Information:			
	Total Files Size (in bytes):	149101	

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.

OBLON
SPIVAK

ATTORNEYS AT LAW

Docket No.: 401318US8

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

RE: Application Serial No.: 13/560,767
Applicants: Hakon SKRAMSTAD
Filing Date: July 27, 2012
For: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPRATUS FOR MODIFYING THE LAYOUT USED BY AVIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
Group Art Unit: 2656
Examiner: KUNTZ, CURTIS A.

Commissioner:

Attached hereto for filing are the following papers:

TRANSMITTAL FOR POWER OF ATTORNEY
POWER OF ATTORNEY
STATEMENT UNDER 37 CFR 3.73(c)

Credit card payment is being made online (if electronically filed), or is attached hereto (if paper filed), in the amount of **$0.00** to cover any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R. 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. **15-0030**. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.

Bradley D. Lytle
Registration No. 40,073

Robert Tarcu
Registration No. 64,622

Customer Number
105218
(703) 413-3000 (phone)
(703) 413-2220 (fax)
(OSMMN 02/12)

Petitioner Exhibit 1002
Page 73 of 285

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8

CONFIRMATION NO. 3368

IMPROPER CPOA LETTER

105218
Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

OC000000060059618

Date Mailed: 04/03/2013

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 03/18/2013. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney is from an assignee and the statement required by 37 CFR 3.73(c) has not been received.

/gbien-aime/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	13/560,767
Patent Number	
Filing Date	July 27, 2012
Issue Date	
First Named Inventor	Hakon SKRAMSTAD
Title	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
Art Unit	2656
Examiner Name	CURTIS A. KUNTZ
Attorney Docket Number	401318US8

SIGNATURE of Applicant or Patent Practitioner

Signature	Robert Tarcu	Date	March 18, 2013
Name	Robert Tarcu	Telephone	703-413-3000
Registration Number	64,622		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

■ *Total of 1 forms are submitted.

POWER OF ATTORNEY BY APPLICANT

(ASSIGNEE, LEGAL REPRESENTATIVE OR PERSON WHO OTHERWISE SHOWS SUFFICIENT PROPRIETARY INTEREST)

I hereby revoke all previous powers of attorney given in the application identified in the attached Transmittal for Power of Attorney form.

■ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter:

105218

Please recognize or change the correspondence address for the above-identified patent to:

■ The address associated with the above-mentioned Customer Number.

I am the Applicant:

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

■ Assignee or Person to Whom the Inventor is Under an Obligation to Assign and am authorized to act on behalf of all assignees

☐ Person Who Otherwise Shows Sufficient *Proprietary* Interest (*e.g.*, a petition under 37 CFR 1.46 (b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature	Dan Lang	Date	9/27/2012
Name	Dan Lang	Telephone	
Title and Company	Vice President & Assistant Secty. Cisco Technology, Inc.		

NOTE: Signature - This form must be signed by the applicant or applicant's representative in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below*.

■ *Total of _____ forms are submitted.

CHANGE OF CORRESPONDENCE ADDRESS
Application

Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	13/560,767
Filing Date	July 27, 2012
First Named Inventor	Hakon SKRAMSTAD
Art Unit	2656
Examiner Name	CURTIS A. KUNTZ
Attorney Docket Number	401318US8

Please change the Correspondence Address for the above-identified patent application to:

■ The address associated with Customer Number: **105218**

I am the:

☐ Applicant/Inventor.

☐ Assignee of record of the entire interest.
Statement under 37 CFR 3.73(c) is enclosed.

■ Attorney or agent of record. Registration Number 64,622.

☐ Registered practitioner named in the application transmittal letter in an application without an Executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number _____.

Signature Robert Tarcu

Typed or Printed Name
Robert Tarcu

Date	Telephone
March 14, 2013	703-413-3000

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

Electronic Acknowledgement Receipt

EFS ID:	15290099
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	105218
Filer:	Bradley Davis Lytle/Maritza Ulloa
Filer Authorized By:	Bradley Davis Lytle
Attorney Docket Number:	401318US8
Receipt Date:	18-MAR-2013
Filing Date:	27-JUL-2012
Time Stamp:	18:09:06
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		401318USPowerOfAttorney.pdf	109823 58c523eb8617a222df0ef125b204647c5441df5c	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	2
	Change of Address	3	3
Warnings:			
Information:			
	Total Files Size (in bytes):	109823	

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.

Form PTO 1449 (Modified)	U.S. DEPARTMENT OF COMMENCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. 401318US8	SERIAL NO. 13/560,767
LIST OF REFERENCES CITED BY APPLICANT		APPLICANT Hakon SKRAMSTAD	
		FILLING DATE July 27, 2012	GROUP 2656

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	2010/0333004 A1	12/30/2010	Ivan Marius KRISTIANSEN, et al.			
	AB	2008/0316295 A1	12/25/2008	Keith C. KING, et al. (corr. to US 2008/0316296 A1, US 2008/0316297 A1, US 2008/0316298 A1, and corr. to US 2012/0327182 A1)			
	AC	2008/0316296 A1	12/25/2008	Keith C. KING, et al.			
	AD	2008/0316297 A1	12/25/2008	Keith C. KING, et al.			
	AE	2008/0316298 A1	12/25/2008	Keith C. KING, et al.			
	AF	2012/0327182 A1	12/27/2012	Keith C. KING, et al.			
	AG	2007/0211141 A1	09/13/2007	Bernd CHRISTIANSEN			
	AH	7,321,384 B1	01/22/2008	Duanpei WU, et al. (corr. to US 2008/0068449 A1 and US 2011/0205333 A1)			
	AI	2008/0068449 A1	03/20/2008	Duanpei WU, et al.			
	AJ	2011/0205333 A1	08/25/2011	Duanpei WU, et al.			
	AK	2011/0043600 A1	02/24/2011	Rajat GOPAL, et al.			
	AL	2010/0103245 A1	04/29/2010	Eran DECKER, et al.			
	AM	2011/0115876 A1	05/19/2011	Gautam KHOT, et al.			
	AN						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	AO	WO 2007/103412 A2 A3	09/13/2007	WIPO (corr. to US 2007/0211141 A1)		
	AP	EP 1 868 348 A2 A3	12/19/2007	EUROPE		
	AQ	EP 2 288 104 A1	02/23/2011	EUROPE (corr. to US 2011/0043600 A1)		
	AR					
	AS					
	AT					
	AU					
	AV					

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	International Search Report and Written Opinion issued January 22, 2013, in PCT/US2012/048594 filed July 27, 2012.
	AX	
	AY	
	AZ	

☐ Additional References sheet(s) attached

Examiner

Date Considered

*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

PATENT COOPERATION TREATY

[redacted]

P. 10

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
Lytle, Bradley D. Hamilton James D.
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, LLP
1940 Duke Street
Alexandria, VA 22314
ETATS-UNIS D'AMERIQUE

RECEIVED IN FOREIGN FILING
DATE: 02/14/2013
TIME:

RECEIVED
FEB 14 2013
OBLON SPIVAK

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)*: 22 January 2013 (22-01-2013)
Applicant's or agent's file reference: 401318WO	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No.: PCT/US2012/048594	International filing date *(day/month/year)*: 27 July 2012 (27-07-2012)
Applicant: CISCO TECHNOLOGY, INC.	

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority: European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer: EMME, Raoul Tel: +49 (0)30 25901-741

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
401318WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2012/048594	27/07/2012	29/07/2011
Applicant		
CISCO TECHNOLOGY, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of:

[X] the international application in the language in which it was filed

[ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**

[X] the text is approved as submitted by the applicant

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant

[ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

[X] as suggested by the applicant

[ ] as selected by this Authority, because the applicant failed to suggest a figure

[ ] as selected by this Authority, because this figure better characterizes the invention

b. [ ] none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/048594

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N7/14 H04N7/15
ADD.

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)
H04N

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 practicable, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/333004 A1 (KRISTIANSEN IVAN MARIUS [NO] ET AL) 30 December 2010 (2010-12-30) paragraph [0008] paragraph [0022] - paragraph [0026] paragraph [0039] - paragraph [0041] paragraph [0048] figures 1,5-6	1-14
X	US 2008/316295 A1 (KING KEITH C [US] ET AL) 25 December 2008 (2008-12-25) paragraph [0042] - paragraph [0048] figures 2,5b,6,10	1-14
A	WO 2007/103412 A2 (CITRIX ONLINE LLC [US]; CHRISTIANSEN BERND [US]) 13 September 2007 (2007-09-13) figures 3-5 paragraph [0058] - paragraph [0060]	1-14

-/--

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

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 January 2013	22/01/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Le Gleut, Ronan

3

Form PCT/ISA/210 (second sheet) (April 2005)

Petitioner Exhibit 1002
Page 83 of 285

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/048594

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 868 348 A2 (ERICSSON AB [SE]) 19 December 2007 (2007-12-19) paragraph [0041] - paragraph [0052] -----	1-14
A	US 7 321 384 B1 (WU DUANPEI [US] ET AL) 22 January 2008 (2008-01-22) figures 7-14 -----	1-14
A	EP 2 288 104 A1 (AVAYA INC [US]) 23 February 2011 (2011-02-23) paragraph [0003] - paragraph [0005] figures 1,5 -----	1-14
A	US 2010/103245 A1 (DECKER ERAN [IL] ET AL) 29 April 2010 (2010-04-29) paragraph [0013] paragraph [0065] figure 6 -----	1-14
A	US 2011/115876 A1 (KHOT GAUTAM [IN] ET AL) 19 May 2011 (2011-05-19) paragraph [0044] - paragraph [0047] figures 6-8 -----	1-14

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

Petitioner Exhibit 1002
Page 84 of 285

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/048594

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 2010333004	A1 30-12-2010	CN	102498717 A	13-06-2012
		EP	2446619 A1	02-05-2012
		NO	331338 B1	28-11-2011
		US	2010333004 A1	30-12-2010
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		EP	1868348 A2	19-12-2007
		JP	2008061220 A	13-03-2008
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		US	2008068449 A1	20-03-2008
		US	2011205333 A1	25-08-2011
EP 2288104	A1 23-02-2011	EP	2288104 A1	23-02-2011
		US	2011043600 A1	24-02-2011
US 2010103245	A1 29-04-2010	NONE		
US 2011115876	A1 19-05-2011	NONE		

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/048594	27.07.2012	29.07.2011

International Patent Classification (IPC) or both national classification and IPC
INV. H04N7/14 H04N7/15

Applicant
CISCO TECHNOLOGY, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	see form PCT/ISA/210	Le Gleut, Ronan Telephone No. +49 30 25901-413

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-14
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-14
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 ✓ US 2010/333004 A1 (KRISTIANSEN IVAN MARIUS [NO] ET AL) 30 December 2010 (2010-12-30)

D2 ✓ US 2008/316295 A1 (KING KEITH C [US] ET AL) 25 December 2008 (2008-12-25)

---------- [lack of novelty] ----------

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

D1 discloses (references into parenthesis)

A method comprising:

providing, on a display, an object configured to be moved by a user along an axis ([0008], [0022]-[0026], [0039]-[0041], Fig.1,5-6);

associating a plurality of predefined layouts with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis ([0008], [0022]-[0026], [0039]-[0041], Fig.1,5-6); and

composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying ([0008], [0022]-[0026], [0039]-[0041], Fig.1,5-6).

Furthermore, the subject-matter of independent claim 1 is also disclosed in D2, see [0042]-[0048] and Figures 2, 5b, 6 and 10.

---- [other independent claims] ----

The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 10 and 11, which therefore are also considered not new.

-------- [dependent claims, negative assessment] --------

Dependent claims 2-9 and 12-14 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty, see D1 [0008], [0022]-[0026], [0039]-[0041], [0048], Fig.1,5-6.

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

HD

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

(19) World Intellectual Property Organization
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13 September 2007 (13.09.2007)

PCT

(10) International Publication Number
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H04N 7/15 (2006.01)

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PCT/US2007/005780

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(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/781,070	9 March 2006 (09.03.2006)	US
11/377,913	16 March 2006 (16.03.2006)	US

(71) Applicant *(for all designated States except US)*: **CITRIX ONLINE, LLC.** [US/US]; 5385 Hollister Avenue, Santa Barbara, CA 93111 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **CHRISTIANSEN, Bernd** [DE/US]; Citrix Online, LLC, 5385 Hollister Avenue, Santa Barbara, CA 93111 (US).

(74) Agents: **RADCLIFFE, Kenneth, E.** et al.; Goodwin Procter LLP, Exchange Place, Boston, MA 02109 (US).

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

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

Published:

— *without international search report and to be republished upon receipt of that report*

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

WO 2007/103412 A2

(54) Title: SYSTEM AND METHOD FOR DYNAMICALLY ALTERING VIDEOCONFERENCE BIT RATES AND LAYOUT BASED ON PARTICIPANT ACTIVITY

(57) Abstract: Systems and Methods to transmit and simultaneously display all video streams in a video conference by dynamically adapting video streams based on audio volume of the participants include allocating an amount of bandwidth to a participant in a videoconference; determining a level of activity exhibited by the participant during the videoconference, and changing the amount of bandwidth allocated to the participant responsive to the determined level of activity. In another aspect, a method for displaying video streams includes creating a graphical representation of a participant in a videoconference; displaying the created graphical representation; determining a level of activity exhibited by the participant during the videoconference; and altering the displayed graphical representation of the participant responsive to the determined level of activity.

SYSTEM AND METHOD FOR DYNAMICALLY ALTERING VIDEOCONFERENCE BIT RATES AND LAYOUT BASED ON PARTICIPANT ACTIVITY

Cross-Reference to Related Applications

[0001] The present application claims priority to and the benefit of U.S. Provisional Patent Application No. 60/781,070, filed on March 9, 2006, and U.S. Patent Application No. 11/377,913, filed on March 16, 2006, the disclosures of which are hereby incorporated herein by reference in their entirety.

Field of the Invention

[0002] The present invention relates to video conferences conducted across a network. More particularly, the present invention relates to systems and methods for simultaneously displaying video streams from multiple participants in a video conference and encoding and sending local video input.

Background of the Invention

[0003] Many multi-way video conferencing applications display the video streams of the various participants in a window with a static layout, and may partition the available space on the screen fairly equally among participants. Many layouts are presently used for multi-way video conferencing applications to display the video streams of the various participants in a window. One layout is N-up, which partitions the window into N planar surfaces of equal size. Other video conferencing applications may arrange transformed surfaces in a window. For example, a chat application may feature a three-dimensional view that arranges participants as if they were sitting around a conference-room table.

[0004] In video conferences with many participants, it may become difficult to perceive a speaker as a display screen becomes crowded and views of individual persons become small. Also, many networks have bandwidth limitations which may be exceeded by transmitting a number of video streams above a certain size. Thus, there exists a need for video conference displays that effectively utilize bandwidth and display area to emphasize important information and views.

Summary of the Invention

[0005] The present invention is directed to systems and methods to transmit and simultaneously display all video streams in a large-scale video conference by dynamically adapting video streams based on audio volume of the participants.

[0006] In one aspect, the present invention is a method of allocating bandwidth to participants in a videoconference. The method comprises: allocating an amount of bandwidth to a participant in a videoconference; determining a level of activity exhibited by the participant during the videoconference, and changing the amount of bandwidth allocated to the participant responsive to the determined level of activity.

[0007] In another aspect, the present invention is a method of generating a dynamic graphical representation of a participant in a videoconference that reflects the participant's level of activity during the videoconference. The method comprises: creating a graphical representation of a participant in a videoconference; displaying the created graphical representation; determining a level of activity exhibited by the participant during the videoconference; and altering the displayed graphical representation of the participant responsive to the determined level of activity.

Brief Description of the Drawings

[0008] The foregoing and other objects, aspects, features, and advantages of the invention will become more apparent and may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

[0009] FIGs. 1A and 1B are block diagrams of embodiments of a computing or network device useful as a device in a client-server network;

[0010] FIG. 2 is a block diagram depicting one embodiment of a computer network;

[0011] FIG. 3 is a block diagram depicting one embodiment of a method of generating a dynamic graphical representation of a participant in a videoconference that reflects the participant's level of activity during the videoconference;

[0012] FIG. 4 is a block diagram depicting an embodiment of altering the displayed graphical representation of a videoconference participant responsive to the determined level of activity;

[0013] FIG. 5 is a block diagram depicting another embodiment of altering the displayed graphical representation of a videoconference participant responsive to the determined level of activity;

[0014] FIG. 6 is a block diagram depicting another embodiment of altering the displayed graphical representation of a videoconference participant responsive to the determined level of activity; and

[0015] FIG. 7 is a block diagram depicting one embodiment of a method of allocating bandwidth to participants in a videoconference.

Detailed Description of the Invention

[0016] Figures 1A and 1B depict block diagrams of a typical computer 100 useful as client computing devices and server computing devices. As shown in FIGs. 1A and 1B, each computer 100 includes a central processing unit 102, and a main memory unit 104. Each computer 100 may also include other optional elements, such as one or more input/output devices 130a-130-b (generally referred to using reference numeral 130), and a cache memory 140 in communication with the central processing unit 102.

[0017] The central processing unit 102 is any logic circuitry that responds to and processes instructions fetched from the main memory unit 104. In many embodiments, the central processing unit is provided by a microprocessor unit, such as those manufactured by Intel Corporation of Mountain View, California; those manufactured by Motorola Corporation of Schaumburg, Illinois; the Crusoe and Efficeon lines of processors manufactured by Transmeta Corporation of Santa Clara, California; the lines of processors manufactured by International Business Machines of White Plains, New York; or the lines of processors manufactured by Advanced Micro Devices of Sunnyvale, California.

[0018] Main memory unit 104 may be one or more memory chips capable of storing data and allowing any storage location to be directly accessed by the microprocessor 102, such as Static random access memory (SRAM), Burst SRAM or SynchBurst SRAM (BSRAM), Dynamic random access memory (DRAM), Fast Page Mode DRAM (FPM DRAM), Enhanced DRAM (EDRAM), Extended Data Output RAM (EDO RAM), Extended Data Output DRAM (EDO DRAM), Burst Extended Data Output DRAM (BEDO DRAM), Enhanced DRAM (EDRAM), synchronous DRAM (SDRAM), JEDEC SRAM, PC100 SDRAM, Double Data

Rate SDRAM (DDR SDRAM), Enhanced SDRAM (ESDRAM), SyncLink DRAM (SLDRAM), Direct Rambus DRAM (DRDRAM), or Ferroelectric RAM (FRAM). In the embodiment shown in FIG. 1A, the processor 102 communicates with main memory 104 via a system bus 120 (described in more detail below). FIG. 1B depicts an embodiment of a computer system 100 in which the processor communicates directly with main memory 104 via a memory port. For example, in FIG. 1B the main memory 104 may be DRDRAM.

[0019] FIGs. 1A and 1B depict embodiments in which the main processor 102 communicates directly with cache memory 140 via a secondary bus, sometimes referred to as a "backside" bus. In other embodiments, the main processor 102 communicates with cache memory 140 using the system bus 120. Cache memory 140 typically has a faster response time than main memory 104 and is typically provided by SRAM, BSRAM, or EDRAM.

[0020] In the embodiment shown in FIG. 1A, the processor 102 communicates with various I/O devices 130 via a local system bus 120. Various busses may be used to connect the central processing unit 102 to the I/O devices 130, including a VESA VL bus, an ISA bus, an EISA bus, a MicroChannel Architecture (MCA) bus, a PCI bus, a PCI-X bus, a PCI-Express bus, or a NuBus. For embodiments in which the I/O device is an video display, the processor 102 may use an Advanced Graphics Port (AGP) to communicate with the display. FIG. 1B depicts an embodiment of a computer system 100 in which the main processor 102 communicates directly with I/O device 130b via HyperTransport, Rapid I/O, or InfiniBand. FIG. 1B also depicts an embodiment in which local busses and direct communication are mixed: the processor 102 communicates with I/O device 130a using a local interconnect bus while communicating with I/O device 130b directly.

[0021] A wide variety of I/O devices 130 may be present in the computer system 100. Input devices include keyboards, mice, trackpads, trackballs, cameras, video cameras, microphones, and drawing tablets. Output devices include video displays, speakers, inkjet printers, laser printers, and dye-sublimation printers. An I/O device may also provide mass storage for the computer system 800 such as a hard disk drive, a floppy disk drive for receiving floppy disks such as 3.5-inch, 5.25-inch disks or ZIP disks, a CD-ROM drive, a CD-R/RW drive, a DVD-ROM drive, tape drives of various formats, and USB storage devices such as the USB Flash Drive line of devices manufactured by Twintech Industry, Inc. of Los Alamitos, California.

[0022] In further embodiments, an I/O device 130 may be a bridge between the system bus 120 and an external communication bus, such as a USB bus, an Apple Desktop Bus, an RS-132 serial connection, a SCSI bus, a FireWire bus, a FireWire 800 bus, an Ethernet bus, an AppleTalk bus, a Gigabit Ethernet bus, an Asynchronous Transfer Mode bus, a HIPPI bus, a Super HIPPI bus, a SerialPlus bus, a SCI/LAMP bus, a FibreChannel bus, or a Serial Attached small computer system interface bus.

[0023] General-purpose computers of the sort depicted in FIG. 1A and FIG. 1B typically operate under the control of operating systems, which control scheduling of tasks and access to system resources. Typical operating systems include: MICROSOFT WINDOWS, manufactured by Microsoft Corp. of Redmond, Washington; MacOS, manufactured by Apple Computer of Cupertino, California; OS/2, manufactured by International Business Machines of Armonk, New York; and Linux, a freely-available operating system distributed by Caldera Corp. of Salt Lake City, Utah, among others.

[0024] For embodiments comprising mobile devices, the device may be a JAVA-enabled cellular telephone, such as the i55sr, i58sr, i85s, or the i88s, all of which are manufactured by Motorola Corp. of Schaumburg, Illinois; the 6035 or the 7135, manufactured by Kyocera of Kyoto, Japan; or the i300 or i330, manufactured by Samsung Electronics Co., Ltd., of Seoul, Korea. In other embodiments comprising mobile devices, a mobile device may be a personal digital assistant (PDA) operating under control of the PalmOS operating system, such as the Tungsten W, the VII, the VIIx, the i705, all of which are manufactured by palmOne, Inc. of Milpitas, California. In further embodiments, the client 113 may be a personal digital assistant (PDA) operating under control of the PocketPC operating system, such as the iPAQ 4155, iPAQ 5555, iPAQ 1945, iPAQ 2215, and iPAQ 4255, all of which manufactured by Hewlett-Packard Corporation of Palo Alto, California; the ViewSonic V36, manufactured by ViewSonic of Walnut, California; or the Toshiba PocketPC e405, manufactured by Toshiba America, Inc. of New York, New York. In still other embodiments, the mobile device is a combination PDA/telephone device such as the Treo 180, Treo 270, Treo 600, Treo 650, Treo 700, or the Treo 700w, all of which are manufactured by palmOne, Inc. of Milpitas, California. In still further embodiments, the mobile device is a cellular telephone that operates under control of the PocketPC operating system, such as the MPx200, manufactured by Motorola Corp. A typical

mobile device may comprise many of the elements described above in FIG. 1A and 1B, including the processor 102 and the main memory 104.

[0025] Referring now to FIG. 2 one embodiment of a computer network is depicted. In brief overview, a number of clients 213a, 213b, 213c, ... , 213n (collectively referred to as 213), are connected via a network 211, to a each other and to a server 205. The clients 213, networks 211, and server 205 may comprise any computing devices comprising substantially similar capabilities, descriptions, functions, and configurations as described herein.

[0026] Still referring to FIG. 2, now in greater detail, in the embodiment shown, a number of clients 213 are connected to a network 211. The network 211 may comprise the Internet, local networks, web servers, file servers, routers, databases, computers, servers, network appliances, or any other computing devices capable of sending and receiving information. The network may comprise computing devices connected via cables, IR ports, wireless signals, or any other means of connecting multiple computing devices. The network and any devices connected to the networks may communicate via any communication protocol used to communicate among or within computing devices, including without limitation SSL, HTML, XML, RDP, ICA, FTP, HTTP, TCP, IP, UDP, IPX, SPX, NetBIOS, NetBEUI, SMB, SMTP, Ethernet, ARCNET, Fiber Distributed Data Interface (FDDI), RS232, IEEE 802.11, IEEE 802.11a, IEE 802.11b, IEEE 802.11g and direct asynchronous connections, or any combination thereof. The network 211 may comprise mobile telephone networks utilizing any protocol or protocols used to communicate among mobile devices, including AMPS, TDMA, CDMA, GSM, GPRS or UMTS.

[0027] In some embodiments, the network configuration shown may be used to create a videoconference among a plurality of clients 213. In one embodiment, a videoconference may comprise a number of clients 213 transmitting a video stream to a number of other clients 213. In some embodiments, each participant may transmit an a video stream to a server 205, which then retransmits said streams to the other participants. In other embodiments, each participant may transmit a video stream to each other participant individually. In still other embodiments, a combination of centralized and decentralized transmissions may be used. For example, if two participants share a local network, the participants may transmit an audio and video stream directly to each other, and also transmit an audio and video stream to a server 205 for transmission to other non-local participants.

[0028] A videoconference transmitted over a network may comprise any known or proprietary videoconferencing protocol, including H.320, H.323, H.324, H.225.0, H.245, H.450, H.235, and H.239 as defined by the International Telecommunications Union, and including any standard or proprietary video compression algorithm, including MPEG-1, MPEG-2, MPEG-4, or H.264. In some embodiments, a client 213 may transmit multiple streams of data as part of a videoconference. For example, a client may transmit one stream of audio data, one stream of video data, one stream of presentation data, and one stream of control data. The audio, video, presentation, and control data may be encoded using any known encoding protocols. In other embodiments, a client may transmit a single stream of data.

[0029] Referring now to FIG. 3, one embodiment of a method for altering the displayed graphical representation of a participant responsive to the determined level of activity is shown. In brief overview, the method comprises: creating a graphical representation of a participant in a videoconference (step 321); displaying the created graphical representation (step 323); determining a level of activity exhibited by the participant during the videoconference (step 325); and altering the displayed graphical representation of the participant responsive to the determined level of activity (step 327). A videoconference display 300 is also depicted at three time intervals.

[0030] Still referring to FIG. 3, now in greater detail, the method shown first comprises creating a graphical representation of a participant in a videoconference (step 321). Said graphical representation may be created by any of the computing devices 100 described herein. In one embodiment, the graphical representation of a participant may comprise a graphical display of a video stream received from the participant. A received video stream received may comprise any video stream, and may comprise any known video stream protocol, including MPEG-1, MPEG-2, MPEG-4, H.261, H.263, and M-JPEG.

[0031] In some embodiments, the graphical representation of a participant may also comprise any display or formatting elements including text, images, borders, and avatars. For example, the video stream of a participant might be displayed along with text indicating the participants name or location. Or, for example, the video stream of a participant might be displayed with an avatar or icon representing the participant.

[0032] In some embodiments, creating a graphical representation of a participant may comprise transforming the graphical representation such that the graphical representation appears to have three dimensions. In one embodiment, a rectangular video stream may be stretched and skewed to give the appearance of facing a given direction. For example, the video streams of a number of participants may be transformed such that they appear to be arranged around a conference table.

[0033] After creating a graphical representation of a participant in a videoconference (step 321); the method shown comprises displaying the created graphical representation (step 323). The graphical representation may be displayed on any display device, including a monitor, CRT screen, LCD screen, television, PDA screen, video projector, and laptop screen.

[0034] In some embodiments, the displaying the created graphical representation may comprise displaying the created graphical representation on a screen also comprising graphical representations of other participants. In these embodiments, any known layout may be used, including N-up, box layouts, ring layouts, and three dimensional layouts. Videoconference screen 300a illustrates on example of an N-up layout with six participants.

[0035] In some embodiments, the graphical representations of a number of participants may initially be displayed as the same size. In other embodiments, graphical representations of participants may initially be displayed in different sizes. For example, the video stream of a videoconference organizer may be initially allocated a larger screen area.

[0036] In some embodiments, special screen locations may be assigned to designated participants. For example, the video stream of the videoconference organizer may initially be assigned to the top left position. Or, for example, the video streams of sub groups of participants may be grouped together.

[0037] In some embodiments, the graphical representations of participants may be displayed on a background. For example, the video stream of a participant might be displayed on a background of a conference table setting, such that the participant appeared to be sitting at the table.

[0038] In some embodiments, the participants displayed may all be remote participants. In other embodiments, a videoconference display screen may also comprise a display of the local participant. In some embodiments, the display of the local participant may be specially

designated and displayed, according to any of the techniques for altering the graphical representation of a participant described herein.

[0039] After displaying the created graphical representation (step 323), the method shown comprises determining a level of activity exhibited by the participant during the videoconference (step 325).

[0040] In some embodiments, the activity level of a participant may be calculated according to the absolute audio volume of the participant. In other embodiments the activity level of a participant may be calculated relative to the audio volumes of all participants. In one embodiment, the activity level of a participant may be computed by dividing the volume output of a given participant by the total volume output from all participants. In other embodiments, other statistical measures, such as deviation from the mean volume of the group, or relative changes in volume from previous levels may be used to compute the activity level of a participant. For example, if a participant's average volume is high but unchanging, this may reflect background noise in the participant's environment rather than participation in the discussion. The activity level of the participant may then be reduced to accommodate this.

[0041] In some embodiments, said activity level computations may be adjusted to avoid sudden large changes in determined activity level. In one embodiment, the activity level for each participant to each participant is controlled to be within some threshold of its activity level to prevent the activity level from changing too abruptly. In some embodiments, a rolling average of a participant's volume may be used to compute activity level to similarly avoid abrupt changes.

[0042] In some embodiments, minimum and maximum values for activity level may be set. For example, a threshold could be set such that no person accounts for more than 50% of the total of all activity levels, and no person takes accounts for less than 4% of the total of all activity levels.

[0043] In some embodiments, metrics other than audio volume may be used to determine a participant's activity level. In one embodiment, the activity level of a participant may be computed according to the amount of motion in the participant's video stream. In another embodiment the activity level may be computed according to the amount of motion in the participant's video stream relative to the other participants. In yet another embodiment, the activity level may be computed according to the amount of motion in the participant's mouth

area. In still another embodiment, the activity level may be computed according to the amount of motion in the participant's mouth area as compared to other participants. In some embodiments, an activity level may be calculated using both amount of motion and audio volume according to any of the methods described herein.

[0044] In some embodiments, an activity level may be calculated using information entered by a participant. For, example, a participant momentarily leaving for a cup of coffee may indicate that they are going to be away, and their activity level may be reduced correspondingly. Or, for example, a participant who only intends to watch passively may indicate they are only observing, and their activity level may be reduced accordingly. Or for example, if a user mutes his or her microphone, their activity level may be reduced. In some embodiments, activity levels may be calculated using a combination of user-entered information and any of the other techniques described herein.

[0045] In other embodiments, activity level may be calculated by any other metric of estimating user participation, including determining the amount of talking or movement of a given participant.

[0046] In some embodiments, the activity levels may be computed in a centralized manner, such that every participant's display will reflect similar sizes for the participants. In one embodiment, the activity levels may be computed at a server 205 and transmitted to the videoconference participants. In other embodiments, a client 213 may serve as a master client and compute and transmit activity levels for all participants. In other embodiments, activity levels may be computed in a decentralized manner.

[0047] After determining a level of activity exhibited by the participant during the videoconference (step 325); the method shown comprises altering the displayed graphical representation of the participant responsive to the determined level of activity (step 327). In some embodiments, the displayed graphical representation of a participant may be altered a number of times. In this embodiment, the amount of time between alterations may comprise any time interval, including but not limited to microseconds, milliseconds, seconds, and minutes. In other embodiments, the displayed graphical representation of a participant may be altered continually or continuously over the course of a videoconference.

[0048] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise altering the size of the displayed graphical representation. In some embodiments, the size of the graphical representation of participants exhibiting high activity levels may be increased. In other embodiments, the size of the graphical representation of participants exhibiting low activity levels may be decreased. In some embodiments, each participant may be allocated a percentage of the total screen area based on their percentage of the total activity level. For example, if a participant's activity level accounts for 40% of the total activity level (as measured by adding the activity levels of all participants), that participant may be allocated 40% of the videoconference display area. In some embodiments, a minimum or maximum value may be set for the screen area a given participant may occupy. In some embodiments, the proportion p of the screen corresponding to a given participant may be calculated by using the formula $p = a / \Sigma a$, where a is the activity level of the participant, and Σa is the sum of all the activity levels of all participants.

[0049] Still referring to FIG. 3 a videoconference display 300 in which the displayed graphical representations of the participants are altered over time is shown. A videoconference display 300a is shown at Time 1. The display 300a comprises six areas 310a, 311a, 312a, 313a, 314a, 315a comprising graphical representations of participants in a video conference. In the embodiment shown, each area displays a video stream transmitted by the participant. In the embodiment shown, the areas for the display of video streams are all the same size at the first time point. The time intervals between Times 1, 2 and 3 may be of any magnitude, including but not limited to microseconds, milliseconds, seconds, minutes.

[0050] In the embodiment shown, the displayed graphical representation of the participants has been altered during the time interval between Time 1 and Time 2. For example, the area 315 enlarges, while the areas 311, 312, and 314 are smaller. Said alterations in size may be responsive to activity levels calculated according to any of the methods described herein. In some embodiments, these changes may reflect that the participant corresponding to area 315 was speaking in the time interval prior to Time 2.

[0051] In the embodiment shown, the displayed graphical representation of the participants has been altered again during the time interval between Time 2 and Time 3. For example, the area 310 enlarges, while the area 313 becomes smaller. Said alterations in size may be responsive to activity levels calculated according to any of the methods described herein. In

some embodiments, these changes may reflect that the participant corresponding to area 310 was speaking in the time interval prior to Time 3. In some embodiments, the area 315 maintaining its larger size may reflect that the participant corresponding to area 315 is still actively engaged in conversation.

[0052] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise altering the relative position to other participants of the displayed graphical representation. In one embodiment, participants with high activity levels may be moved higher and closer to the center of a display relative to other participants. In another embodiment, participants with lower activity levels may be moved lower and closer to the edges of a display relative to other participants. For example, the participants may all be initially displayed in a row. Displays of participants may then be raised or lowered according to their activity level. In other embodiments, a designated position may be set aside for participants with activity levels above a given threshold. For example, the participant with the highest activity level may be displayed in the center of a ring, or in the top-left corner of a grid. In other embodiments, designated positions may be set aside for participants with activity levels below a given threshold. For example, participants with an activity level indicating they have not yet spoken may be displayed in a bottom row.

[0053] Referring now to FIG. 4, a block diagram depicting an embodiment of altering the displayed graphical representation of a videoconference participant responsive to the determined level of activity is shown. In brief overview, a videoconference display screen 400, is depicted at three time points, Times 1, 2 and 3. The videoconference display 400 comprises a number of areas 410, 411, 412, 413, 414, 415 in which video streams are displayed. The time intervals between Times 1, 2 and 3 may be of any magnitude, including but not limited to microseconds, milliseconds, seconds, minutes.

[0054] Still referring to FIG. 4, now in greater detail, a videoconference display 400a is shown at a first time point. The display 400a comprises six areas 410, 411, 412, 413, 414, 415 for displaying video streams. Each area corresponds to a participant in the videoconference, and may comprise any of the graphical representations described herein.

[0055] In the embodiment shown, several of the areas 410, 411, 412, 413, 414, 415 and their corresponding video streams change size and position during the time interval between Time 1 and Time 2. For example, the areas 410, 411, 413, and 414 shrink and move downward,

while the area 415 enlarges and moves up and to the center of the display 400. Said changes in size and position may be responsive to activity levels calculated according to any of the methods described herein.

[0056] In the embodiment shown, several of the areas 410, 411, 412, 413, 414, 415 and their corresponding video streams again change size and position during the time interval between Time 2, and Time 3. For example, area 415 enlarges further and moves to the top-center of the display, while area 412 shrinks and moves to the bottom-right corner. Said changes in size and position may be responsive to an activity level calculated according to any of the methods described herein.

[0057] Now referring to FIG. 5, a block diagram depicting one embodiment of dynamically computing videoconference display areas is shown. In brief overview, a videoconference display 500 is depicted at 2 time points, Time 1 and Time 2. The display 500 is divided into a plurality of circles 510, 511, 512, 513, wherein each circle corresponds to a videoconference participant. The time intervals between Times 1 and 2 may be of any magnitude, including but not limited to milliseconds, seconds, minutes, and hours.

[0058] Still referring to FIG. 5, now in greater detail, each circle, such as 510 corresponds to a given videoconference participant. In the embodiment shown, at Time 1, all circles are the same size and have the same radius. In the embodiment shown, the video stream of each participant would be displayed inside the circle corresponding to that participant. In some embodiments, a participant's video stream may be displayed in an area comprising a rectangle inscribed in said participant's circle.

[0059] In the embodiment shown the size of each circle may be computed by treating the circle as an enclosed cylinder holding gas at a given pressure. The pressure may correspond to the activity level of the given participant, and may be calculated according to any of the methods described herein. Once the pressure is computed, the radius of the circle can be computed using known formulae based on physical principles. In one embodiment, the radius, r, of a circle may be computed using the formula

$$r = \sqrt{(kp / \pi)}$$

where p is the pressure of the circle, and k is an initial constant. In some embodiments, the initial constant k may be set such that all circles are initially the same size and together occupy the entire display. In other embodiments, circles may be set with different initial constants to

provide for different initial sizes. Other formulae may also be used to compute the subsequent position of the circles.

[0060] In the embodiment shown, the circles 510, 511, 512, 513 change size between Time 1 and Time 2. For example, the circle 511 becomes smaller, while the circle 513 grows larger. Said changes in pressure and corresponding size and position may be responsive to activity levels calculated according to any of the methods described herein.

[0061] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise altering the transformation of the displayed graphical representation. In one embodiment, transformations of the displayed graphical representation may be altered such that the representations appear to be facing the participant with the highest activity level

[0062] Now referring to FIG. 6, a block diagram depicting another embodiment of altering the displayed graphical representation of a videoconference participant responsive to the determined level of activity is shown. In brief overview, a videoconference display screen 600, is depicted at three time points, Times 1, 2 and 3. The videoconference display 600 comprises a number of areas 610, 611, 612, 613 in which video streams are displayed. The time intervals between Times 1, 2 and 3 may be of any magnitude, including but not limited to milliseconds, seconds, minutes, and hours.

[0063] Still referring to FIG. 6, now in greater detail, a videoconference display 600a is shown at a first time point. The display 600a comprises four areas 610, 611, 612, 613 corresponding to participants in a videoconference. Each area may comprise any of the graphical representations of participants discussed herein. In the embodiment shown the rectangular areas are transformed such that they appear to be part of a three-dimensional scene.

[0064] At Time 1, in the embodiment shown, the areas 610, 611, 612, 613 are displayed in an arch centered around the area 612. In the embodiment shown, the area 612a is transformed so that it and its corresponding video stream appear flat. In the embodiment shown, the areas 610a, 611a, and 613a are transformed such that the areas appear to be facing area 612a. Said transformations may be performed according to any known image and video transformation algorithms, and may be implemented in accordance with any technique described herein.

[0065] At Time 2, in the embodiment shown the areas 610, 611, 612, 613 have changed transformation. For example, area 613 is transformed so that it appears at a greater angle, while area 610 is transformed so that it appears to be more directly facing outward. Said changes may be responsive to activity levels calculated according to any of the methods described herein.. In some embodiments, said changes may be a result of more active participation by the participant corresponding to area 610.

[0066] At Time 3, in the embodiment shown, the areas 610, 611, 612, 613 have again changed their transformation. For example, area 610 is transformed so that it appears to be directly facing outward, while areas 611, 612, and 613 are transformed such that they appear to be facing area 610. Said changes may be responsive to activity levels calculated according to any of the methods described herein.

[0067] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise altering the graphical representation of a participant in other ways. In one embodiment, participants below a given activity level threshold may be displayed in black and white, while persons above a given threshold are displayed in color. In another embodiment, participants below a given threshold may be displayed in grayscale. In some embodiments, the bit-depth of the colors used in the graphical representation of a participant may be altered. In other embodiments, a colored border may be used to indicate the participant with the highest activity level, or the participant most likely to be speaking. In other embodiments, any attributes of a participant's video stream may be altered, including but not limited to color, brightness, contrast, and sharpness. For example, the video stream of a relatively inactive participant may be dimmed and/or blurred, while the video stream of an active participant may be brightened and/or sharpened.

[0068] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise displaying a still image in place of a video stream for a given participant. In some embodiments, participants below a given activity level threshold may be displayed as a static image. In some embodiments, said static image may represent the frame of the participant's video stream prior to their activity level falling below the threshold. In other embodiments, the static image may comprise a still photo or avatar designated by the participant.

[0069] In some embodiments, altering the displayed graphical representation of a participant (step 327) may comprise altering text within the graphical representation. In some embodiments, a participant with an activity level below a given threshold might be displayed with text such as "idle" or "inactive." In other embodiments, a participant with an activity level above a given threshold might be displayed with text such as "active" or "speaking."

[0070] In any of the embodiment described above for altering the displayed graphical representation of a participant, methods may be used so that the displayed graphical representation of a participant does not change too rapidly. For example, the altered relative position of a participant may be limited to a certain distance from the previous position. Or for example, the altered transformation of a participant may be limited to a certain angle from the previous transformation.

[0071] Referring now to FIG. 7, a method of allocating bandwidth to participants in a videoconference is shown. In brief overview, the method comprises:

[0072] allocating an amount of bandwidth to a participant in a videoconference (step 701); determining a level of activity exhibited by the participant during the videoconference(step 703); and changing the amount of bandwidth allocated to the participant responsive to the determined level of activity(step 705).

[0073] Still referring to FIG. 7, now in greater detail, the method shown comprises allocating an amount of bandwidth to a participant in a videoconference (step 701). Said allocation may be done by any allocation method. In some embodiments, bandwidth may be initially allocated equally to all participants. In other embodiments, designated participants, such as the videoconference organizer, may be initially allocated greater bandwidth than other participants. In still other embodiments, bandwidth may be allocated based on local connection bandwidth. For example, if a total bandwidth for a videoconference is fixed, bandwidth may be allocated to individual participants based on the capabilities of the participants local connections.

[0074] After allocating an amount of bandwidth to a participant in a videoconference (step 701), the method comprises determining a level of activity exhibited by the participant during the videoconference(step 703). This level of activity may be determined using any of the methods described herein.

[0075] After determining a level of activity exhibited by the participant during the videoconference(step 703), the method comprises changing the amount of bandwidth allocated to the participant responsive to the determined level of activity(step 705). Any known means of changing video transmission bandwidth may be used. In some embodiments, the bandwidth may be changed by transmitting at a lower or higher resolution. In one embodiment, the resolution of the transmitted video may correspond to the current screen area allocated to the participant. In other embodiments, the bandwidth may be changed by transmitting at a lower or higher frame rate. In still other embodiments, the bandwidth may be changed by transmitting video with more or fewer colors. In still other embodiments, the bandwidth may be changed by transmitting video in black and white or grayscale. In yet other embodiments, the bandwidth may be changed by altering the quantization of prediction errors or the granularity of the subsampling. In one embodiment, changing the bandwidth may comprise switching to a different video codec.

[0076] In one embodiment, changing the amount of bandwidth allocated to the participant responsive to the determined level of activity(step 705) may comprise each participant may adjusting the bit rate of his or her own video stream such that the video stream consumes the same fraction of the globally available bandwidth as the ratio of the participant's screen estate to the total screen estate. The globally available bandwidth may either be static, assigned by a server 205 at run-time, or collaboratively estimated at run-time using well-known techniques. In another embodiment, a participant may change the bandwidth of his or her own video stream in response to the participants activity level as a percentage of the total activity level. In other embodiments, a user's local bandwidth may also be included in calculating the bit rate of a given video stream.

[0077] In one embodiment, if a participant's activity is below a given threshold, the participant's video-stream bit-rate may be reduced to zero. In this embodiment, a still image may be displayed in place of the participant's video stream.

[0078] In some embodiments, the techniques described herein may be employed in videoconferences wherein each participant transmits a local video stream to all other participants. In one embodiment, each participant may utilize any of the above methods in a decentralized manner. For example, a participant may receive a number of video streams from other participants, and compute the activity level and corresponding size of the displayed

representation of each participant using any of the methods described above. Or, for example, a participant may receive a number of video streams from other participants, compute the activity level of each participant, compute the proportion the participant's own activity level to the total, and adjust the participant's own transmitted bandwidth accordingly using any of the methods described herein.

[0079] In other embodiments, the techniques described herein may be employed in videoconferences wherein any of the discussed methods are performed in a centralized manner. For example, a server 205, or elected master client 213 may compute activity levels for each participant and transmit said activity levels to all other participants. Or, for example, a server 205 may compute both activity levels and corresponding bandwidth allocations for each participant, and transmit information corresponding to said bandwidth allocations to all participants. In some embodiments, the server 205 may then alter the bandwidths that the server 205 retransmits the video streams of said participants.

[0080] In some embodiments, an interface may provide for manual override of any of the functions described herein. In some embodiments, a given participant may enlarge the display of a given participant if the user so wishes. For example, in some embodiments, functionality may be provided so that a participant may request that the user's video stream is displayed at a given size.

[0081] While the invention has been particularly shown and described with reference to specific preferred embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein departing from the spirit and scope of the invention as defined by the appended claims.

We Claim:

1. A method of generating a dynamic graphical representation of a participant in a videoconference that reflects the participant's level of activity during the videoconference, the method comprising:

(a) creating a graphical representation of a participant in a videoconference;

(b) displaying the created graphical representation;

(c) determining a level of activity exhibited by the participant during the videoconference; and

(d) altering the displayed graphical representation of the participant responsive to the determined level of activity.

2. The method of claim 1 wherein step (a) comprises creating a two-dimensional graphical representation of a participant in a videoconference.

3. The method of claim 1 wherein step (a) comprises creating a three-dimensional graphical representation of a participant in a videoconference.

4. The method of claim 1 wherein step (a) comprises creating a two-dimensional graphical representation of a participant in a videoconference using an image of the participant.

5. The method of claim 1 wherein step (a) comprises creating a two-dimensional video representation of a participant in a videoconference.

6. The method of claim 1 wherein step (c) comprises determining the participant's absolute volume level during the videoconference.

7. The method of claim 1 wherein step (c) comprises determining the participant's volume level during the videoconference relative to other participants.

8. The method of claim 1 wherein step (c) comprises determining the participant's volubility during the videoconference.

9. The method of claim 1 wherein step (c) comprises determining the participant's level of animation during the videoconference.

10. The method of claim 1 wherein step (c) comprises determining the participant's level of animation during the videoconference relative to other participants.

11. The method of claim 1 wherein step (d) comprises changing the size of the displayed graphical representation of the participant responsive to the determined level of activity.

12. The method of claim 1 wherein step (d) comprises changing the relative position of the displayed graphical representation of the participant responsive to the determined level of activity.

13. The method of claim 1 wherein step (d) comprises changing the color bit depth of the displayed graphical representation of the participant responsive to the determined level of activity.

14. The method of claim 1 wherein step (d) comprises replacing a color graphical representation of the participant with a grayscale representation of the participant responsive to the determined level of activity.

15. The method of claim 1 wherein step (d) comprises replacing a color graphical representation of the participant with a black and white representation of the participant responsive to the determined level of activity.

16. The method of claim 1 wherein step (d) comprises replacing a video representation of the participant with a still image responsive to the determined level of activity.

17. The method of claim 1 wherein step (d) comprises changing the z-axis ordering of the displayed graphical representation of the participant responsive to the determined level of activity.

18. The method of claim 1 wherein step (d) comprises changing the transformation of the displayed graphical representation of the participant responsive to the determined level of activity.

19. An apparatus for generating a dynamic graphical representation of a participant in a videoconference that reflects the activity level of the participant during the videoconference, the apparatus comprising:

a display engine displaying a graphical representation of a participant in a videoconference;

an activity monitor in communication with the display engine, the activity monitor determining a level of activity exhibited by the participant during the videoconference,

wherein the display engine alters the displayed graphical representation of the participant responsive to the determined level of activity.

20. The apparatus of claim 19 wherein the display engine creates a two-dimensional graphical representation of a participant in a videoconference.

21. The apparatus of claim 19 wherein the display engine creates a three-dimensional graphical representation of a participant in a videoconference.

22. The apparatus of claim 19 wherein the display engine creates a two-dimensional graphical representation of a participant in a videoconference using an image of the participant.

23. The apparatus of claim 19 wherein the display engine creates a two-dimensional video representation of a participant in a videoconference.

24. The apparatus of claim 19 wherein the activity monitor determines the participant's absolute volume level during the videoconference.

25. The apparatus of claim 19 wherein the activity monitor determines the participant's volume level during the videoconference relative to other participants.

26. The apparatus of claim 19 wherein the activity monitor determines the participant's volubility during the videoconference.

27. The apparatus of claim 19 wherein the activity monitor determines the participant's level of animation during the videoconference.

28. The apparatus of claim 19 wherein the activity monitor determines the participant's level of animation during the videoconference relative to other participants.

29. The apparatus of claim 19 wherein the display engine changes the size of the displayed graphical representation of the participant responsive to the determined level of activity.

30. The apparatus of claim 19 wherein the display engine changes the relative position of the displayed graphical representation of the participant responsive to the determined level of activity.

31. The apparatus of claim 19 wherein the display engine changes the color bit depth of the displayed graphical representation of the participant responsive to the determined level of activity.

32. The apparatus of claim 19 wherein the display engine replaces a color graphical representation of the participant with a grayscale representation of the participant responsive to the determined level of activity.

33. The apparatus of claim 19 wherein the display engine replaces a color graphical representation of the participant with a black and white representation of the participant responsive to the determined level of activity.

34. The apparatus of claim 19 wherein the display engine replaces a video representation of the participant with a still image responsive to the determined level of activity.

35. The apparatus of claim 19 wherein the display engine changes the z-axis ordering of the displayed graphical representation of the participant responsive to the determined level of activity.

36. The apparatus of claim 19 wherein the display engine changes the transformation of the displayed graphical representation of the participant responsive to the determined level of activity.

37. A method of allocating bandwidth to participants in a videoconference, the method comprising:

(a) allocating an amount of bandwidth to a participant in a videoconference;

(b) determining a level of activity exhibited by the participant during the videoconference; and

(c) changing the amount of bandwidth allocated to the participant responsive to the determined level of activity.

38. The method of claim 37 wherein step (b) comprises determining the participant's absolute volume level during the videoconference.

39. The method of claim 37 wherein step (b) comprises determining the participant's volume level during the videoconference relative to other participants.

40. The method of claim 37 wherein step (b) comprises determining the participant's volubility during the videoconference.

41. The method of claim 37 wherein step (b) comprises determining the participant's level of animation during the videoconference.

42. The method of claim 37 wherein step (b) comprises determining the participant's level of animation during the videoconference relative to other participants.

43. The method of claim 37 wherein step (b) comprises (b-a) receiving a communication from another participant in the video conference, the communication including an indication of the activity level exhibited by the another participant; and (b-b) comparing an indication of the participant's level of activity to the another participant's level of activity.

44. The method of claim 37 wherein step (c) comprises increasing the amount of bandwidth allocated to the participant.

45. The method of claim 37 wherein step (c) comprises decreasing the amount of bandwidth allocated to the participant.

46. The method of claim 37 further comprising changing the size of the transmitted graphical representation of the participant responsive to the bandwidth allocated to the participant.

47. The method of claim 37 further comprising changing the color bit depth of the transmitted graphical representation of the participant responsive to the bandwidth allocated to the participant.

48. The method of claim 37 further comprising replacing a color graphical representation of the participant with a grayscale representation of the participant responsive to the bandwidth allocated to the participant.

49. The method of claim 37 further comprising replacing a color graphical representation of the participant with a black and white representation of the participant responsive to the bandwidth allocated to the participant.

50. The method of claim 37 further comprising replacing a video representation of the participant with a still image responsive to the bandwidth allocated to the participant.

51. An apparatus for allocating bandwidth to participants in a videoconference, the apparatus comprising:

a network engine transmitting data to a remote participant in a videoconference;

an activity monitor in communication with the network engine, the activity monitor determining a level of activity exhibited by a local participant during the videoconference,

wherein the network engine changes the available bandwidth responsive to the determined level of activity.

52. The apparatus of claim 47 wherein the activity monitor determines the local participant's absolute volume level during the videoconference.

53. The apparatus of claim 47 wherein the activity monitor determines the local participant's volume level during the videoconference relative to other participants.

54. The apparatus of claim 47 wherein the activity monitor determines the local participant's volubility during the videoconference.

55. The apparatus of claim 47 wherein the activity monitor determines the local participant's level of animation during the videoconference.

56. The apparatus of claim 47 wherein the activity monitor determines the local participant's level of animation during the videoconference relative to other participants.

57. The apparatus of claim 47 further comprising a display engine in communication with the network engine, the display engine changing the size of the transmitted graphical representation of the participant responsive to the amount of bandwidth allocated to the local participant.

58. The apparatus of claim 47 further comprising a display engine in communication with the network engine, the display engine changing the color bit depth of the transmitted graphical representation of the participant responsive to the amount of bandwidth allocated to the local participant.

59. The apparatus of claim 47 further comprising a display engine in communication with the network engine, the display engine replacing a color graphical representation of the participant with a grayscale representation of the participant responsive to the amount of bandwidth allocated to the local participant.

60. The apparatus of claim 47 further comprising a display engine in communication with the network engine, the display engine replacing a color graphical representation of the participant with a black and white representation of the participant responsive to the amount of bandwidth allocated to the local participant.

61. The apparatus of claim 47 further comprising a display engine in communication with the network engine, the display engine replacing a video representation of the participant with a still image responsive to the amount of bandwidth allocated to the local participant.

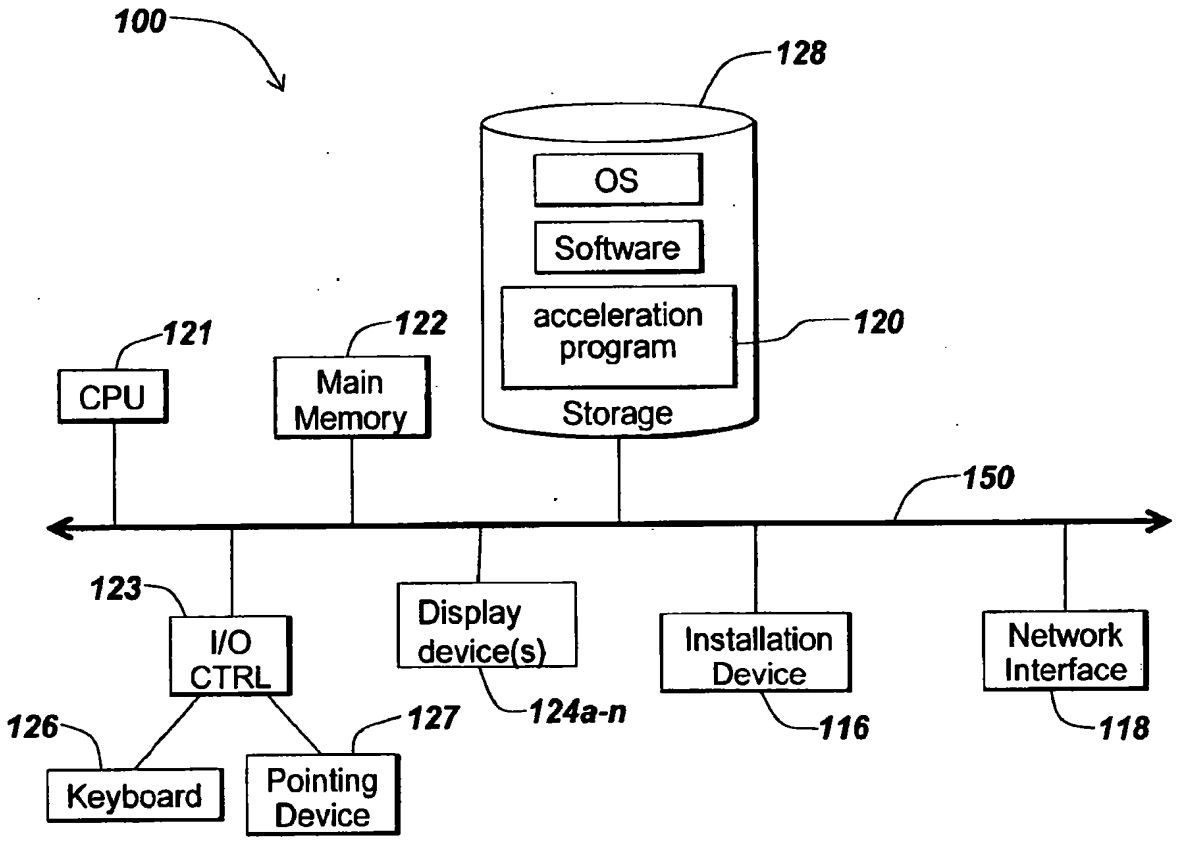

100
128
OS
Software
acceleration program
120
Storage
121
CPU
122
Main Memory
150
123
I/O CTRL
Display device(s)
124a-n
Installation Device
116
Network Interface
118
126
Keyboard
127
Pointing Device

Fig. 1A

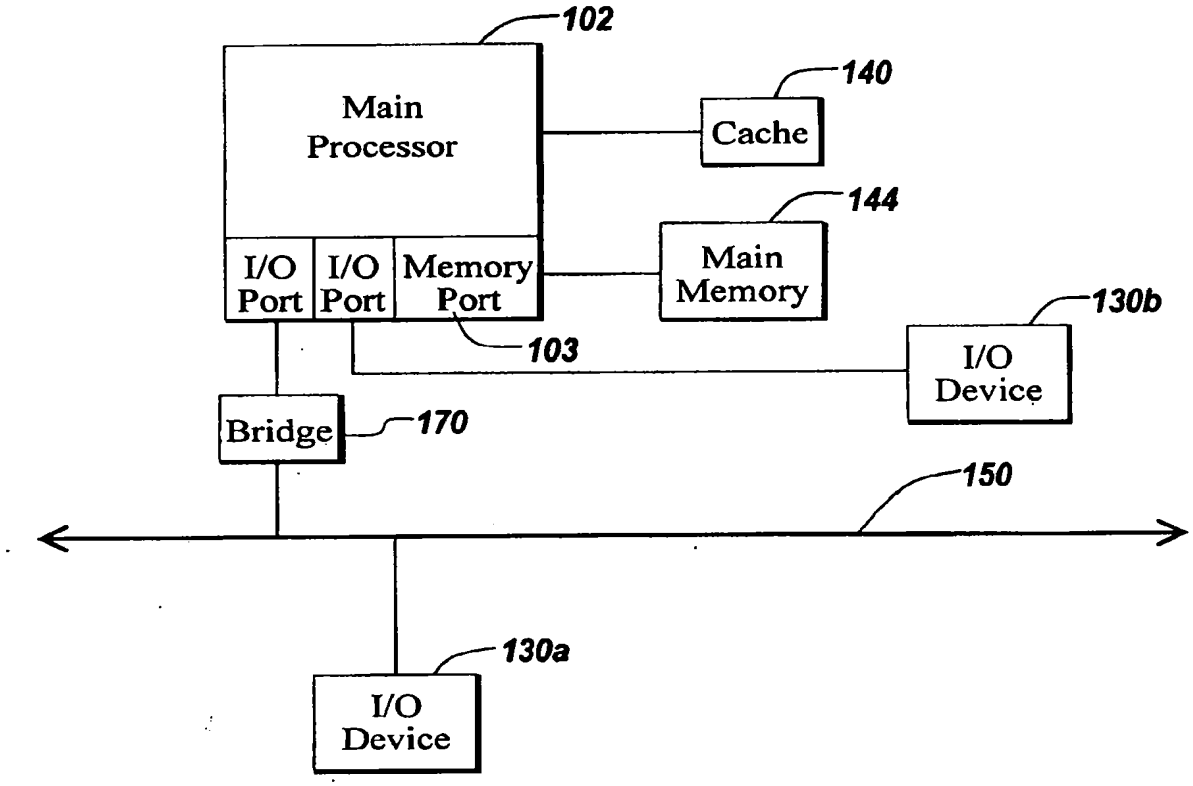

102
Main Processor
140
Cache
144
Main Memory
I/O Port
I/O Port
Memory Port
103
130b
I/O Device
Bridge
170
150
130a
I/O Device

Fig. 1B

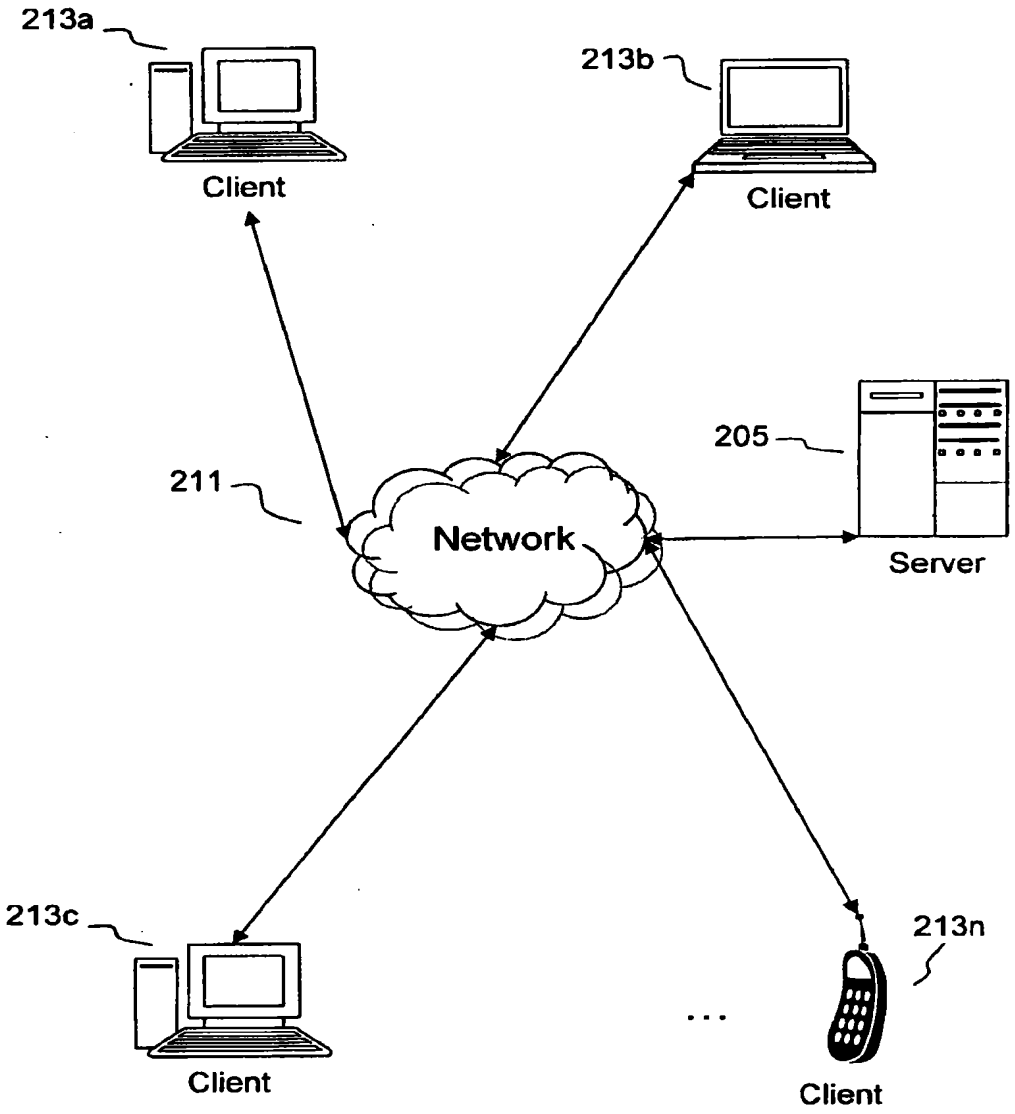

213a
Client
213b
Client
205
Server
211
Network
213c
Client
213n
Client

Fig. 2

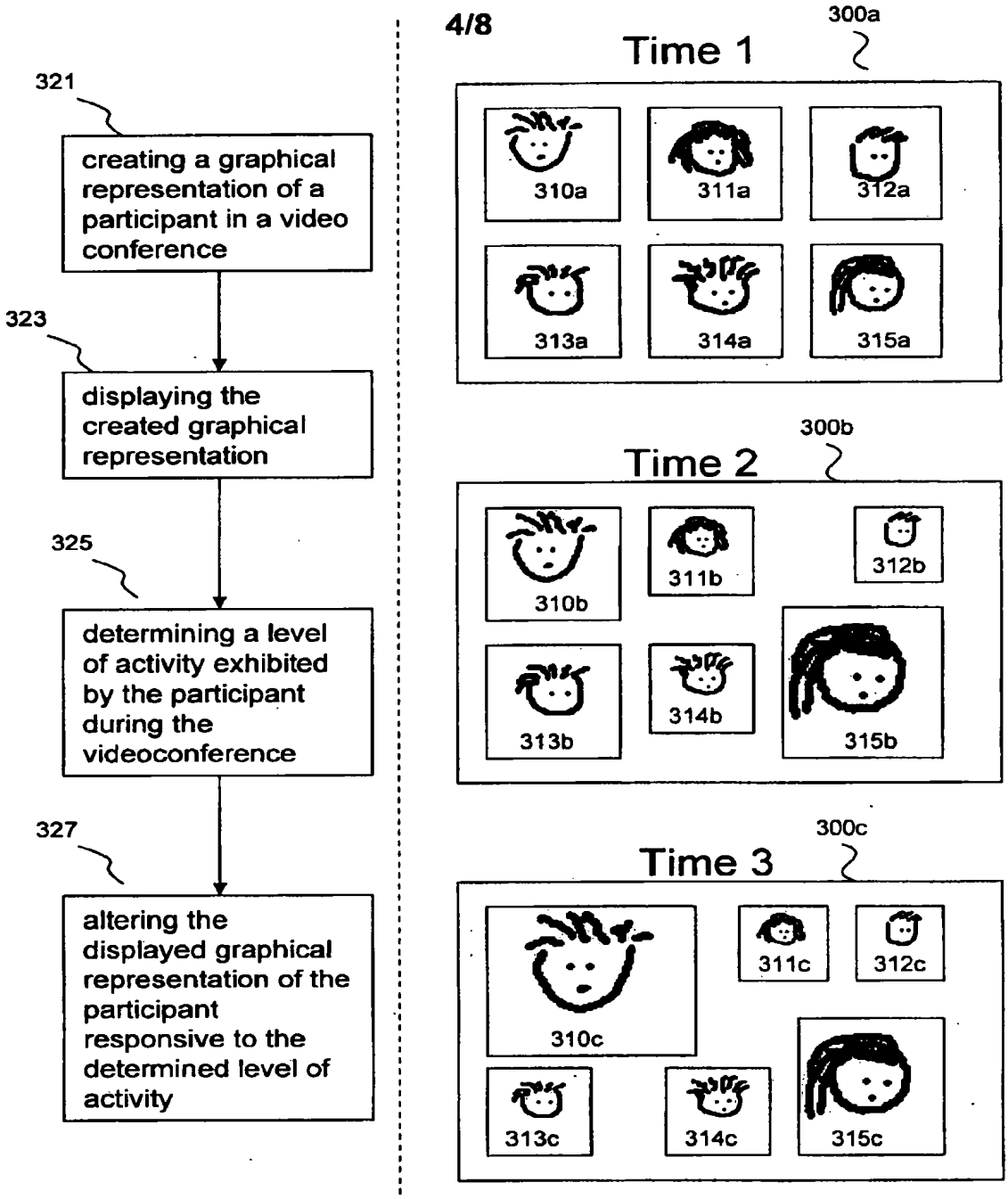

321
creating a graphical representation of a participant in a video conference
323
displaying the created graphical representation
325
determining a level of activity exhibited by the participant during the videoconference
327
altering the displayed graphical representation of the participant responsive to the determined level of activity
300a
Time 1
310a
311a
312a
313a
314a
315a
300b
Time 2
310b
311b
312b
313b
314b
315b
300c
Time 3
310c
311c
312c
313c
314c
315c

Fig. 3

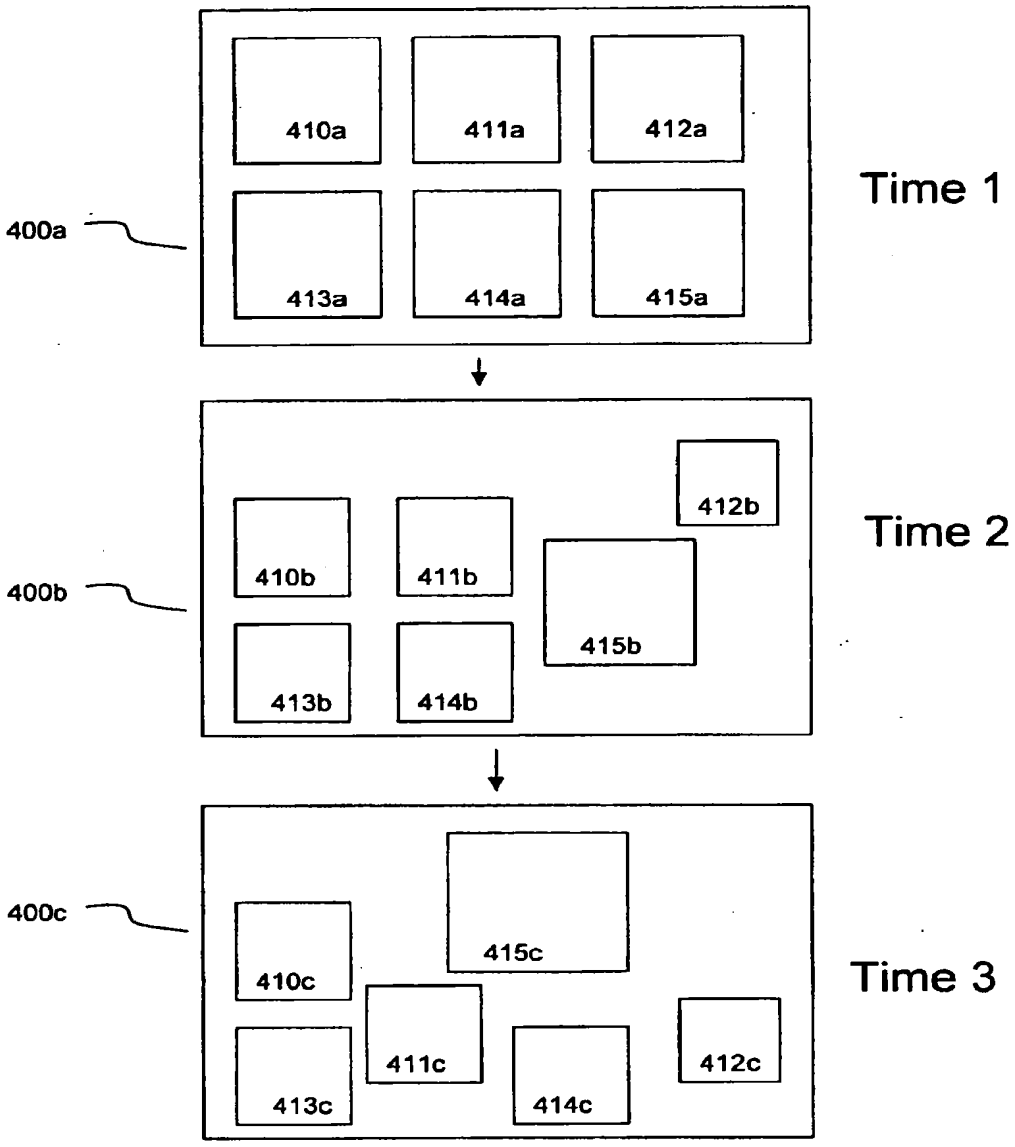

410a
411a
412a
413a
414a
415a
400a
Time 1
412b
410b
411b
415b
413b
414b
400b
Time 2
415c
410c
411c
412c
413c
414c
400c
Time 3

Fig. 4

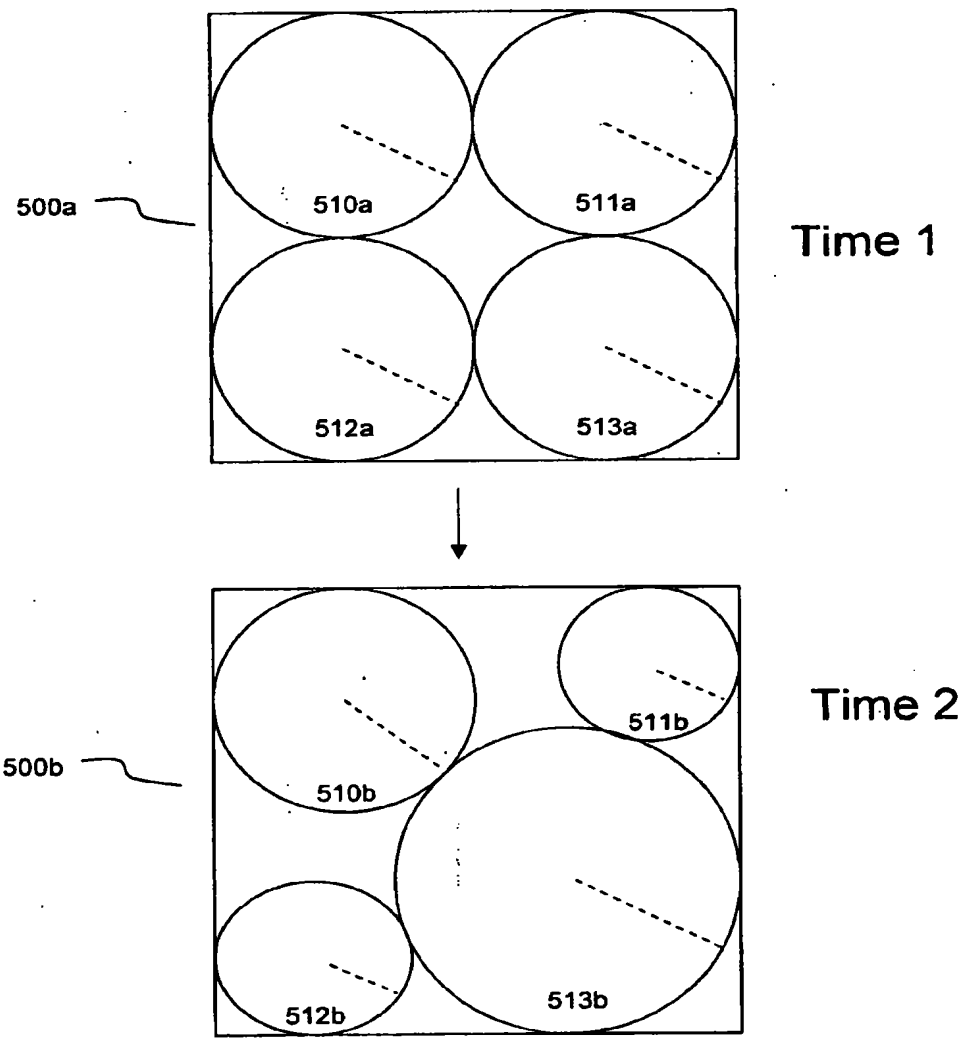

500a
510a
511a
512a
513a
Time 1
500b
510b
511b
512b
513b
Time 2

Fig. 5

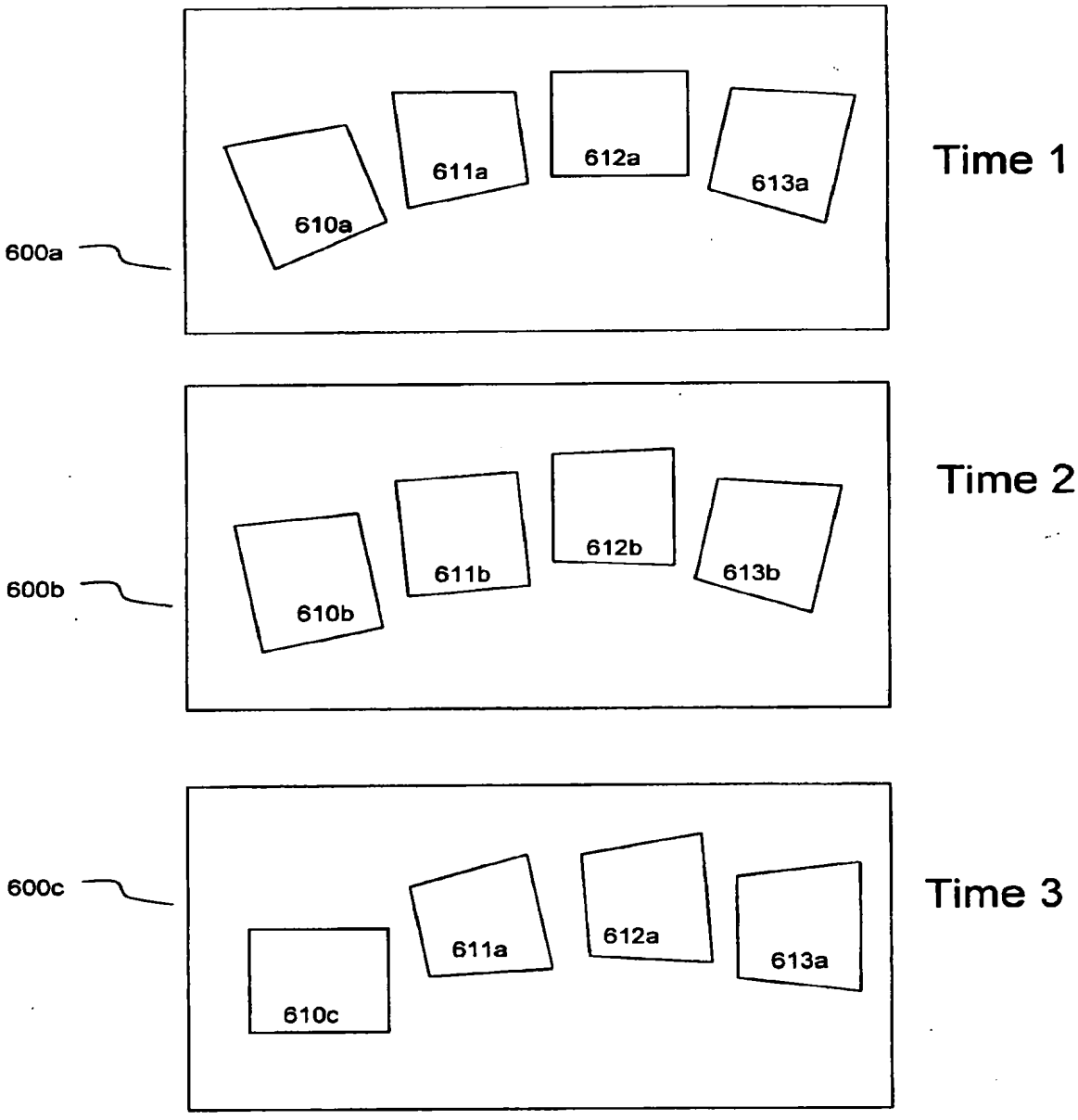

600a
610a
611a
612a
613a
Time 1
600b
610b
611b
612b
613b
Time 2
600c
610c
611a
612a
613a
Time 3

Fig. 6

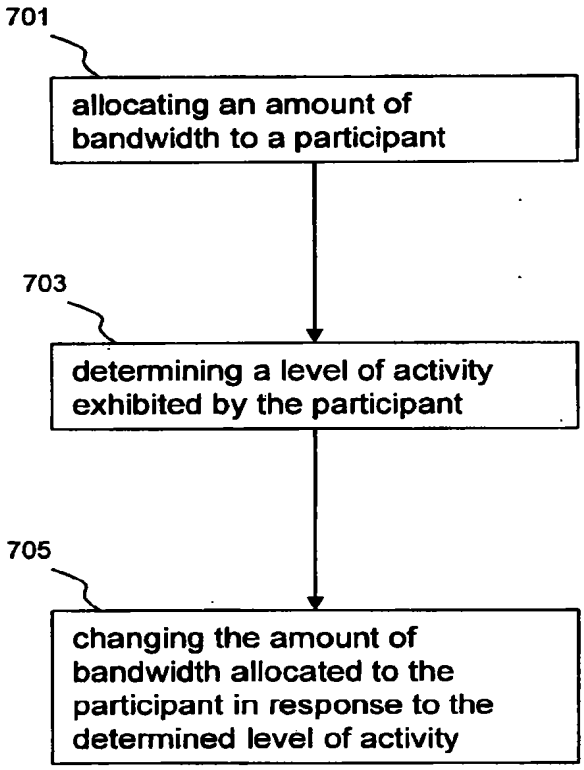

701
allocating an amount of bandwidth to a participant
703
determining a level of activity exhibited by the participant
705
changing the amount of bandwidth allocated to the participant in response to the determined level of activity

Fig. 7

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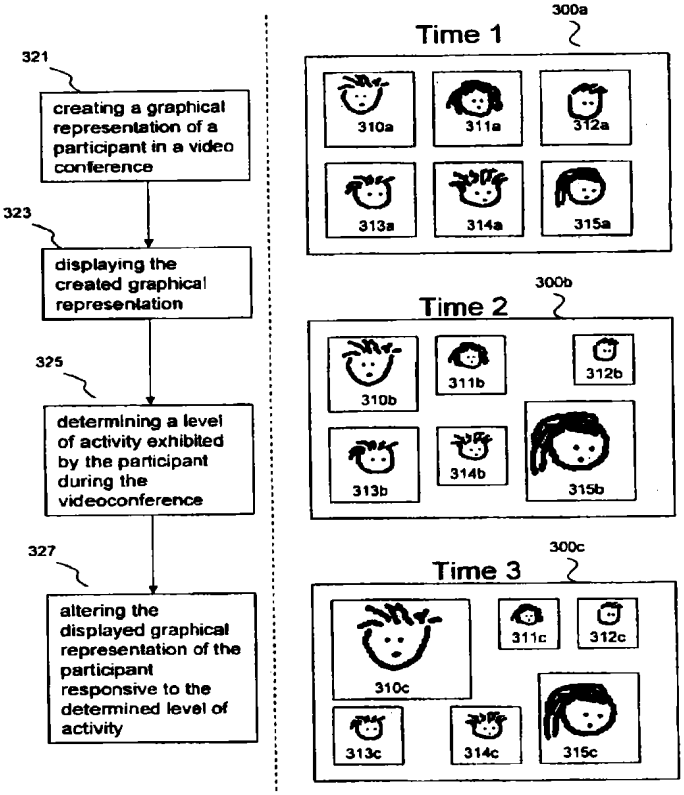
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Published:
— *with international search report*

[Continued on next page]

(54) Title: SYSTEM AND METHOD FOR DYNAMICALLY ALTERING VIDEOCONFERENCE BIT RATES AND LAYOUT BASED ON PARTICIPANT ACTIVITY



(57) Abstract: Systems and Methods to transmit and simultaneously display all video streams in a video conference by dynamically adapting video streams based on audio volume of the participants include allocating an amount of bandwidth to a participant in a videoconference; determining a level of activity exhibited by the participant during the videoconference, and changing the amount of bandwidth allocated to the participant responsive to the determined level of activity. In another aspect, a method for displaying video streams includes creating a graphical representation of a participant in a videoconference; displaying the created graphical representation; determining a level of activity exhibited by the participant during the videoconference; and altering the displayed graphical representation of the participant responsive to the determined level of activity.

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

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International application No
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INV. H04N7/15

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)
H04N

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 99/20010 A1 (INTERVAL RESEARCH CORP [US]) 22 April 1999 (1999-04-22) page 9; table 1 page 11, line 28 - page 12, line 11 page 14, line 15 - page 16, line 12 page 17, line 18 - page 18, line 12 figures 5-7	1-36
Y	WO 99/53691 A (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS SVENSKA AB [SE]) 21 October 1999 (1999-10-21) page 3, lines 18-29 page 4, line 26 - page 6, line 2	3,17,21, 35

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

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
14 September 2007	26/09/2007

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Van der Zaal, Robert

Form PCT/ISA/210 (second sheet) (April 2005)

International application No
PCT/US2007/005780

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 2005/099492 A1 (ORR STEPHEN J [CA]) 12 May 2005 (2005-05-12) paragraph [0008] figures 7-9 paragraphs [0049] - [0053] figures 7-9	1-36
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 2002510457 T	02-04-2002
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GB 2313250 A	19-11-1997	NONE	

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(11) EP 1 868 348 A2

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(51) Int Cl.:
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(21) Application number: **07252423.4**

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Designated Extension States:
AL BA HR MK YU

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(54) Conference layout control and control protocol

(57) A teleconferencing system includes a network. The system includes a plurality of nodes in communication with each other to form a conference. Each node having a video display with a display layout, at least one of the nodes individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node. A method for providing a teleconference including the steps of forming a conference with a plurality of nodes in communication with each other through a network. Each node having a video display with a display layout. There is the step of controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node. A teleconferencing node. A teleconferencing system includes a network. The system includes a plurality of nodes in communication with each other through the network to form a conference. Each node communicating only a change to the other nodes when the change occurs. A method for conducting a telecommunications conference between at least three parties includes the steps of establishing a conference between the party. There is the step of making a change to the conference. There is the step of communicating only the change to the parties.

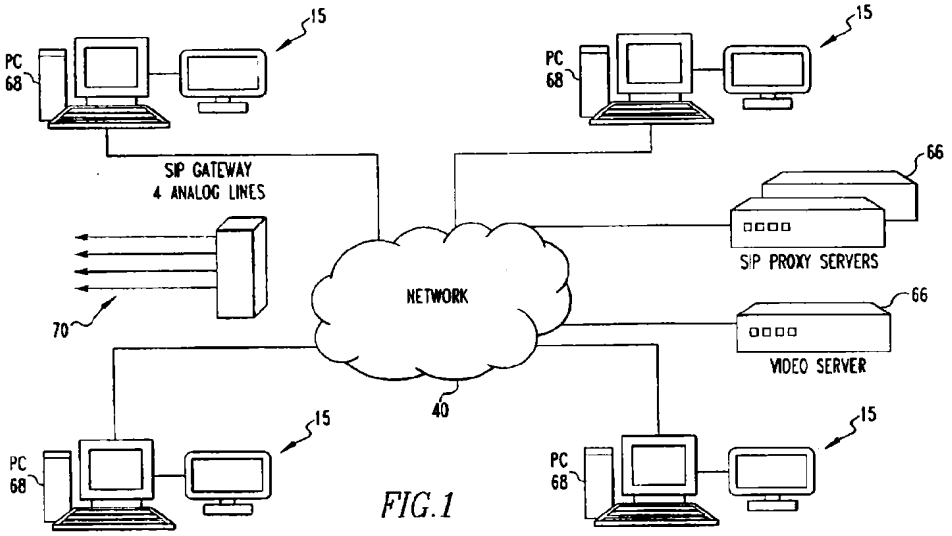


FIG.1

EP 1 868 348 A2

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to contemporaneously filed U.S. provisional patent applications: serial number 60/814,477, titled "Intelligent Audio Limit Method", by Richard E. Huber, Arun Punj and Peter D. Hill, having attorney docket number FORE-119; serial number 60/814,491, titled "Associating Independent Multimedia Sources Into a Conference Call", by Arun Punj, Richard E. Huber and Gregory H. Smith, having attorney docket number FORE-121, both of which are incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention is related to control of a video display of a teleconference. More specifically, the present invention is related to control of a video display of a teleconference where at least one of the nodes of the teleconference individually controls at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0003] The present invention is related to a teleconference between nodes where each node communicates only a change to the conference to the other nodes when the change occurs. More specifically, the present invention is related to a teleconference between nodes where each node communicates only a change to the conference only to the nodes affected by the change when the change occurs.

BACKGROUND OF THE INVENTION

[0004] In regard to display layout, in a regular MCU based conference call, the MCU controls the layout of the video streams on each participant. In fact, the MCU sends the same image to all the participants. For example, in a conference call with 10 participants, the MCU would pick any 4 lets say B, C, D, E and form a composite image with B, C, D and E (probably as Hollywood squares) and send it to all the participants.

[0005] In ViPr, this model has been extended to where each participant could individually choose the layout independently. Thus, A could view 2 as large videos (say B and C) and view the other 7 as small videos. B could pick 1 large video, 3 small videos and a TV channel as its display.

[0006] In regard to protocol, consider a conference call with 10 participants. In the traditional signaling protocol, when there was a change in the state of the conference, for example, if P1 disables its video, a message used to be sent with information for all the parties P1 through P10; this causes serious scalability issues. The present invention provides a technique to control a very large conference call (with 100s of participants) in an efficient manner. The technique is whereby only the difference needs to be sent out, for instance, in the case mentioned above, a small NOTIFY event is sent with information that P1 has turned off its transmitter.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention is related to a teleconferencing system. The system comprises a network. The system comprises a plurality of nodes in communication with each other to form a conference, preferably of live scenes at each node. Each node having a video display with a display layout, at least one of the nodes individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0008] The present invention is related to a method for providing a teleconference. The method comprises the steps of forming a conference with a plurality of nodes in communication with each other through a network, preferably of live scenes at each node. Each node having a video display with a display layout. There is the step of controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0009] The present invention pertains to a teleconferencing node for a network with other nodes. The node comprises a network interface which communicates with the other nodes to form a conference, preferably of live scenes at each node. The node comprises a controller individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0010] The present invention pertains to a teleconferencing system. The system comprises a network. The system comprises a plurality of nodes in communication with each other through the network to form a conference, preferably of live scenes at each node. Each node communicating only a change to the other nodes when the change occurs.

[0011] The present invention pertains to a method for conducting a telecommunications conference between at least three nodes, for instance, parties. The method comprises the steps of establishing a conference between the nodes, preferably of live scenes at each node. There is the step of making a change to the conference. There is the step of

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communicating only the change to the nodes, preferably of live scenes at each node.

[0012] The present invention pertains to a teleconferencing node for a network with other nodes. The node comprises a network interface which communicates with the other nodes to form a conference, preferably of live scenes at each node. The node comprises a controller which communicates only a change to the other nodes when the change occurs.

[0013] The ability to efficiently control a large number of conference participants is very desirable. This can be especially true for low bandwidth links. Additionally, this is also a reduction of intermediate node processing since much smaller messages need to be exchanged.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0014] In the accompanying drawings, the preferred embodiment of the invention and preferred methods of practicing the invention are illustrated in which:

[0015] Figure 1 is a schematic representation of a system for the present invention.

[0016] Figure 2 is a schematic representation of a network for the present invention.

[0017] Figure 3 is a schematic representation of a videophone connected to a PC and a network.

[0018] Figure 4 is a schematic representation of the system for the present invention.

[0019] Figures 5a and 5b are schematic representations of front and side views of the videophone.

[0020] Figure 6 is a schematic representation of a connection panel of the videophone.

[0021] Figure 7 is a schematic representation of a multi-screen configuration for the videophone.

[0022] Figure 8 is a block diagram of the videophone.

[0023] Figure 9 is a block diagram of the videophone architecture.

[0024] Figure 10 is a schematic representation of the system.

[0025] Figure 11 is a schematic representation of the system.

[0026] Figure 12 is a schematic representation of a system of the present invention.

[0027] Figure 13 is a schematic representation of another system of the present invention.

[0028] Figure 14 is a schematic representation of an audio mixer of the present invention.

[0029] Figure 15 is a block diagram of the architecture for the mixer.

[0030] Figure 16 is a block diagram of an SBU.

[0031] Figure 17 is a schematic representation of a videophone UAM in a video phone conference.

[0032] Figure 18 is a schematic representation of a videophone UAM in a two-way telephone call.

[0033] Figure 19 is a schematic representation of a network for a mixer.

[0034] Figure 20 is a block diagram of the present invention.

[0035] Figure 21 is a block diagram of the present invention showing several nodes.

[0036] Figure 22 is a block diagram of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] Referring now to the drawings wherein like reference numerals refer to similar or identical parts throughout the several views, and more specifically to figures 20 and 21 thereof, there is shown a teleconferencing system 10. The system 10 comprises a network 40. The system 10 comprises a plurality of nodes in communication with each other to form a conference, preferably of live scenes at each node. Each node having a video display 54 with a display layout, at least one of the nodes individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0038] Preferably, each node is forced to display video in the specific format. Each node preferably is locked into the specific format. Preferably, each node is forced to display certain video streams from the other nodes of the conference at specific locations on the display. Each node preferably controls what is displayed on any portion of the screen not controlled by the one of the nodes. Preferably, the one of the nodes completely controls the display layout of each node.

[0039] The present invention is related to a method for providing a teleconference. The method comprises the steps of forming a conference with a plurality of nodes in communication with each other through a network 40, preferably of live scenes at each node. Each node having a video display 54 with a display layout. There is the step of controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0040] The present invention pertains to a teleconferencing node for a network 40 with other nodes. The node comprises a network interface 42 which communicates with the other nodes to form a live conference, preferably of live scenes at each node. The node comprises a controller 19 individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

[0041] In the operation of the invention, this invention provides a technique to control layout of an individual conference participant screen from one of the conference participants. For example, if there are participants P1 through P10 in a

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conference call, one of the participants could become moderator and force P2 to view (P1 and P5) in large video and rest in small video the respective live scenes of each participant. Each party's display could be individually controlled in this manner.

[0042] This layout control can be enforced on an individual window rather than the entire screen to offer individualized control of the non-managed windows on the screen.

[0043] A remote party can control the screen layout of each conference participant. Typically, a moderator would force all parties to use the same layout as the moderator. However, there could be cases where fine grain control could grant a sub-moderator control over a subsection of the conference participants.

[0044] The layout control mechanism generates a layout message that contains the desired screen layout for conference participants. The layout message also contains the list of participants, which should receive this message. This layout message is then sent via a SIP NOTIFY event to the conference focus or host. The conference focus will then add this message to the outgoing message queue of each party contained in this list. The focus will then send this message as it processes all of the queued events for each party. When the message is sent to and received by a particular party, the party will modify its screen layout to match the request contained in the message. If the screen layout change requires that the party connect or disconnect to a new media stream, then the party will issue the appropriate events to make the requested changes.

[0045] In the present invention, functionality has been added which allows a user or a set of users (moderator/moderators) to individually control the display layout on each ViPr video phone in the conference. This control could be partial or complete. In complete control display layout format, each participant in a conference is forced to display video in a specific format. It is somewhat like an MCU, however it is different in regard that each participant could be locked into a different format. But once a participant is locked into a given format it has no control over display layout of the conference call. For example, A could be locked to display 3 big videos of live scenes from C, D and E and 6 small videos from F, G, H, I, J, K.

[0046] In partial control display format, each participant is instructed to display certain streams at specific locations. But it has control over what to display on the rest of screen. For example, A could be instructed to display B in its left big video. However, it could choose whether to display 1, 2 or 3 big videos. Similarly, scheme would be available for audio/small video.

[0047] The Layout Control messages are sent as SIP/NOTIFY messages although they 'could' be sent via other SIP or HTTP means.

[0048] In a 'typical' ViPr conference call, each terminal is provided with all of the available audio and video streams from each other participant in the call. Each user at each terminal usually would let the local terminal automatically place each video in sequential order on the screen. Then the user CAN manually choose to select which of the parties video get shown as large video or small video windows on the screen.

[0049] If a call participant wants to moderate the call then they can use 'Layout Control' feature to place restrictions on some or all of the other terminals. These restrictions can include which participants to display as large video windows. They can also control which of the small video windows are locked to a particular participant. The restrictions can be specified as mandatory or optional which in turn specifies whether a participant can override the moderators choice or not. The layout control can also be used to control the placement of secondary images on the screen. The layout control can also control the size of any secondary images on the screen. The layout control can also control the audio mute of remote parties and the ability for remote parties to request the floor when they wish to be recognized by the floor and unmuted.

[0050] A SIP/NOTIFY message containing the layout control options is sent to the conference host and then the conference host distributes this message to all of the other parties.

[0051] The call moderator uses the standard SIP/SDP "a=Rx-List: A B C" mechanism to specify which parties the call moderator is displaying, where 'A B C' represent the Party-Identifiers of the remote parties which are being viewed. When operating in call moderated mode these are all treated as 'optional' layout positions unless an 'm' is appended to the party, such as 'Am Bm Cm'. The 'm' is the mandatory flag and tells the remote User Interface which parties 'must' be locked into position on the screen. The optional parties can still be changed independently by each remote terminal if the user interface wishes to enable this. The user interface CAN enforce an 'all mandatory' mode on the conference, in which case all parties are treated as mandatory when operating in a moderated call.

[0052] The event named "moderator-layout" is used to identify a layout control message for controlling other aspects of the screen. The option string keywords used to control the size of secondary videos and images are "chan_size" and "col_size" respectively. The events named "floor-request" and "floor-withdrawn" are used to tell the moderator that a party wants the floor or wishes to withdraw their request. The event named "floor-granted" is sent by the moderator to a party to inform them that they have been unmuted and can now speak. The terminal User Interface will respect each of these events and control the screen as directed by the call moderator.

[0053] The following applications are all incorporated by reference herein:

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U.S. patent application 10/114,402 titled VIDEOPHONE AND METHOD FOR A VIDEO CALL

U.S. patent application 10/871,852 titled AUDIO MIXER AND METHOD

U.S. patent application 11/078,193 titled METHOD AND APPARATUS FOR CONFERENCING WITH STREAM

[0054] A node can include a member, party, terminal, or participant of a conference. A conference typically comprises at least 3 nodes, and could have 10 or 20 or even 50 or 100 or 150 or greater nodes.

[0055] Referring now to the drawings wherein like reference numerals refer to similar or identical parts throughout the several views, and more specifically to figure 22 thereof, there is shown a teleconferencing system 10. The system 10 comprises a network 40. The system 10 comprises a plurality of nodes in communication with each other through the network 40 to form a conference, preferably of live scenes at each node. Each node communicating only a change to the other nodes when the change occurs.

[0056] Preferably, each node communicates only the change only to the parties affected by the change.

[0057] The present invention pertains to a method for conducting a telecommunications conference between at least three nodes, for instance, parties. The method comprises the steps of establishing a live conference between the nodes conference, preferably of live scenes at each node. There is the step of making a change to the conference. There is the step of communicating only the change to the nodes.

[0058] Preferably, the communicating step includes the step of communicating only the change only to the nodes affected by the change. The making step preferably includes the step of making the change to one of the nodes' status. Preferably, the making step includes the step of making the change to the conference's state. There is preferably the step of sending a directed message from one of the nodes to only certain of but less than all of the nodes. Preferably, the establishing step includes the step of establishing the conference based on SIP NOTIFY/OK techniques.

[0059] The change to the conference preferably includes a change to one of the nodes' status. Preferably, the change to the conference includes a change to the conference's state. One of the nodes sends a directed message to only certain of but less than all of the nodes. Preferably, the plurality of nodes establishes the conference based on SIP NOTIFY/OK techniques. Each node preferably has a controller 19 and a Network Interface 42 in communication with the controller 19 and the network 40. The controller 19 effecting any change to its node and sending the change through the network interface 42 to through the network 40 to the other nodes of the conference.

[0060] The present invention pertains to a teleconferencing node for a network 40 with other nodes. The node comprises a network interface 42 which communicates with the other nodes to form a live conference, preferably of live scenes at each node. The node comprises a controller 19 which communicates only a change to the other nodes when the change occurs.

[0061] In the operation of the preferred embodiment, the large conference control mechanism uses a conference control message to manage all of the parties on the call. A participant generates a conference control message that contains both the transmitted streams properties and the desired lists of receive streams from other conference participants. This conference control message is then sent via a SIP NOTIFY event to the conference focus or host. The conference focus will then add this message to the outgoing message queue of each party affected by this message. The focus will then send these messages as it processes all of the queued events for each party. When the message is sent to and received by a particular party, the party will add the requesting party to its list of outgoing streams. A conference control message can also be sent to indicate the desire to place video streams on or off "hold" for control of voice-only operation.

Large Conference Signaling invention

[0062] ViPr conference previously was based on an offer/answer model. In this model, the complete state of the conference was carried in each message exchanged between conference participants. For example, consider a conference between 5 participants P1 through P5. In this case, these five parties would be connected into a conference via a central point called host. The Host would form a table which contains the complete state of the conference. Like If parties P1 through P3 are transmitting/Receiving Video/Audio and parties P2 and P3 are only transmitting/receiving audio only this table would indicate that complete state. When ever any changes happened in the conference the Host would recomputed the table and send that information to everyone. For example, if P3 stopped transmitting video, it would change the table 1 to table 2 and send that complete table to everyone.

P1	Video(tx=0n, rx=On), Audio(tx=on,rx=on)
P2	video(tx=0n, rx=0n), Audio(tx=on,rx=on)

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(continued)

P3	Video(tx=0n, rx=0n), Audio(tx=on,rx=on)
P4	Video(tx=0ff, rx=on), Audio(tx=on,rx=on)
P5	Video(tx=off, rx=on), Audio(tx=on,rx=on)
Table 1	

P1	Video(tx=0n, rx=0n), Audio(tx=on,rx=on)
	Video(tx=0n, rx=0n), Audio(tx=on,rx=on)
	Video(tx=0n, rx=0ff), Audio(tx=on,rx=on)
P4	Video(tx=0ff, rx=on), Audio(tx=on,rx=on)
	Video(tx=off, rx=on), Audio(tx=on,rx=on)
Table 2	

[0063] This scheme worked well because it was consistent with the existing SIP standards and allowed us to add extensions to the basic SIP protocol to enable ViPr style conferencing.

[0064] This scheme works well if the number of participants in the conference is less than 15 or so, beyond that the table, which contains all the parties, becomes too big to be passed around efficiently. Additionally, not every party is affected by every change in the state of the conference - and flooding it with messages which it does not need to handle is unnecessary. Another problem with this model is that it does not allow for the ability to send application level non media related messages between two SIP peers.

[0065] To remedy the above issues we invented this new scheme. In this new scheme following critical changes have been made:

$ The state of the conference can change in two respects. Either one of the participants had requested a change in its status (party local) or one of party has requested a change in the state of the whole conference (global change). When ever, any such change is made only the information specific to the party being changed or the global conference state is communicated between conference participants. To use example from table 2, only the information corresponding to P3 would be sent out, rather than the complete table. [Thus only row referring to p3 is re-sent to other participants]. Examples of Global
Events:

--> Conference Name Change
--> Conference Moderator State Change
--> Floor Request Status Change
--> Conference Type Change
--> Conference Status Messages (A party being rejected from joining the conference etc)

Examples Of Party Events

--> Party Toggling camera
--> Party Toggling Hold status
--> Party Delete
--> Party Add
--> Party Status Change (becomes moderator/relinquish moderator)
--> Party requesting a change in Receive Media Stream

$ Only the parties, which are affected by the change, receive the changed information.

$ It is possible to send a directed message from one party P1 to any number of parties. For example, P1 could request the host to relay a message to P2, p3 and p4. But not to P5. This last functionality is important to enable group based signaling in conferencing.

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[0066] The new design is based on SIP NOTIFY/OK methods and defines a new event package. Standards RFC 3261 and RFC 3264 define the base specification for SIP. RFC 3265 defines a framework for using events, both of which are incorporated by reference herein.
As an example, a host is always required for Vipr conference. In fact, parties in a conference are not ever directly signaling with each other. For example, if there is a conference call between A, B and C. There are three SIP Call Legs

-- Host to A
-- Host to B
-- Host to C

Media flows directly between A, B and C.
[0067] In the present invention, B is currently receiving video from A and now wishes to also receive video from C. This change could be communicated in either of two ways:

- B Sends a NOTIFY to Host, with a field in the NOTIFY [called dest-party-list:C] indicating that this message may only be sent to C.

- Alternatively, Host can detect that this message only affects C and may send that message only to C although B has not been explicitly put in any such field.

Videophone

[0068] Referring to figures 8, 9, 10 and 11, an imaging device 30, such as a conventional analog camera 32 provided by Sony with S video, converts the images of a scene from the imaging device 30 to electrical signals which are sent along a wire to a video decoder 34, such as a Philips SAA7114 NTSC/PAL/decoder. The video decoder 34 converts the electrical signals to digital signals and sends them out as a stream of pixels of the scene, such as under BT 656 format. The stream of pixels are sent out from the video decoder 34 and split into a first stream and a second stream identical with the first stream. An encoder 36, preferably an IBM eNV 420 encoder, receives the first stream of pixels, operates on the first stream and produces a data stream in MPEG-2 format. The data stream produced by the video encoder 36 is compressed by about 1/50 the size as compared to the data as it was produced at the camera. The MPEG-2 stream is an encoded digital stream and is not subject to frame buffering before it is subsequently packetized so as to minimize any delay. The encoded MPEG-2 digital stream is packetized using RTP by a Field Programmable Gate Array (FPGA) 38 and software to which the MPEG-2 stream is provided, and transmitted onto a network 40, such as an Ethernet 802.p or ATM at 155 megabits per second, using a network interface 42 through a PLX 9054 PCI interface 44. If desired, a video stream associated with a VCR or a television show, such as CNN or a movie, can be received by the decoder 34 and provided directly to the display controller 52 for display. A decoder controller 46 located in the FPGA 38 and connected to the decoder 34, controls the operation of the decoder 34.
[0069] Alternatively, if a digital camera 47 is used, the resulting stream that is produced by the camera is already in a digital format and does not need to be provided to a decoder 34. The digital stream from the digital camera 47, which is in a BT 656 format, is split into the first and second streams directly from the camera, without passing through any video decoder 34.
[0070] In another alternative, a fire wire camera 48, such as a 1394 interface fire wire camera 48, can be used to provide a digital signal directly to the FPGA 38. The fire wire camera 48 provides the advantage that if the production of the data stream is to be at any more than a very short distance from the FPGA 38, then the digital signals can be supported over this longer distance by, for instance, cabling, from the fire wire camera 48. The FPGA 38 provides the digital signal from the fire wire camera 48 to the encoder 36 for processing as described above, and also creates a low fame rate stream, as described below.
[0071] The second stream is provided to the FPGA 38 where the FPGA 38 and software produce a low frame rate stream, such as a motion JPEG stream, which requires low bandwidth as compared to the first stream. The FPGA 38 and a main controller 50 with software perform encoding, compression and packetization on this low frame rate stream and provide it to the PCI interface 44, which in turn transfers it to the network interface 42 through a network interface card 56 for transmission onto the network 40. The encoded MPEG-2 digital stream and the low frame rate stream are two essentially identical but independent data streams, except the low frame rate data stream is scaled down compared to the MPEG-2 data stream to provide a smaller view of the same scene relative to the MPEG-2 stream and require less resources of the network 40.
[0072] On the network 40, each digital stream is carried to a desired receiver videophone 15, or receiver videophones 15 if a conference of more than two parties is involved. The data is routed using SIP. The network interface card 56 of the receive videophone 15 receives the packets associated with first and second data streams and provides the data

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from the packets and the video stream (first or second) chosen by the main controller to a receive memory. A main controller 50 of the receive videophone 15 with software decodes and expands the chosen received data stream and transfers it to a display controller 52. The display controller 52 displays the recreated images on a VGA digital flat panel display using standard scaling hardware. The user at the receive videophone 15 can choose which stream of the two data streams to view with a touch screen 74, or if desired, chooses both so both large and small images of the scene are displayed, although the display of both streams from the transmitting videophone 15 would normally not happen. A discussion of the protocols for display is discussed below.

By having the option to choose either the larger view of the scene or the smaller view of the scene, the user has the ability to allocate the resources of the system 10 so the individuals at the moment who are more important for the viewer to see in a larger, clearer picture, can be chosen; while those which the user still would like to see, but are not as important at that moment, can still be seen.

[0073] The display controller 52 causes each distinct video stream, if there is more than one (if a conference call is occurring) to appear side by side on the display 54. The images that are formed side by side on the display 54 are clipped and not scaled down so the dimensions themselves of the objects in the scene are not changed, just the outer ranges on each side of the scene associated with each data stream are removed. If desired, the images from streams associated with smaller images of scenes can be displayed side by side in the lower right corner of the display 54 screen. The display controller 52 provides standard digital video to the LCD controller 72, as shown in figure 9. The display controller 52 produced by ATI or Nvidia, is a standard VGA controller. The LCD controller 72 takes the standardized digital video from the display controller 52 and makes the image proper for the particular panel used, such as a Philips for Fujistu panel.

[0074] To further enhance the clipping of the image, instead of simply removing portions of the image starting from the outside edge and moving toward the center, the portion of the image which shows no relevant information is clipped. If the person who is talking appears in the left or right side of the image, then it is desired to clip from the left side in if the person is on the right side of the image, or right side in if the person is on the left side of the image, instead of just clipping from each outside edge in, which could cause a portion of the person to be lost. The use of video tracking looks at the image that is formed and analyzes where changes are occurring in the image to identify where a person is in the image. It is assumed that the person will be moving more relative to the other areas of the image, and by identifying the relative movement, the location of the person in the image can be determined. From this video tracking, the clipping can be caused to occur at the edge or edges where there is the least amount of change. Alternatively, or in combination with video tracking, audio tracking can also be used to guide the clipping of the image which occurs. Since the videophone 15 has microphone arrays, standard triangulation techniques based on the different times it takes for a given sound to reach the different elements of the microphone array are used to determine where the person is located relative to the microphone array, and since the location of a microphone array is known relative to the scene that is being imaged, the location of the person in the image is thus known.

[0075] The functionalities of the videophone 15 are controlled with a touch screen 74 on the monitor. The touch screen 74, which is a standard glass touchscreen, provides raw signals to the touch screen controller 76. The raw signals are sensed by the ultrasonic waves that are created on the glass when the user touches the glass at a given location, as is well known in the art. The touch screen controller 76 then takes the raw signals and converts them into meaningful information in regard to an X and Y position on the display and passes this information to the main controller 50.

[0076] If a television or VCR connection is available, the feed for the television or movie is provided to the decoder 34 where the feed is controlled as any other video signal received by the videophone 15. The television or movie can appear aside a scene from the video connection with another videophone 15 on the display 54.

[0077] The audio stream of the scene essentially follows a parallel and similar path with the audio video stream, except the audio stream is provided from an audio receiver 58, such as a microphone, sound card, headset or hand set to a CS crystal 4201 audio interface 60 or such as a Codec which performs analog to digital and digital analog conversion of the signals, as well as controls volume and mixing, which digitizes the audio signal and provides it to a TCI 320C6711 or 6205 DSP 62. The DSP 62 then packetizes the digitized audio stream and transfers the digitized audio stream to the FPGA 38. The FPGA 38 in turn provides it to the PCI interface 44, where it is then passed on to the network interface card 56 for transmission on the network 40. The audio stream that is received by the receive videophone 15, is passed to the FPGA 38 and on to the DSP 62 and then to the audio interface 60 which converts the digital signal to an analog signal for playback on speakers 64.

[0078] The network interface card 56 time stamps each audio packet and video packet that is transmitted to the network 40. The speed at which the audio and video that is received by the videophone 15 is processed is quick enough that the human eye and ear, upon listening to it, cannot discern any misalignment of the audio with the associated in time video of the scene.

The constraint of less than 20-30 milliseconds is placed on the processing of the audio and video information of the scene to maintain this association of the video and audio of the scene. To insure that the audio and video of the scene is in synchronization when it is received at a receive videophone 15, the time stamp of each packet is reviewed, and corresponding audio based packets and video based packets are aligned by the receiving videophone 15 and corre-

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spondingly played at essentially the same time so there is no misalignment that is discernible to the user at the receiver videophone 15 of the video and audio of the scene.

[0079] An ENC-DSP board contains the IBM eNV 420 MPEG-2 encoder and support circuitry, the DSP 62 for audio encoding and decoding, and the PCI interface 44. It contains the hardware that is necessary for full videophone 15 terminal functionality given a high performance PC 68 platform and display 54 system 10. It is a full size PCI 2.2 compliant design. The camera, microphone(s), and speakers 64 interface to this board. The DSP 62 will perform audio encode, decode, mixing, stereo placement, level control, gap filling, packetization, and other audio functions, such as stereo AEC, beam steering, noise cancellation, keyboard click cancellation, or de-reverberation. The FPGA 38 is developed using the Celoxia (Handel-C) tools, and is fully reconfigurable. Layout supports parts in the 1-3 million gate range.

[0080] This board includes a digital camera 47 chip interface, hardware or "video DSP" based multi-channel video decoder 34 interface, video overlay using the DVI in and out connectors, up to full dumb frame buffer capability with video overlay.

[0081] Using an NTSC or PAL video signal, the encoder 36 should produce a 640 X 480, and preferably a 720 X 480 or better resolution, high-quality video stream. Bitrate should be controlled such that the maximum bits per frame is limited in order to prevent transmission delay over the network 40. The decoder 34 must start decoding a slice upon receiving the first macroblock of data. Some buffering may be required to accommodate minor jitter and thus improve picture.

[0082] MPEG-2 is widely used and deployed, being the basis for DVD and VCD encoding, digital VCR's and time shift devices such as TiVo, as well as DSS and other digital TV distribution. It is normally considered to be the choice for 4 to 50 Mbit/sec video transmission. Because of its wide use, relatively low cost, highly integrated solutions for decoding, and more recently, encoding, are commercially available now.

[0083] MPEG-2 should be thought of as a syntax for encoded video rather than a standard method of compression. While the specification defines the syntax and encoding methods, there is very wide latitude in the use of the methods as long as the defined syntax is followed. For this reason, generalizations about MPEG-2 are frequently misleading or inaccurate. It is necessary to get to lower levels of detail about specific encoding methods and intended application in order to evaluate the performance of MPEG-2 for a specific application.

[0084] Of interest to the videophone 15 project are the issues of low delay encode and decode, as well as network 40 related issues. There are three primary issues in the MPEG-2 algorithm that need to be understood to achieve low delay high quality video over a network 40:

- The GOP (Group Of Pictures) structure and its effect on delay
- The effect of bit rate, encoded frame size variation, and the VBV buffer on delay and network 40 requirements
- The GOP structure's effect on quality with packet loss

The GOP Structure and Delay:

[0085] MPEG-2 defines 3 kinds of encoded frames: I, P, and B. The most common GOP structure in use is 16 frames long:

IPBBPBBPBBPBBPBB. The problem with this structure is that each consecutive B frame, since a B frame is motion estimated from the previous and following frame, requires that the following frames are captured before encoding of the B frame can begin. As each frame is 33msec, this adds a minimum of 66msec additional delay for this GOP structure over one with no B frames. This leads to a low delay GOP structure that contains only I and/or P frames, defined in the MPEG-2 spec as SP@ML (Simple Profile) encoding.

Bit Rate, Encoded Frame Size, and the VBV

[0086] Once B frames are eliminated to minimize encoding delay, the GOP is made up of I frames and P frames that are relative to the I frames. Because an I frame is completely intraframe coded, it takes a lot of bits to do this, and fewer bits for the following P frames.

[0087] Note that an I frame may be 8 times as large as a P frame, and 5 times the nominal bit rate. This has direct impact on network 40 requirements and delay: if there is a bandwidth limit, the I frame will be buffered at the network 40 restriction, resulting in added delay of multiple frame times to transfer over the restricted segment. This buffer must be matched at the receiver because the play-out rate is set by the video, not the network 40 bandwidth. The sample used for the above data was a low motion office scene; in high motion content with scene changes, frames will be allocated more or less bits depending on content, with some large P frames occurring at scene changes.

[0088] To control this behavior, MPEG-2 implements the VBV buffer (Video Buffering Verifier), which allows a degree of control over the ratio between the maximum encoded frame size and the nominal bit rate. By tightly constraining the

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VBV so that the I frames are limited to less than 2X the size indicated by the nominal bit rate, the added buffering delay can be limited to 1 additional frame time. The cost of constraining the VBV size is picture quality: the reason for large I frames is to provide a good basis for the following P frames, and quality is seriously degraded at lower bit rates (<4Mbit) when the size of the I frames is constrained. Consider that at 2Mbit, the average frame size is 8Kbytes, and even twice this size is not enough to encode a 320X240 JPEG image with good quality, which is DCT compressed similar to an I frame.

[0089] Going to I frame only encoding allows a more consistent encoded frame size, but with the further degradation of quality. Low bit rate I frame only encoding does not take advantage of the bulk of the compression capability of the MPEG-2 algorithm.

[0090] The MPEG-2 specification defines CBR (Constant Bit Rate) and VBR (Variable Bit Rate) modes, and allows for variable GOP structure within a stream. CBR mode is defined to generate a consistent number of bits for each GOP, using padding as necessary. VBR is intended to allow consistent quality, by allowing variation in encoding bandwidth, permitting the stream to allocate more bits to difficult to encode areas as long as this is compensated for by lower bit rates in simpler sections. VBR can be implemented with two pass or single pass techniques. Variable GOP structure allows, for example, the placement of I frames at scene transition boundaries to eliminate visible compression artifacts. Due to the low delay requirement and the need to look ahead a little bit in order to implement VBR or variable GOP, these modes are of little interest for the videophone 15 application.

[0091] Because P and B frames in a typical GOP structure are dependant on the I frame and the preceding P and B frames, data loss affects all of the frames following the error until the next I frame. This also affects startup latency, such as when flipping channels on a DSS system 10, where the decoder 34 waits for an I frame before it can start displaying an image. For this reason, GOP length, structure, and bit rate need to be tuned to the application and delivery system 10. In the case of real time collaboration using IP, an unreliable transport protocol such as RTP or UDP is used because a late packet must be treated as lost, since you can't afford the delay required to deal with reliable protocol handshaking and retransmission. Various analysis has been done on the effect of packet loss on video quality, with results showing that for typical IPB GOP structures, a 1% packet loss results in 30% frame loss. Shorter GOP structures, and ultimately I frame only streams (with loss of quality), help this some, and FEC (Forward Error Correction) techniques can help a little when loss occurs, but certainly one of the problems with MPEG-2 is that it is not very tolerant of data loss.

[0092] A GOP structure called Continuous P frame encoding addresses all of the aforementioned issues and provides excellent video quality at relatively low bit rates for the videophone 15. Continuous P encoding makes use of the ability to intra-frame encode macro-blocks of a frame within a P frame. By encoding a pseudo-random set of 16X16 pixel macro-blocks in each frame, and motion-coding the others, the equivalent of I-frame bits are distributed in each frame. By implementing the pseudo-random macro-block selection to ensure that all blocks are updated on a frequent time scale, startup and scene change are handled in a reasonable manner.

[0093] IBM has implemented this algorithm for the S420 encoder, setting the full frame DCT update rate to 8 frames (3.75 times per second). The results for typical office and conference content is quite impressive. The encoding delay, encoded frame size variation, and packet loss behavior is nearly ideal for the videophone 15. Review of the encoded samples shows that for scene changes and highly dynamic content that encoder 36 artifacts are apparent, but for the typical talking heads content of collaboration, the quality is very good.

[0094] High-quality audio is essential prerequisite for effective communications. High-quality is defined as full-duplex, a 7 kHz bandwidth, (telephone is 3.2kHz), > 30 dB signal-to-noise ratio, no perceivable echo, clipping or distortion. Installation will be very simple involving as few cables as possible. On board diagnostics will indicate the problem and how to fix it. Sound from the speakers 64 will be free of loud pops and booms and sound levels either too high or too low.

[0095] An audio signal from missing or late packets can be "filled" in based on the preceding audio signal. The audio buffer should be about 50 ms as a balance between network 40 jitter and adding delay to the audio. The current packet size of 320 samples or 20 ms could be decreased to decrease the encode and decode latency. However, 20 ms is a standard data length for RTP packets.

[0096] Some of the processes described below are available in commercial products. However, for cost and integration reasons, they will be implemented on a DSP 62. In another embodiment, a second DSP 62 can perform acoustic echo cancellation instead of just one DSP 62 performing this function also.

[0097] The audio system 10 has a transmit and a receive section. The transmit section is comprised of the following:

Microphones

[0098] One of the principal complaints of the speaker phone is the hollow sound that is heard at the remote end. This hollow sound is due to the room reverberation and is best thought of as the ratio of the reflected (reverberant) sound power over the direct sound power. Presently, the best method to improve pickup is to locate microphones close to the talker and thus increase the direct sound power. In an office environment, microphones could be located at the PC 68 monitor, on the videophone 15 terminal and at a white board.

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Automatic Gain Control

[0099] The gain for the preamplifier for each microphone is adjusted automatically such that the ADC range is fully used. The preamp gain will have to be sent to other audio processes such as AEC and noise reduction.

CODEC

[0100] In its simplest form, this is an ADC device. However, several companies such as Texas Instruments and Analog Devices Inc have CODECS with analog amplifiers and analog multiplexers. Also, resident on the chip is a DAC with similar controls. The automatic gain control described in the previous section is implemented in the CODEC and controlled by the DSP 62.

Noise Reduction

[0101] Two methods of noise reduction can be used to improve the SNR. The first method is commonly called noise gating that turns on and off the channel depending on the level of signal present. The second method is adaptive noise cancellation (ANC) and subtracts out unwanted noise from the microphone signal. In office environment, it would be possible use ANC to remove PA announcements, fan noise and in some cases, even keyboard clicks.

[0102] Noise reduction or gating algorithms are available in commercial audio editing packages such as Cool Edit and Goldwave that can apply special effects, remove scratch and pop noise from records and also remove hiss from tape recordings.

Acoustic Echo Cancellation

[0103] Echo is heard when the talker's voice returns to the talker after more than 50 ms. The echo is very distracting and thus needs to be removed. The two sources of echo are line echo and acoustic echo. The line echo is due to characteristics of a two-line telephone system 10. The PSTN removes this echo using a line echo canceller (LEC). When using a speaker phone system 10, acoustic echo occurs between the telephone speaker and the microphone. The sound from the remote speaker is picked by the remote microphone and returned to talker. Acoustic echo cancellation (AEC) is more difficult than LEC since the room acoustics are more complicated to model and can change suddenly with movement of people. There are many AEC products ranging from the stand-alone devices such as ASPI EF1210 to Signal Works object modules optimized to run on DSP 62 platforms.

Automixing

[0104] Automixing is selecting which microphone signals to mix together and send the monaural output of the mixer to the encoder 36. The selection criteria is based on using the microphone near the loudest source or using microphones that are receiving sound that is above a threshold level. Automixers are commercially available from various vendors and are used in teleconferencing and tele-education systems.

Encoding

[0105] To reduce data transmission bandwidth, the audio signal is compressed to a lower bit rate by taking advantage of the typical signal characteristics and our perception of speech. Presently, the G.722 codec offers the best audio quality (7 kHz bandwidth @ 14 bits) at a reasonable bit rate of 64kbits/sec.

RTP Transmission

[0106] The encoded audio data is segmented into 20 msec segments and sent as RealTime Protocol (RTP) packets. RTP was specifically designed for realtime data exchange required for VoIP and teleconference applications.

[0107] The receive section is:

RTP Reception

[0108] RTP packets containing audio streams from one or more remote locations are placed in their respective buffers. Missing or late packets are detected and that information is passed to the Gap Handler. Out of order packets are a special case of late packets and like late packets are likely to be discarded. The alternative is to have a buffer to delay playing out the audio signal for at least one packet length. The size of the buffer will have to be constrained such that

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the end-to-end delay is no longer than 100ms.

Decoding

[0109] The G.722 audio stream is decoded to PCM samples for the CODEC.

Gap Handling

[0110] Over any network, RTP packets will be lost or corrupted. Therefore, the Gap Handler will "fill in" the missing data based on the spectrum and statistics of the previous packets. As a minimum, zeros should be padded in the data stream to make up data but a spectral interpolation or extrapolation algorithm to fill in the data can be used.

Buffering

[0111] Network jitter will require buffering to allow a continuous audio playback. This buffer will likely adjust its size (and hence latency) based on a compromise between the short-term jitter statistics and the effect of latency.

Rate Control

[0112] The nominal sample rate for a videophone 15 terminal is 16 kHz. However, slight differences will exist and need to be handled. For example, suppose that videophone 15 North samples at precisely 16,001 Hz while videophone 15 South samples at 15,999 Hz. Thus, the South terminal will accumulate 1 more samples per second than it outputs to the speaker and the North terminal will run a deficit of equal amount. Long-term statistics on the receiving buffer will be able to determine what the sample rate differential is and the appropriate interpolation (for videophone 15 North) or decimation (for videophone 15 South) factor can be computed.

Volume Control

[0113] Adjusting the volume coming from the speakers 64 is typically done by the remote listeners. A better way might be to automatically adjust the sound from the speakers 64 based on how loud it sounds to the microphones in the room. Other factors such as the background noise and the listener's own preference can be taken into account.

Stereo Placement

[0114] Remote talkers from different locations can be placed in the auditory field. Thus, a person from location A would consistently come from the left, the person from location B from the middle and the person from location C from the right. This placement makes it easier to keep track of who is talking.

Speakers

[0115] The quality of the sound to some extent is determined by the quality of the speakers 64 and the enclosure. In any case, self-amplified speakers 64 are used for the videophone 15 terminal.

Differentiation

[0116] Present conferencing systems such as the PolyCom Soundstation offer satisfactory but bandlimited full-duplex audio quality. However, the bandwidth is limited to 3500 Hz and the resulting sound quality strains the ear and especially in distinguishing fricative sounds.

[0117] Videophone 15 extends the bandwidth to 7 kHz and automixes multiple microphones to minimize room reverberation. When three or more people are talking, each of the remote participants will be placed in a unique location in the stereo sound field. Combined with the high-quality audio pick-up and increased bandwidth, a conference over the network 40 will quickly approach that of being there in person.

[0118] The audio system 10 uses multiple microphones for better sound pick-up and a wideband encoder (G.722) for better fidelity than is currently offered by tollgrade systems. Additionally, for multiple party conferences, stereo placement of remote talkers will be implemented and an acoustic echo cancellation system 10 to allow hands free operation. Adjustment of volume in the room will be controlled automatically with a single control for the end user to adjust the overall sound level.

[0119] In the videophone 15 network 40, a gateway 70 connects something non-SIP to the SIP environment. Often

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there are electrical as well as protocol differences. Most of the gateways 70 connect other telephone or video conference devices to the videophone 15 system 10.

[0120] Gateways 70 are distinguished by interfaces; one side is a network 40, for videophone 15 this is Ethernet or ATM. The external side may be an analog telephone line or RS-232 port. The type, number and characteristics of the ports distinguishes one gateway 70 from another. On the network 40 side, there are transport protocols such as RTP or AAL2, and signaling protocols such as SIP, Megaco or MGCP.

[0121] On the external side, there may be a wide variety of protocols depending on the interfaces provided. Some examples would be ISDN (Q.931) or POTS signaling. PSTN gateways 70 connect PSTN lines into the videophone 15 system 10 on site.

PBX gateways 70 allow a videophone 15 system 10 to emulate a proprietary telephone to provide compatibility to existing onsite PBX. POTS gateways 70 connect dumb analog phones to a videophone 15 system 10. H.323 gateways 70 connect an H.323 system 10 to the SIP based videophone 15 system 10. This is a signaling-only gateway 70 -- the media server 66 does the H.261 to MPEG conversion.

[0122] Three enabling technologies for the videophone 15 are the Session Initiation Protocol (SIP), the Session Description Protocol (SDP) and the Real-time Transport Protocol (RTP), all of which are incorporated by reference herein.

[0123] SIP is a signaling protocol for initiating, managing and termination voice and video sessions across packet networks.

[0124] SDP is intended for describing multimedia sessions for the purposes of session announcement, session invitation, and other forms of multimedia session initiation. SIP uses SDP to describe media sessions.

[0125] RTP provides end-to-end network 40 transport functions suitable for applications transmitting real-time data, such as audio, video or simulation data, over multicast or unicast network 40 services. SIP uses RTP for media session transport.

[0126] The videophone 15 can perform conferences with three or more parties without the use of any conferencing bridge or MCU. This is accomplished by using ATM point to multipoint streams as established by SIP. More specifically, when the MPEG-2 stream and the low frame rate stream is packetized for transmission onto the network 40, the header information for each of the packets identifies the addresses of all the receive videophones 15 of the conference, as is well known in the art. From this information, when the packets are transmitted to the network 40, SIP establishes the necessary connectivity for the different packets to reach their desired videophone 15 destinations.

[0127] As an example of a conference that does not use any conferencing bridge, let there be 10 videophones 15 at discreet locations who are parties to a conference. Each videophone 15 produces an audio based stream, and an MPEG-2 based stream and a low frame rate based stream. However, each videophone 15 will not send any of these streams back to itself, so effectively, in a 10 party conference of videophones 15, each communicate with the nine other videophones 15. While it could be the case that the videophone 15 communicates with itself, to maximize the bandwidth utilization, the video produced by any videophone 15 and, if desired, the audio produced by a videophone 15 can be shown or heard as it essentially appears to the other videophones 15, but through an internal channel, which will be described below, that does not require any bandwidth utilization of the network 40.

[0128] In the conference, each videophone 15 receives nine audio based streams of data. Three MPEG-2 based streams of data and six low frame rate based streams of data. If desired, the receiver could choose up to nine streams of low frame rate based streams so the display 54 only shows the smaller images of each videophone 15, or up to four of the MPEG-2 based streams of data where the display 54 is filled with four images from four of the videophones 15 of the conference with no low frame rate based streams having their image shown, since there is no room on the display 54 for them if four MPEG-2 based streams are displayed. By having three MPEG-2 based streams shown, this allows for six of the low frame rate based streams to be shown. Each of the streams are formed as explained above, and received as explained above at the various videophones 15.

[0129] If more than four large images are desired to be shown of a conference, then the way that this is accomplished is additional videophones 15 are connected together so that the displays of the different videophones 15 are lined up side by side, as shown in figure 7. One videophone 15 can be the master, and as each additional videophone is added, it becomes a slave to the master videophone 15, which controls the display 54 of the large and small images across the different videophones 15.

[0130] In terms of the protocols to determine who is shown as a large image and who is shown as a small image on the displays of the videophones 15 of the conference, one preferred protocol is that the three most recent talkers are displayed as large, and the other parties are shown as small. That is, the party who is currently talking and the two previous talkers are shown as large. Since each videophone 15 of the conference receives all the audio based streams of the conference, each videophone 15 with its main controller 50 can determine where the talking is occurring at a given moment and cause the network interface card 56 to accept the MPEG-2 stream associated with the videophone 15 from which talking is occurring, and not accept the associated low frame rate stream. In another protocol, one videophone 15 is established as the lead or moderator videophone 15, and the lead videophone 15 picks what every other videophone 15 sees in terms of the large and small images. In yet another protocol, the choice of images as to who is large and who

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is small is fixed and remains the same throughout the conference. The protocol can be that each videophone 15 can pick how they want the images they receive displayed. Both the MPEG-2 based stream and the low frame rate stream are transmitted onto the network 40 to the receive videophones of the conference. Accordingly, both video based streams are available to each receive videophone 15 to be shown depending on the protocol for display 54 that is chosen.

[0131] In regard to the audio based streams that are transmitted by each videophone 15, to further effectively use the bandwidth, and to assist in the processing of the audio by decreasing the demands of processing placed on any transmit videophone 15 or receive videophone 15, an audio based stream can only the transmitted by a videophone 15 when there is audio above a predetermined decibel threshold at the transmit videophone 15. By only transmitting audio based streams that have a loud enough sound, with the assumption that the threshold would be calibrated to be met or exceeded when talking is occurring, this not only eliminates extraneous background noise from having to be sent and received, which essentially contributes nothing but uses bandwidth, but assists in choosing the MPEG-2 stream associated with the talking since only the audio streams that have talking are being received.

[0132] As mentioned above, if a given videophone 15 desires to see its own image that is being sent out to the other videophones 15, then the low frame rate stream that is formed by the FPGA 38 is sent to a local memory in the videophone 15, but without any compression, as would be the case for the low frame rate stream that is to be packetized and sent onto the network 40 from the videophone 15. From this local memory, the main processor with software will operate on it and cause it to be displayed as a small image on the display 54.

[0133] Furthermore, the videophone 15 provides for the control of which audio or video streams that it receives from the network 40 are to be heard or seen. In situations where the conference has more parties than a user of the videophone 15 wishes to see or hear, the user of the videophone 15 can choose to see only or hear only a subset of the video or audio streams that comprise the total conference. For instance, in a 100 party conference, the user chooses to see three of the video streams as large pictures on the screen, and 20 of the video streams as a small images on the screen, for a total of 23 pictures out of the possible 100 pictures that could be shown. The user of the videophone 15 chooses to have the three loudest talkers appear as the large pictures, and then chooses through the touch screen 74 of the parties in the conference, which are listed on a page of the touch screen, to also be displayed as the small pictures. Other protocols can be chosen, such as the 20 pictures that are shown as small pictures can be the last 20 talkers in the conference starting from the time the conference began and each party made his introductions. By controlling the number of video streams shown, organization is applied to the conference and utilization of the resources of the videophone 15 are better allocated.

[0134] In regard to the different pictures that are shown on the screen, a choice can be associated with each picture. For example, one picture can be selected by a moderator of the conference call, two of the pictures can be based on the last/loudest talkers at a current time of the conference, and the other picture can be associated with a person the user selects from all the other participants of the conference. In this way, every participant or user of the conference could potentially see a different selection of pictures from the total number of participants in the conference. The maximum bandwidth that is then needed is for one video stream being sent to the network, and four video streams being received from the network, regardless of the number of participants of the conference.

[0135] In regard to the audio streams, the limitation can be placed on the videophone 15 that only the audio streams associated with the three loudest talkers are chosen to be heard, while their respective picture is shown on the screen. The DSP 62 can analyze the audio streams that are received, and allow only the three audio streams associated with the loudest speakers to be played, and at the same time, directing the network interface 42 to only receive the first video streams of the large pictures associated with the three audio streams having the loudest talkers. Generally speaking, the more people that are talking at the same time, the more confusion and less understanding occurs. Thus, controls by the user are exercised over the audio streams to place some level of organization to them.

[0136] As part of the controls in regard to the audio streams, as mentioned above, each videophone 15 will only send out an audio stream if noise about the videophone 15 is above a threshold. Preferably, the threshold is dynamic and is based on the noise level of the three loudest audio streams associated with the three loudest talkers at a given time. This follows, since for the audio stream to be considered as one of the audio streams with the three loudest talkers, the noise level of other audio streams must be monitored and identified in regard to their noise level. The DSP 62 upon receiving the audio streams from the network interface 42 through the network 40, reviews the audio stream and identifies the three streams having the loudest noise, and also compares the noise level of the three received audio streams which have been identified with the three loudest talkers with the noise level of the scene about the videophone 15. If the noise level from the scene about the videophone 15 is greater than any one of the audio streams received, then the videophone 15 sends its audio stream to the network 40. This type of independent analysis by the DSP 62 occurs at each of the videophones in the conference, and is thus a distributive analysis throughout the conference. Each videophone, independent of all the other videophones, makes its own analysis in regard to the audio streams it receives, which by definition have only been sent out by the respective videophone 15 after the respective videophone 15 has determined that the noise about its scene is loud enough to warrant that at a given time it is one of the three loudest. Each videophone 15 than takes this received audio stream information and uses it as a basis for comparison of its own noise level. Each

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videophone 15 is thus making its own determination of threshold.

[0137] An alternative way of performing this distributed analysis is that each videophone, after determining what it believes the threshold should be with its DSP 62, can send this threshold to all the other videophones of the conference, so all of the videophones can review what all the other videophones consider the threshold to be, and can, for instance, average the thresholds, to identify a threshold that it will apply to its scene.

[0138] By using the technique of choosing the video streams of the three loudest talkers, there may be moments when parties start talking loudly all at once, and creating confusion and inability for understanding, but by doing so it raises the noise in the threshold level, resulting in very shortly the elimination of the audio streams that are not producing as much noise as others, so that only the audio streams of the three largest talkers will once again be chosen and heard, with the others not being chosen, and thus removing some of the noise that the other audio streams might be contributing. This implies that there may be times when more than three audio streams are received by the videophone 15 since more than three videophones may have a noise level above the threshold at a given moment, allowing each of such videophones to produce an audio stream at that time and to send it to the network 40. However, as just explained, once the threshold is changed, the situation will stop. This distributed analysis in regard to audio streams, is not limited to the videophone 15 described here but is also applicable to any type of an audio conference, whether there is also present video streams or not.

[0139] Consistent with the emphasis on conserving the use of bandwidth, and to send only what is necessary to conserve the bandwidth, clipping of an image occurs at the encoder 36 rather than at the receive videophone 15. In the instances where the transmit videophone 15 is aware of how its image will appear at the receive videophones 15, the encoder 36 clips the large image of the scene before it is transmitted, so there is that much less of the image to transmit and utilize bandwidth. If clipping is to occur at the receiver videophone 15, then the main processor with software will operate on the received image before it is provided to the display controller 52.

[0140] A second camera can be connected to the videophone 15 to provide an alternative view of the scene. For instance, in a room, the first camera, or primary camera, can be disposed to focus on the face of the viewer or talker. However, there may be additional individuals in the room which the person controlling the videophone 15 in the room wishes to show to the other viewers at the receive videophones 15. The second camera, for instance, can be disposed in an upper corner of the room so that the second camera can view essentially a much larger portion of the room than the primary camera. The second camera feed can be provided to the decoder 34. The decoder 34 has several ports to receive video feeds. Alternatively, if the stream from the second camera is already digitized, it can be provided to the processing elements of the videophone 15 through similar channels as the primary camera. Preferably, each videophone 15 controls whatever is sent out of it, so the choice of which camera feed is to be transmitted is decided by the viewer controlling the videophone 15. Alternatively, it is possible to provide a remote receive videophone 15 the ability to control and choose which stream from which camera at a given videophone 15 is to be transmitted. The control signals from the control videophone 15 would be transmitted over the network 40 and received by the respective videophone 15 which will then provide the chosen stream for transmission. Besides a second camera, any other type of video feed can also be provided through the videophone 15, such as the video feed from a DVD, VCR or whiteboard camera.

[0141] In a preferred embodiment, the videophone 15 operates in a peak mode. In the peak mode, the videophone 15 camera takes a still image of the scene before it and transmits this image to other videophones 15 that have been previously identified to receive it, such as on a list of those videophones 15 on its speed dial menu. Alternatively, in the peak mode, the still image that is taken is maintained at the videophone 15 and is provided upon request to anyone who is looking to call that videophone 15. Ideally, as is consistent with the preferred usage of the videophone 15, each videophone 15 user controls whatever is sent out of the videophone 15, and can simply choose to turn off the peak mode, or control what image is sent out. When an active call occurs, the peak mode is turned off so there is no conflict between the peak mode and the active call in which a continuous image stream is taken by the camera. The peak mode can have the still image of the scene be taken at predetermined time intervals, say at one-minute increments, five-minute increments, 30-minute increments, etc. In the peak mode, at a predetermined time before the still image is taken, such as five or ten seconds before the image is taken, an audible queue can be presented to alert anyone before the camera that a picture is about to be taken and that they should look presentable. The audible queue can be a beep, a ping or other recorded noise or message. In this way, when the peak mode is used, a peak into the scene before the camera of the videophone 15 is made available to other videophones 15 and provides an indication of presence of people in regard to the camera to the other videophones 15.

[0142] As another example of a presence sensor, the location of the automatic lens of the camera in regard to the field before it can act as a presence sensor. When no one is before the camera, then the automatic lens of the camera will focus on an object or wall that is in its field. When a person is before the camera, the automatic lens will focus on that person, which will cause the lens to be in a different position than when the person is not before the lens. A signal from the camera indicative of the focus of the lens can be sent from the camera to the FPGA 38 which then causes the focus information to be sent to a predetermined list of videophone 15 receivers, such as those on the speed dial list of the transmit videophone 15, to inform the receive videophones 15 whether the viewer is before the videophone 15 to

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indicate that someone is present.

[0143] The videophone 15 also provides for video mail. In the event a video call is attempted from one videophone 15 to another videophone 15, and the receive videophone 15 does not answer the video call after a predetermined time; for instance 4 rings, then a video server 66 associated with the receive videophone 15 will respond to the video call. The video server 66 will answer the video call from the transmit videophone 15 and send to the transmit videophone 15 a recorded audio message, or an audio message with a recorded video image from the receive videophone 15 that did not answer, which had been previously recorded. The video server 66 will play the message and provide an audio or an audio and video queue to the caller to leave their message after a predetermined indication, such as a beep. When the predetermine indication occurs, the caller will then leave a message that will include an audio statement as well as a video image of the caller. The video and audio message will be stored in memory at the video server 66. The message can be as long as desired, or be limited to a predetermined period of time for the message to be defined. After the predetermined period of time has passed, or the caller has finished and terminated the call, the video server 66 saves the video message, and sends a signal to the receive videophone 15 which did not answer the original call, that there is a video message waiting for the viewer of the receive videophone 15. This message can be text or a video image that appears on the display 54 of the receive videophone 15, or is simply a message light that is activated to alert the receive videophone 15 viewer that there is video mail for the viewer.

[0144] When the viewer wishes to view the video mail, the viewer can just choose on the touch screen 74 the area to activate the video mail. The user is presented with a range of mail handling options, including reading video mail, which sends a signal to the video server 66 to play the video mail for the viewer on the videophone 15 display 54. The image stream that is sent from the video server 66 follows the path explained above for video based streams to and through the receive videophone 15 to be displayed. For the videophone 15 viewer to record a message on the video server 66 to respond to video calls when the viewer does not answer the video calls, the viewer touches an area on the touch screen 74 which activates the video server 66 to prompt the viewer to record a message either audio or audio and video, at a predetermined time, which the viewer than does, to create the message.

[0145] The videophone 15 provides for operation of the speakers 64 at a predetermined level without any volume control by the user. The speakers 64 of the videophone 15 can be calibrated with the microphone so that if the microphone is picking up noise that is too loud, then the main controller 50 and the DSP 62 lowers the level of audio output of the speakers 64 to decrease the noise level. By setting a predetermined and desirable level, the videophone 15 automatically controls the loudness of the volume without the viewer having to do anything.

[0146] The videophone 15 can be programmed to recognize an inquiry to speak to a specific person, and then use the predetermined speech pattern that is used for the recognition as the tone or signal at the receive videophone 15 to inform the viewer at the receive videophone 15 a call is being requested with the receive videophone 15. For instance, the term "Hey Craig" can be used for the videophone 15 to recognize that a call is to be initiated to Craig with the transmit videophone 15. The viewer by saying "Hey Craig" causes the transmit videophone to automatically initiate a call to Craig which then sends the term "Hey Craig" to the receive videophone 15 of Craig. Instead of the receive videophone 15 of Craig ringing to indicate a call is being requested with Craig, the term "Hey Craig" is announced at the videophone 15 of Craig intermittently in place of the ringing that normally would occur to obtain Craig's attention. The functionality to perform this operation would be performed by the main controller 50 and the DSP 62. The statement "Hey Craig" would be announced by the viewer and transmitted, as explained above, to the server 66. The server 66, upon analyzing the statements, would recognize the term as a command to initiate a call to the named party of the command. The server 66 would then utilize the address information of the videophone 15 of Craig to initiate the call with the videophone 15 of Craig, and cause the signal or tone to be produced at the videophone 15 of Craig to be "Hey Craig".

[0147] As is well known in the art, the encoder 36 is able to identify the beginning and the end of each frame. As the encoder 36 receives the data, it encodes the data for a frame and stores the data until the frame is complete. Due to the algorithm that the encoder 36 utilizes, the stored frame is used as a basis to form the next frame. The stored frame acts as a reference frame for the next frame to be encoded. Essentially this is because the changes to the frame from one frame to the next are the focus for the encoding, and not the entire frame from the beginning. The encoded frame is then sent directly for packetization, as explained above, with out any buffering, except for packetization purposes, so as to minimize any delay. Alternatively, as the encoder 36 encodes the data for the frame, to even further speed the transmission of the data, the encoded data is ordered on for packetization purposes without waiting for the entire frame to be encoded. The data that is encoded is also stored for purposes of forming the frame, for reasons explained above, so that a reference frame is available to the encoder 36. However, separately, the data as it is encoded is sent on for packetization purposes and forms into a frame as it is also being prepared for packetization, although if the packet is ready for transmission and it so happens only a portion of the frame has been made part of the packet, the remaining portion of the frame will be transmitted with a separate packet, and the frame will not be formed until both packets with the frame information are received at the receive videophone 15.

[0148] Referring to figure 1, videophones 15 are connected to the network 40. Videophones 15 support 10/100 ethernet connections and optionally ATM 155Mbps connections, on either copper or Multimode Fiber. Each videophone 15

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terminal is usually associated with a users PC 68. The role of the videophone 15 is to provide the audio and Video aspects of a (conference) call. The PC 68 is used for any other functions. Establishing a call via the videophone 15 can automatically establish a Microsoft Netmeeting session between associated PCs 68 so that users can collaborate in Windows-based programs, for example, a Power Point presentation, or a spread sheet, exchange graphics on an electronic whiteboard, transfer files, or use a text-based chat program, etc. The PC 68 can be connected to Ethernet irrespective of how the videophone 15 terminal is connected. It can, of course, also be connected to an ATM LAN. The PC 68 and the associated transmit videophone 15 communicate with each other through the network 40. The PC 68 and the associated transmit videophone 15 communicate with each other so the PC 68 knows to whom the transmit videophone 15 is talking. The PC 68 can then communicate with the PC 68 of the receive videophone 15 to whom the transmit videophone 15 is talking. The PC 68 can also place a call for the videophone 15.

[0149] Most of the system 10 functionality is server based, and is software running of the videophone 15 Proxy Server, which is preferably an SIP Proxy Server. One server 66 is needed to deliver basic functionality, a second is required for resilient operation, i.e. the preservation of services in the event that one server 66 fails. Software in the servers and in the videophone 15 terminal will automatically swap to the back up server 66 in this event. With this configuration, videophone 15 terminals can make or receive calls to any other videophone 15 terminal on the network 40 and to any phones, which are preferably SIP phones, registered on the network.

[0150] Media Servers provide a set of services to users on a set of media streams. The media server 66 is controlled by a feature server 66 (preferably an feature server 66). It is employed to provide sources and sinks for media streams as part of various user-invocable functions. The services provided on the media server 66 are:

Conference Bridging
Record and Playback
Transcoding
Tones and announcements

[0151] The media server 66 is a box sitting on the LAN or WAN. In general, it has no other connections to it. It is preferably an SIP device. The feature servers are in the signaling path from the videophone 15 terminals. The media path, however, would go direct from the media server 66 to the appliance.

[0152] In operation, the user may ask for a function, such as videomail. The feature server 66 would provide the user interface and the signaling function, the media server 66 would provide the mechanisms for multimedia prompts (if used) and the record and playback of messages.

[0153] To enable a videophone 15 terminal to make or accept calls to any non protocol or standard (such as SIP) (video) phones, a Gateway 70, such as an SIP gateway, is added. A four analogue line gateway 70 can be connected either directly to the PSTN, or to analogue lines of the local PBX. The normal rules for provisioning outgoing lines apply. Typically one trunk line is provisioned for every six users, i.e. it assumes any one user uses his phone to dial an external connection 10 minutes out of any hour. If the videophone 15 terminal is to act as an extension on a current PBX as far as incoming calls are concerned then one analogue line is needed for every videophone 15.

[0154] TV sources, such as CNN, are available to the videophone 15 user. The videophone 15 Video Server 66 enables this service. The Server 66 supports the connection of a single Video channel that is then accessible by any videophone 15 user on the network 40. The Video channel is the equivalent of two normal conference sessions. A tuner can set the channel that is available. A new videophone 15 Video Server 66 should be added to the configuration for each different channel the customer wishes to have available simultaneously.

[0155] The videophone 15 server 66 (preferably SIP) also contains a database for user data, including a local cache of the users contact information. This database can be synchronized with the users main contact database. Synchronization can be used, for instance, with Outlook/Exchange users and for Lotus Notes users. A separate program that will run on any NT based server 66 platform does synchronization. Only one server 66 is required irrespective of the number of sites served.

[0156] As shown in figure 2, usually videophone 15 terminals will be distributed across several sites, joined by a Wide Area network 40. One server 66 is sufficient to serve up to 100+ videophones 15 on a single campus. As the total number of videophones 15 on a site increases, at some stage more servers need to be installed.

[0157] With videophones 15 distributed across several sites, it is possible for them to operate based on central servers, but this is not a recommended configuration, because of the WAN bandwidth used and the dependence on the WAN. Preferably, each site has at least one server 66, which is preferably an SIP server 66 when SIP is used. For the more cautious, the simplest and easiest configuration is if each site has duplicated servers, preferably each being SIP servers. However using a central server 66 as the alternate to remote site servers will work too.

[0158] Videophones 15 anywhere in the network 40 can make PSTN or PBX based outgoing calls from a single central gateway 70. However, if there is the need for the videophone 15 to also be an extension on a local PBX to accept incoming calls then a PSTN gateway 70 needs to be provided at each location. There needs to be a port on the gateway

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70 for every videophone 15 on that site.

[0159] A central CNN server 66 can distribute TV channel to any videophone 15 on the network 40. Nevertheless, it may be preferable to include site specific servers than take that bandwidth over the WAN.

[0160] A videophone 15 is available to connect to either a 10/100 Ethernet network 40 or an ATM network 40 at 155 Mbits/sec (with both Fiber and Copper options). An ATM connected videophone 15 uses an IP control plane to establish the ATM addresses of the end-points for a call, and then uses ATM signaling to establish the bearer channel between those end points. The bearer channel is established a Switched Virtual Circuit (SVC), with the full QoS requirements specified.

[0161] Each video stream is between 2Mbps and 6Mbps duplex as determined by settings and bandwidth negotiation. As the display means can show more than a single video stream, the overall required connection bandwidth to each videophone increases with the number of parties in the call. Transmit end clipping ensures that the maximum required bandwidth is approximately 2.5 times the single video stream bandwidth in use. If there are several videophones 15 on a site, the normal telephone ratio between users and trunks will apply to videophone 15 sessions. In other words, a videophone 15 user is expected to talk on average to two other people in each call, i.e. two streams and will use the videophone 15 on average 10 minutes in the hour. For the average encoding rate of 3Mbps, this gives a WAN bandwidth need of 6Mbps which can be expected to support up to 6 users.

[0162] As shown in figure 3, the videophone 15 operates on a 'p' enabled Ethernet network 40, when there is a low density of videophone 15 terminals. The videophone 15 system 10 will establish an SVC across the ATM portion of the network 40 linking the two videophones 15 together, and make use of the 'p' enabled Ethernet to ensure sufficient Quality of Service is delivered over the Ethernet part of the connection.

[0163] The essential elements of the videophone 15 system 10 are shown in Figure 4. Together they create multi-media collaboration tools greatly enhancing the ability of geographically dispersed teams to interact. Such teams are increasingly common in almost every large enterprise, yet the tools to help them work effectively and efficiently are little changed from a decade ago and are in many respects unsatisfactory. Videophone 15 addresses the many issues of existing systems in a comprehensive way to create a discontinuous improvement in remote collaboration. It is enabled by newly available technology, differentiated by Quality of Service and the right mix of functions, made useable by the development of an excellent user interface, and designed to be extensible by using a standards based architecture.

[0164] The audio and video streams, as explained above, are transmitted from the originating videophone 15 to terminating videophones 15 on the network using, for example, well known SIP techniques. SIP messages may be routed across heterogeneous networks using IP routing techniques. It is desirable for media streams in heterogeneous networks to have a more direct path. Preferably, in instances where the originating videophone 15 of a conference is connected to an Ethernet, and a terminating videophone 15 of the conference is connected to an ATM network, as shown in figure 15, the following addressing of the packets that cross the network between the originating and terminating videophones occurs. The originating videophone 15 sends a packet onto the Ethernet to which it is an communication with the originating videophone's IP address. The packet reaches an originating gateway 80 which links the Ethernet with the ATM network. At the originating gateway 80, the IP address of the originating videophone 15 is saved from the packet, and the originating gateway 80 adds to the packet the ATM address of the originating gateway 80 and sends the packeton to the terminating videophone 15. When the terminating videophone 15 receives the packet, it stores the ATM address of the originating gateway 80 from the packet, and sends back to the originating gateway 80 a return packet indicating that it has received the packet, with the ATM address of the terminating videophone 15. The originating gateway 80, when it receives the return packet saves the ATM address of the terminating videophone 15 and adds the IP address of the originating gateway 80 to the return packet. The return packet is then sent from the originating gateway 80 back to the originating videophone 15.

[0165] In this way, the specific addresses of each critical node of the overall path between and with the originating videophone 15 and the terminating videophone 15 is known to each critical node of the path. At minimum, each node on the path knows the address of the next node of the path, and if desired, additional addresses can be maintained with the respective packets as they move along the path so each node of the path knows more in regard to addresses of the critical nodes then the next node that the packet goes to. This is because as the packet moves from node to node, and specifically in the example, from the originating videophone 15 to the originating gateway 80 to the terminating videophone 15 and then back to the originating gateway 80 and then to the originating videophone 15, each node saves the critical address of the previous node from which to the respective packet was received, and introduces its own address relative to the type of network the next node is part of. Consequently, all the critical addresses that each node needs to send the packet onto the next node are distributed throughout the path.

[0166] This example of transferring a packet from an originating videophone 15 on an Ethernet to a terminating videophone 15 on an ATM network also is applicable for the reverse, where the originating terminal or videophone 15 is in communication with an ATM network and the terminating videophone 15 is in communication with an Ethernet.

[0167] Similarly, the path can involve an originating videophone 15 in communication with an Ethernet and a terminating videophone 15 in communication with an Ethernet where there is an ATM network traversed by the packet in between,

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as shown in figure 16. In such a case, there would be two gateways at each edge where there is an interface between the Ethernet and the ATM network. As explained above, the process would simply add an additional node to the path, where the originating gateway 80 introduces its own ATM address to the packet and sends it to the terminating gateway 82 which saves the originating gateway's ATM address and adds the terminating gateway's IP address to the packet, which it then sends onto the terminating videophone 15 on the Ethernet. With the return packet, the same thing happens in reverse, and each gateway saves the respective address information from the previous gateway or terminating videophone 15, and adds its own address to the return packet that it sends on ultimately to the originating videophone 15, with the originating gateway 80 and the originating videophone 15 saving the ATM address of the terminating gateway 82 or the originating gateway 80, respectively, so the respective addresses in each link of the overall path is stored to more efficiently and quickly send on subsequent packets of a connection.

[0168] For instance, the main controller 50 and the network interface 42 of the videophone 15 can add the address of the videophone 15 to each packet that it sends to the network 40 using the same techniques that are well known to one skilled in the art of placing SIP routing information (or whatever standard routing information is used) with the packet. The network interface 42 also stores the address information it receives from a packet from a node on the network in a local memory. Similarly, for a gateway on the network 40, the same can be applied. As is well known, the gateway has controlling means and a data processing means for moving a packet on to its ultimate destination. A network interface 42 and a main controller 50 of the controlling mechanism of the gateway, operating with well known techniques in regard to SIP routing information, stores address information received from a packet and places its own address information relative to a network 40 in which it is going to send the packet, with the packet. For example, the address information of the gateway, or the videophone 15, can be placed in a field that is in the header portion associated with the packet. It should be noted, that while the example speaks to the use of videophones 15 as terminating and originating sources, any type of device which produces and receives packets can be used as a node in this overall scheme.

[0169] The Virtual Presence Video-Phone (videophone) 15 is a desk top network 40 appliance that is a personal communications terminal. It replaces the phone on the users desk, providing all the features of a modern PBX terminal with the simplicity of user interface and ease of use afforded by videophones' 15 large touch screen 74.

[0170] Videophone 15 adds the video dimension to all interpersonal communications, changing the experience to that of virtual presence. In the past the quality of video on video conference systems has not been high enough for the technology to be transparent. videophone 15 is the first personal videophone to deliver high enough video quality to create the right experience. For effective real time video communication not only has the picture quality to be close to broadcast TV quality, but the latency must be kept very low. Lip Sync is also important if a natural conversation is to flow. All these issues have been addressed in the design of the videophone 15 video subsystem. videophone 15 uses the latest encoder 36 and decoder 34 technology configured specifically for this application. In other words, videophone 15 gets as close as possible to 'being there'.

[0171] Videophone 15 also greatly improves on conventional speaker phone performance through the use of a high fidelity, near CD quality audio channel that delivers crystal clear voice. Stereo audio channels provide for spatial differentiation of each participants audio. Advanced stereo echo cancellation cancels not only all the sound from the units speakers 64 but enables the talker to carry on a conversation at normal conversational levels, even when in a noisy room.

[0172] Videophone 15 directly supports the establishment of up to 4 remote party (i.e. 5 way) video conference calls and or up to 10 party audio conference calls. Each user has visibility on the availability of all other members of his/her work group. The videophone 15 preferably uses Session Initiation Protocol (SIP) as a means of establishing, modifying and clearing multi-stream multi-media sessions. Videophone 15 can establish an audio call to any other SIP phone or to any other phone via a gateway 70.

[0173] Videophone 15 places high demands on the network 40 to which it is attached. Videophone 15 video calls demand a network 40 that can supply continuous high bandwidth, with guarantees on bandwidth, latency and jitter. Marconi plc specializes in providing networks that support high Quality of Service applications. A conference room version of videophone 15 is also available.

[0174] The videophone 15 is a communications terminal (platform) that has the capability of fully integrating with a user's PC 68, the computing platform. A videophone 15 application for the PC 68 provides a number of integration services between the PC 68 and the associated videophone 15 terminal. This will include the automatic establishment of NetMeeting sessions between the parties in a videophone 15 conference call, if so enabled, for the purpose of sharing applications such as whiteboard, or presentations, etc. other capabilities including "drag and drop" dialing by videophone 15 of a number on the PC 68.

[0175] A set of servers, preferably each being SIP servers, provide call control and feature implementation to the network 40 appliances. These are software servers running on standard computing platforms, capable of redundancy. These servers also run a local copy of the users contact information database and users preference database. Applications available on these servers provide access to corporate or other LDAP accessible directories.

[0176] A synchronization server 66 maintains synchronization between the users main contact database and the local copy on the server 66 (preferably SIP). Outlook Exchange or Lotus Notes synchronization is supported. A set of Media

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Gateways 70 are used to the analogue or digital PSTN network 40. A set of Media Gateways 70 interfaces to the most common PABX equipment, including the voice mail systems associated with those PABX's.

[0177] The Media server 66 provides a number of services to the videophone 15 terminal. It acts as a Bridging-Conference server 66 for video conference over 4 parties, if desired. It can also provide transcoding between the videophone 15 standards and other common audio or video formats, such as H320/H323. It can provide record and playback facilities, enabling sessions to be recorded and playback. It can provide the source of tones and announcements.

[0178] A Firewall according to the standard being used, such as an SIP Firewall, is required to securely pass the dynamically created RTP streams under the control of standard proxy software (such as SIP proxy software). A TV server 66 acts as a source of TV distribution, allowing videophone 15 users to select any channel supported, for example CNN.

[0179] Videophone 15 is for Ethernet and ATM desktops. The videophone 15 terminal will support end to end ATM SVC's and use them to establish connections with the requisite level of Quality of Service. Videophone 15 will also support IP connectivity via LANE services. For this to guarantee the required QoS, LANE 2 is required. The videophone 15 provides ATM passthrough to an ATM attached desk-top PC 68, or an ATM to Ethernet pass through to attach the PC 68 via Ethernet.

[0180] The videophone 15 requires the support of end to end QoS. For an Ethernet attached videophone 15 the user connection needs to support 802.1p, DiffServ and/or IntServ or better. If the destination is reachable via an ATM network 40, an Ethernet to ATM gateway 70 will be provided. The SIP proxy server 66 and SIP signaling will establish the ATM end-point nearest to the target videophone 15 terminal, i.e. its ATM address if it is ATM attached, or the ATM Ethernet gateway 70 that is closest. Signaling will establish an SVC across the ATM portion of the network 40 with the appropriate QoS. This SVC will be linked to the specific Ethernet flow generating the appropriate priority indication at the remote end.

[0181] The videophone 15 product line consists of several end terminals (appliances), a set of servers which provide features not built into the appliances, and a set of gateways 70 that connect the products to existing facilities and outside PSTN services. The basic functionality provided by the system 10 is:

- Telephony Services, with video available on all "on-net" calls, very high quality audio and video
- Multiparty Conference Services, audio and video, ad hoc or prescheduled, completely self-serve, fully integrated into the telephony services
- Presence Services - with a variety of tools to determine availability for collaboration
- Shared Surface Services - electronic whiteboard, application sharing, document sharing, presentation broadcast
- Other value added services such as broadcast video (Mikes message to the troops) TV distribution. Online interactive training, etc. Session recording services is also available, if desired.

[0182] Videophone 15 is a telephone with dramatic new functionality, not a computer trying to do what a telephone does. This allows full concurrent use of a computer for the things that it is good at, while providing a flexible but application specific appliance for communication. The user interface and physical design can be tuned for this application, providing an instant on, highly reliable communications device like current phones, something that the PC 68 will never be. This approach also provides control over the operating environment of the device, eliminating the support problems related to PC 68 hardware and software configuration issues.

[0183] Human factor studies have demonstrated time after time that audio quality is the single most important factor for effective, transparent communication. While a handset is necessary, excellent quality hands free audio including Acoustic Echo Cancellation (AEC), Automatic Gain Control (AGC), wide band audio capability (G.722 8kHz bandwidth or better), stereo output, and integration with the PC 68 sound output provides new levels of effective remote collaboration. A high quality microphone array, designed and processed to limit tin-can effects is also present.

[0184] A simple, clean, intuitive, fully flexible platform for visual output and button/selection input is used. In the first videophone model, this is a high quality TFT full color screen, 17" diagonal 16 by 9 screen with 1260 x 768 resolution or better, overlaid with a medium resolution high life touch-panel. A bright (>200 nit), extended viewing angle (>+-60°) active matrix panel is used to display full motion video for comfortable viewing in an office environment. Larger, brighter, faster, higher contrast, and higher viewing angle screens can be used.

[0185] The videophone 15 uses a TFT color LCD, having PC 68 like architecture with a VGA type display 54 interface based on an Intel Celeron/440 MMX and a Lynx VGA controller.

[0186] A high quality digital 480 line progressive scan camera is used to provide 30 frames per second of at least 640x480 video. Videophone 15 uses MPEG2 encoding taking advantage of the video encoder 36 technology for set top boxes. A variety of different bit rates can be generated, allowing the video quality to adapt to the available resources for one-to-one calls, and to the highest quality participant for one or many-to-many calls. An integrated high quality camera module is positioned close to the screen, with an external video input (Firewire) provided to allow the use of additional cameras, VCRs, or other video sources.

[0187] An existing 10/100BaseT Ethernet connection to the desktop is the only connection necessary for communi-

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cation to the LAN, WAN, PC 68 desktop, and various servers, proxies, and gateways 70. Time critical RTP streams for audio and video are marked with priority using 802.1p, supplying the mechanism within the Ethernet domain of the LAN for QoS. DiffServ is also supported, with RSVP as an option. In order to eliminate the need for additional building wiring to the desktop, the videophone 15 will include a small 10/100 Ethernet switch, allowing the existing desktop port to be used for both the phone and the PC 68.

[0188] Videophone 15 also supports an ATM interface. The interface is based on using the HE155 Mbits/sec card with either a fiber or copper interface. The videophone 15 provides an ATM pass-through port to connect to an ATM connected desktop or to connect an Ethernet connected PC 68 to the ATM connected videophone 15.

[0189] The cost and performance tradeoffs for the conference room environment are obviously different than those for the desktop. Video projection, multiple cameras with remote Pan/Tilt/Zoom, multiple microphones, multiple video channels, rear projection white boards, and other products appropriate for the conference room environment are integrated into a conference room videophone 15. The interworking of the conference room environment and the desktop is seamless and transparent. This environment will make heavy use of OEM equipment that is interfaced to the same infrastructure and standards in place for the desktop. The hardware design is essentially the same, with additional audio support for multiple microphones, and additional video support for multiple cameras and displays. Alternatively, a PC 68 application, either mouse or touch screen 74 driven, if the PC 68 has as touch screen 74, that links to a low cost SIP phone can be used. For those desktops and other places that do not require the collaboration capabilities described above, a standard phone can be used that works with the system 10 without requiring additional wiring or a PBX.

[0190] Using the SIP (Session Initiation Protocol) standard, the terminal devices are supported by one or more servers that provide registration, location, user profile, presence, and various proxy services. These servers are inexpensive Linux or BSD machines connected to the LAN.

[0191] The videophone 15 is the phone, so a key set of PBX functions must be provided, including transfer, forward, 3 (and 4, 5, ...) party conferencing, caller ID +, call history, etc. Some of these features may be built on top of a SIP extension mechanism called "CPL", which is actually a language to provide call handling in a secure, extensible manner.

[0192] The videophone 15 provides for active presence and instant messaging. Perhaps the most revolutionary tool for improving day to day distributed group collaborative work, presence allows people to know who's in and what they're doing. It provides the basis for very low overhead calling, eliminating telephone tag and traditional number dialing, encouraging groups to communicate as a group rather than through the disjoint one-to-one phone conversations that are common now. Integration with Instant Messaging (real time email) provides a no delay way of exchanging short text messages, probably making use of the PC 68 keyboard for input.

[0193] The videophone 15 provides for distributed/redundant architecture. This is the phone system 10 and it must be reliable. It should also be able to be centrally managed with local extensions, with distributed servers providing "instant" response to all users. Each of the different SIP proxy functions, for instance, if SIP is used, will be deployed such that they can be arbitrarily combined into a set of physical servers, with redundant versions located in the network 40.

[0194] Microsoft NetMeeting is used for shared surface and shared application functionality. Computer/Telephony Interface (CTI) for the PC 68 and PDA, with features such as integrated contact lists, auto-dialing of selected phone numbers or names, calendar logging of call history, automatic entry of contacts, etc. can be used.

[0195] SIP presents challenges to firewalls because the RTP flows use dynamically allocated UDP ports, and the address/port information is carried in SIP messages. This means the Firewall has to track the SIP messages, and open "pin holes" in the firewall for the appropriate address/port combinations.

Further, if NAT is employed, the messages must be altered to have the appropriate translated address/ports. There are two ways to accomplish such a task. One is to build the capability into the firewall. The top 3 firewall vendors (Checkpoint, Network Associates and Axxent) provide this. An alternative is to have a special purpose firewall that just deals with SIP in parallel with the main firewall. There are commercial versions of such a firewall, for example, that of MicroAppliances. It should be noted that SIP or NetMeeting are preferred embodiments that are available to carry out their necessary respective functionality. Alternatives to them can be used, if the necessary functionality is provided.

[0196] Figure 5 shows the main physical components of the videophone 15 terminal. The stand provides a means of easily adjusting the height of the main display 54 panel and of securing the panel at that height. The range of height adjustment is to be at least 6 inches of travel to accommodate different user heights. It is assumed that the stand will sit on a desk and that desktop heights are standardized. The link between the stand and the main unit must provide for a limited degree of tilt out of the vertical to suit user preference and be easily locked at that angle. The amount of tilt needed -0 + 15E from the vertical. The main unit can directly wall mount without the need of the stand assembly as an option.

[0197] The main unit case provides the housing for all the other elements in the videophone 15 design including all those shown in figure 5 and all the internal electronics. The case provides for either left-hand or right-hand mounting of the handset. Right-handed people tend to pick up the handset with the left hand (because they will drive the touch screen 74 and write with the right) and left handed people the reverse. Though the left hand location will be the normal one, it must be possible to position the handset on the right. A Speaker jack is provided on the case to allow the speakers 64

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to be mounted remote from the videophone 15. Inputs are provided to handle the speaker outputs from the associated PC 68, so that videophone 15 can control the PC 68 and videophone 15 audio. Implementation of a wireless connection to speakers 64 (via Bluetooth, or SONY standards) can be used.

[0198] A handset is provided with the unit and should connect using a standard RJ9 coiled cable and connector jack. When parked the handset should be easy to pick-up and yet be unobtrusive. A handset option provides an on handset standard keypad. A wireless handset to improve mobility of the terminal user can be used.

[0199] A jack is provided for the connection of a stereo headset + microphone. Use of headsets for normal phone conversations is increasing. The user shall be able to choose to use a headset + boom mounted microphone, or a headset only, employing the microphone array as the input device. There is an option for a wireless headset to improve mobility of the terminal user.

[0200] An IR port is provided to interface to PDA's and other IR devices, in a position on the main case to allow easy access. For the moment IR interfaces on phones and PDA's are the most common and therefore for the same reasons as a bluetooth interface is required so too is an IR interface.

[0201] An array microphone is embedded in the casing. The array must not generate extraneous noise as a consequence of the normal operation of the terminal. Specifically, it should not be possible to detect user action on the touch-panel. The array microphone allows a user to talk at normal conversational levels within an arc (say 6 feet) round the front of the units and 110E in the horizontal plane and in the presence of predefined dbs of background noise. The unit must provide unambiguous indication that the microphone is active/not active, i.e. the equivalent of 'on-hook' or 'off-hook'. A videophone 15 user will want reassurance that he is not being listened into without his knowledge. This is the audio equivalent of the mechanical camera shutter.

[0202] The main videophone 15 unit may have a smart card reader option to provide secure access to the terminal for personal features. Access to videophone 15 will need an array of access control features, from a simple password logon on screen, to security fob's. A smart card reader provides one of these access methods.

[0203] There is clearly an advantage if the tilt and pan is controllable from the screen, and preferably, if Pan and Tilt are electronic only and need no mechanical mechanisms. The camera mount should be mounted as close to the top of the main screen as possible to improve eye contact.

[0204] The camera should be a digital camera 47 capable of generating 480p outputs. The camera output feeds an MPEG-2 encoder 36. It should be possible to dynamically configure the camera so that the camera output is optimized for feeding the encoder 36 at the chosen encoder 36 output data-rate. Faces form the majority of input the camera will receive, and therefore the accurate capture under a wide range of lighting conditions of skin tone is an essential characteristic.

[0205] The camera should be operated in a wide range of lighting conditions down to a value of 3 lux. The camera should provide automatic white balance. White balance changes must be slow, so that transients on the captured image do not cause undue picture perturbation. Only changes that last over 5 seconds should change the white balance. The camera should be in focus from 18 inches inches to 10 feet, i.e. have a large depth of field and desirably be in focus to 20 feet. Both the user and the information if any on his white board both need to be in focus. Auto-focus, where the camera continually hunts for the best focus as the user moves, produces a disturbing image at the receiver end and must be avoided.

[0206] The camera should allow a limited zoom capability, from the setting where one user is directly in front of the camera, to another setting where a few users are simultaneously on one videophone 15. As an alternative, different lenses may be provided. This can be specified in terms of lens field of view, from say a 30E field to view to a 75E field of view.

[0207] The camera should be able to input a larger picture than needed for transmission, for example a 1280 x 960 image. This would allow for limited zoom and horizontal and vertical pan electronically, removing the need for electro-mechanical controls associated with the camera. The camera should be physically small, so that an 'on-screen' mounting is not eliminated simply by the size of the camera.

[0208] A medium resolution long life touch panel forms the primary method of communicating with the videophone 15 and forms the front of the main display 54. The panel will get a lot of finger contact and therefore must withstand frequent cleaning to remove smears and other finger prints that would otherwise affect the display 54 quality. It should be easy to calibrate the touch panel, i.e. ensure that the alignment between the area touched on the touch panel and the display 54 underneath will result in meeting the 'false touch' requirement.

[0209] The touch screen 74 surface must minimize surface reflections so that the display 54 is clear even when facing a window. The requirement is that 'false touches' are rare events. The resolution requirement on the touch panel is therefore heavily dependent on the smallest display 54 area touch is trying to distinguish. The resolution and the parallax error combined should be such that the chance of a 'false touch' due to these factors by the average trained user is less than 5%. (One false touch in 20 selections). It is desirable that this false touch ratio is less than 2%, i.e. one false touch in 50 selections.

[0210] Where appropriate, audible and or visible feedback of a successful touch must be given to the user. These tones may vary depending on what is on the touch screen 74 display 54 at the time. For example when using a keyboard,

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keyboard like sounds are appropriate, when using a dial-pad different sounds are likely to be relevant and so on. Audible feedback may not be needed in all circumstances, though usually some audible or visible indication of a successful touch is helpful to the user. It should be possible for the user to be able to turn tones on and off and set the tones, tone duration and volume level associated with the touch on some settings screen. Default values should be provided. The touch screen 74 can also be used with a stylus as well as the finger.

[0211] The display 54 panel should be at least 17" diagonal flat panel (or better) full color display 54 technology, with a 16 x 9 aspect ratio preferred but a 16 x 10 aspect ratio being acceptable.

[0212] The screen resolution should be at least 1280 x 768. The viewable angle should be at least 6E off axis in both horizontal and vertical planes. The screen contrast ratio should be better than 300:1 typical. The color resolution should be at least 6 bits per color, i.e. able to display 262K colors 6 bits per color is acceptable for the prototype units. 8 bits per color is preferred, other things being equal, for the production units. The display 54 panel should have a high enough brightness to be viewed comfortably even in a well lit or naturally lit room. The brightness should be at least 300cd/m^2. The display 54 and the decode electronics should be able to display 720P high resolution images from appropriate network 40 sources of such images.

[0213] The back light shall have a minimum life to 50% of minimum brightness of at least 25,000 hours. If the back-light is turned off due to inactivity on the videophone 15 terminal, then it should automatically turn on if there is an incoming call and when the user touches anywhere on the touchscreen. The inactivity period after which the touchscreen is turned off should be settable by the user, up to "do not turn off".

[0214] The connections required in the connection area of the videophone 15 are as shown in figure 6. Each connector requirement will be briefly described in paragraphs below.

[0215] Two RJ 45 10/100 Ethernet connectors are for connection to the network 40 and from the associated PC 68.

[0216] An optional plug in ATM personality module shall be provided that enables the videophone 15 to easily support 155 Mbits/sec interfaces for both Optical and copper interfaces.

[0217] A USB port shall be provided to allow various optional peripherals to be easily connected, for example a keyboard, a mouse, a low cost camera, etc.

[0218] A 1394 (Firewire) interface should be provided to permit connection to external (firewire) cameras or other video sources. The interface should permit full inband camera control over the firewire interface. Where necessary external converters should be used to convert from say S-Video to the firewire input. It should be possible to use this source in place of the main camera source in the videophone 15 output to the conference. It should also be possible to specify normal or "CNN" mode i.e. clippable or not clippable on this video source. An XVGA video output should be provided to enable the videophone 15 to drive external projectors with an image that reflects that displayed on the main display 54.

[0219] An audio input shall be provided for PCAudio output. To ensure integration of the PC 68 audio and videophone 15 audio, only one set of speakers 64 will be deployed. The PC 68 sound will pass through the audio channel of the videophone 15. A jack or pair of jacks shall be provided to connect to a headset and attached boom microphone. Headset only operation, using the built in microphone array must also be possible. If the headset jack is relatively inaccessible, it should be possible to leave the headset plugged in, and select via a user control whether audio is on the headset or not. Connections are provided to external left and right hand speakers 64. It is possible to use one, two or three videophone 15 units as though they were a single functional unit, as illustrated in figure 7.

[0220] In configurations of more than one videophone 15, only one unit acts as the main control panel, the other unit (s) display video and those controls directly associated with the video being displayed. Only one set of speakers 64 will be needed for any of these configurations.

[0221] A number of options shall be provided as far as microphone inputs and audio streams are concerned, from using a single common microphone input, to transmitting the audio from each microphone array to the sources of the video on that videophone 15.

[0222] A number of options shall be provided for Video inputs. The default shall be to transmit the view of the 'control panel' videophone 15. If more bandwidth is available then each user can get the Video from the screen on which the user is displayed, yielding a more natural experience. All coordination of the multiple videophone 15 terminals can be achieved over the LAN connection, i.e. not need any special inter-unit cabling.

[0223] The videophone 15 videophone provides its user with a number of main functions:

- It is the office phone
- It is the users Phone
- It is a videophone
- It is a conference phone

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- It is a video conference phone

  - It provides easy access to and management of contact details

  - It provides access and management of voice/video mail

[0224] The units functionality falls into two categories, user functions and systems functions.

[0225] User functions are any functions to which the user will have access.

[0226] System 10 functions are those required by I.T. to set up monitor and maintain the videophone 15 terminal and which are invisible to the normal user. Indeed, an important objective of the overall design is to make sure the user is presented with a very simple interface where he can use videophone 15 with virtually no training.

[0227] The following defines the basic feature set that is the minimum set of features that must be available.

[0228] The videophone 15 videophone acts as a conventional telephone when no user is logged onto the terminal. Its functionality must not depend at all on there being an associated PC 68.

[0229] The following describes the functionality of videophone 15 as a conventional phone in an office.

[0230] The terminal is able to have a conventional extension number on the PABX serving the site.

[0231] The terminal is able to accept an incoming call from any phone, whether on the PABX, on the videophone 15 network 40 or any external phone without discrimination.

[0232] The videophone 15 is able to accept calls from other compatible SIP phones.

[0233] An incoming call will generate a ring tone as configured (see set up screen requirements below). Specifically, the ring tone for videophone 15 calls that include Video will have an option for a distinguishing ring from audio only calls, whether from videophone 15 terminals or not.

[0234] An incoming call will generate an incoming call indication in the status area on the display 54. This display 54 must give as much Caller ID information as provided by the incoming call, or indicate that none is available.

[0235] It is possible to accept the incoming call:

a) By pressing the call accept button on the incoming call status display 54.
b) By picking up the handset - which will always accept all the offered options I.e. video and audio.

[0236] It is possible for the user to switch between handset and hands free (speaker phone) operation easily within a call. Picking up the handset within a call should automatically switch to handset mode from speaker phone mode. Replacing the handset without reselecting speaker phone mode will disconnect the call.

[0237] An on screen indication should be given of the mode, i.e. handset or hands-free.

[0238] The call status bar can display the call duration.

[0239] It is possible to adjust the volume of the incoming call by readily available controls on the main display 54. Headset and speaker volumes should be independently adjustable.

[0240] When in speaker phone mode, it is possible to return the handset to the handset stand without disconnecting the call.

[0241] A call is terminated:

$ If the user presses the clear call button on the call status display 54.
$ If the user replaces the handset when in handset mode and hands free is not selected.
$ If the remote party hangs up the call provided it is reliably indicated to the videophone 15.

[0242] HOLD - It should be possible to place a call on Hold and to take the call off Hold again. Hold status should be displayed on the status display 54, with a button to allow that held call to be picked up.

[0243] CALL WAITING - Additional incoming calls must generate an incoming call indication in the status area of the display 54. It must not generate a call tone, unless enabled in the settings menu.

[0244] It is possible to accept a new incoming call in the current operating mode, i.e. handset or hands free, from the call accept button on the status display 54.

[0245] Accepting another incoming call will automatically place current calls on HOLD.

[0246] Pressing the "take off hold" button on any call must automatically transfer any other calls to Hold.

[0247] The number of simultaneous incoming calls that can be handled is set by the availability of status display 54 space. It must not be less than two calls.

[0248] When the number of current calls exceeds the number that can be handled, any other incoming calls:

a) Get a busy tone or
b) Are immediately forwarded to voice mail

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c) Are immediately forwarded to the configured forwarding number
d) Are sent a recorded message.

[0249] As determined by the users "call forward busy" settings.

[0250] If incoming calls that are within the acceptable limit are not answered within a (configurable) interval, the calls are:

a) forwarded to voice mail
b) forwarded to the pre-configured forwarding number
c) sent a recorded message.

[0251] As determined by the user's "call forward no answer" settings.

[0252] CALL TRANSFER - It is possible for the user to easily transfer any call to any other number. The transfer function will put the call on hold and allow a new number to be dialed. Once ringing tone is heard, the user will have the option of completing the transfer. Alternatively, the user will be able to talk to the new number and then either initiate the transfer or first join all (three) parties in a conference call. If the latter, a function will be provided for the user to exit that conference call. In the event that there is no reply or just voice mail from the called terminal, the user will have the option of returning to the original call.

[0253] CALL FORWARD - It must be possible to set the phone up to automatically forward incoming calls to a pre-configured number. Call forwarding can be:

a) unconditional
b) forward on busy
c) forward on No Answer

[0254] CONFERENCE CALLS - It is possible to conference calls into an audio only conference, irrespective of the origin of the voice call. It is possible to conference at least 3 calls, i.e. a four-way conversation. It is required only to support a single conference at any one time, but still be able to accept one other incoming call as described in call waiting above. It is acceptable that the prototype be only able to accept one incoming call to a particular conference, i.e. an external bridge will be needed for non-videophone calls.

[0255] Options associated with the incoming call status display 54 will allow the user to add or remove a call from a conference connection.

[0256] It is possible to add calls to a conference irrespective of whether they are incoming or outgoing calls.

[0257] If remote conference user hangs up, that call leg must be cleared automatically.

[0258] Calls can be made hands free or whilst using the handset. Picking up the handset should bring up the dial pad if not in a call and connect the audio to the handset. An on-screen tone dial pad (i.e. numbers 1 through 0 plus '*' and '#') is required. In addition, there should be a pause button to insert a pause into a dialed string (for getting through PABXs unless the gateway(s) 70 can be programmed to remove this requirement) Consideration should be given to adding a + key and arranging that the + sign is automatically translated into the international access string for that location.

[0259] A key to correct entry errors (eg [BACK] key and a clear key to clear the entry are also required. A short press of the [BACK] key should remove the last entered number, a longer press continue to remove numbers, a press over should clear the number register.

[0260] The number display 54 should be automatically formatted to the local number format. [This may require a user setting to select country of operation as each country has a different style or if an international code is entered that code should be used as the basis of formatting the remaining part of the number.]

[0261] When connected to services that make use of the tone number pad to select features, the correct tones must be generated in the direction of that service, when the on screen key pad or the handset key pad is used. The dial-pad must be able to provide this function irrespective of how the call is initiated.

[0262] REDIAL - It is possible to redial the last dialed number through a single touch on an appropriately identified function.

[0263] AUTO REDIAL - It is possible to trigger an auto-redial mechanism, for example by holding the [REDIAL] button. Auto redial will automatically repeat the call if the previous attempts return a busy signal a number of tries.

[0264] CAMP ON BUSY - When making a call to a device that permits its support, a "Camp on Busy" function is available. Camp on Busy calls the user back once the called party is available. A message shall be generated to say 'this service is not available' if the called number cannot support Camp on Busy.

[0265] There can be an appropriate log on screen displayed when no user is logged onto the videophone 15.

[0266] A log of incoming, outgoing frequent and missed calls should be displayed on an appropriate view of the integrated dial screens. One or two touch access to 'last number re-dial' facility should always be available on the dial screens. Further definitions of these logs are given below.

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[0267] To access the full set of features available on the videophone 15 terminal, a user must log into the terminal. A login screen is provided in which the user can enter his name and password. This can be the same as his normal network 40 access name and password The videophone 15 terminal will therefore make use of the sites user authentication services. Any screens needed to enable IT personnel to configure the videophone 15 to use these authentication services must be provided. Alternative methods of identifying the user are available, for example, the use of a smart card or ID fob. There is no requirement for the user to already be logged on to a PC 68 prior to logging in to a videophone 15 terminal.

[0268] Multiple users can be logged onto a single videophone 15 and distinct incoming ring tones for each user can be provided. The incoming call indication should also identify the called parties name and well as the calling parties name. If multiple users are logged onto a single videophone 15, all the call forwarding functions are specific to the user to whom the call is addressed.

[0269] If the user is already logged in at his PC 68, the action of logging onto the videophone 15 shall create an association between the PC 68 where the User was logged on and the videophone 15 terminal provided this is confirmed from the PC 68. It is possible for a user to be logged on to multiple videophone 15 terminals simultaneously. The active videophone 15 is the one on which any call for that user is answered first.

[0270] The home page screen contains a status area that is visible on all screens (except in full screen mode). Status includes the name of the logged on user - or "no user logged on". The User's "Presence" status, Icons for video and audio transmission, Voice mail "Message" indication and the date and time.

[0271] A "message" indication is lit and flashing if there is unheard voice mail on the user voicemail system 10. Pressing the indicator brings up the Voicemail handling screen.

[0272] Touching the Date time area gives access to the Calendar functions.

[0273] The home page has a control bar area that is visible across all screens (except in full screen mode).

[0274] The control bar gives direct access to the most frequently used call control features and access to all other functions. Icons should be used on the buttons, but text may also be used to emphasize functional purpose.

[0275] The control panel also has global controls for the microphone, Camera and Speakers 64. The controls should clearly indicate their operational state, e.g. ON or OFF and where possible Icons should be used.

[0276] A self-image is available that indicates both the picture being taken by camera and that portion that is visible to the remote end of the active call. It is possible to turn self-image on and off and to determine whether it is always on or only once an active call has been established.

[0277] It is possible to display the camera image in the main video area of the screen at any time, i.e. in a call, not in a call, etc. The image should be that for a single Video call and should overlay any other video present. It should be possible to request a full screen version of that video. This can be thought of as a digital mirror and allows the user to make sure he/she is happy with what the camera will/is show(ing).

[0278] It is desirable for diagnostic purposes that the user can also see the image after encoding and decoding, so that he is aware of the quality of the image that will be seen at the far end. If this mode is supported then both the camera direct and the encoded decoded image side by side. The user can capture his self image, for use as the image associated with his contact information.

[0279] The major part of the Home screen is allocated to an Integrated Dial functions. There are four main sub-functions, a speed dial display 54, a directories access display 54, a dial-pad and access to call logs. The dial-pad and access to call logs are to occupy the minimum screen area compatible with ease of use, maximizing the area available to the Speed Dial/Contacts pages. The speed dial area is detailed first, any common requirements across all the main sub-functions are only detailed under speed dial and are implied for the other three functions. The function of the Dial area is to select a user to whom a call is to be made.

[0280] The speed dial area is as large as possible, consistent with the other requirements for the dial screen. >20 speed dial locations is adequate. Each location should be large enough to make the identification of the persons detailed stored at that location very easily readable at the normal operational distance from the screen say 3 feet.

[0281] The user's information stored in a speed dial location includes the persons name, 'presence status' if known, the number that will be called if that speed dial is selected and an icon to indicate whether the user supports video calls. The detailed information also stores what kind of video, e.g. videophone 15, compatible MPEG2, H261 etc.

[0282] The area provides a clear area to be touched to initiate a call. A thumbnail view of the person is included if available. A method of handling long names (i.e. names that do not fit in the space allocated on the Speed Dial button) is provided.

[0283] Conventional telephone numbers in standard international format i.e. "+ country code area code number" are automatically translated to the external access plus the international access codes needed to make a call to this number.

[0284] The full contact details associated with a person on the Speed dial page is available. The contact details provide all the numbers at which the user can be reached and a means of selecting one of the numbers as the default number that is used on the Speed Dial page. It is possible to select and dial an alternative number for that user via this link to the contacts page.

[0285] The User information includes most recent call history for that person, for example the last 10 calls either

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incoming missed or outgoing. Just providing the 'last call' information would be an acceptable minimum functionality.

[0286] It is possible to edit the contact details associated with the Speed dial entry and or create a new contact entry for the Speed dial page. It is possible to copy an entry from the contacts, directories or call log screens onto the Speed Dial page. It is possible copy an entry from the Speed Dial page to the contacts or Directory screens. It is possible to delete a Speed dial entry, or to move that entry to another contacts page. (i.e. copy and then delete original).

[0287] It is possible to control the placing of users on the Speed Dial page. It should also be possible in some manner (color coding) to distinguish between different classes of Speed Dial users, i.e. business, family, colleagues, vendors, customers. The speed dial page may well contain names from multiple other categories in the contacts information. Some form of automatic organization is available, for example, last name first name company or by class followed by last name first name company etc.

[0288] It is possible to define a group of users as a single speed dial entry. It is acceptable if the group size is limited to the size of the maximum conference call. It is possible to select the Directories view from the Speed Dial page. The Directories view will occupy the same screen area as the Speed Dial page. It is possible select from the range of on-line directories to which videophone 15 has access. The default will be the Outlook and or Lotus Notes directory that contains the users main contact details. The name of the selected directory should be displayed.

[0289] The categories established by the user in his Outlook or Notes contacts list is available as selections. If the number of categories do not fit in the display 54 area, buttons are provided to scroll either up or down the list. The list should be organized alphabetically.

[0290] The Speed Dial category is the category used to populate the Speed Dial page. There is some indication on when the Speed dial page is full and it no longer possible to add further names to this contacts category, unless they replace an existing entry. The ability to order Speed dial entries in order of most recent call, i.e. the least used Speed Dial entry would be at the bottom. This would be used to see which entry was best candidate for deletion to allow a more used number to be entered.

[0291] It is possible to easily find and select an entry from the selected category, with the minimum of user input. The entry selection mechanisms must work for relatively short lists and for very long lists (10,000's of names). The mechanisms must include the ability to enter a text string on which to search. It is possible to select the sort order for the presented data, by last name, first name or organization. There is a method of correcting entry errors, and quickly re-starting the whole search.

[0292] It is desirable if each order of the search keys was significant and could be changed by the user. In other words for example pressing and holding the left most search key enables the user to select to search on Last Name, First Name or Company (or an extended list of attributes. This is useful for example for finding someone in a particular department, or at a particular location - "who is in Korea"). The second key then qualifies the first key search and so on. Thus, the keys are set Company, Last Name First Name; say Marconi, then do an alphabetic user search within last names at Marconi. Clearly when each sort category is selected there is some implied sub-ordering of entries with the same value in that category field. So for last name selected, the implied sub-order is first name then company, for company the implied sort order is last name first name, and for first name, say last name company.

[0293] The call log screen displays the most recent entries of three categories of calls, outgoing, incoming, and missed calls, with a clear indication of which category is selected. In addition there should be a "frequent" category, that lists numbers by the frequency of use, over the last (<200) calls of any type. There should be access to the Dial Pad from the call log screen. The analysis of the value of providing a far greater degree of handling call log data is deferred.

[0294] At minimum, when the "message" is touched a connection is made to the users voice mail system 10, the voice mail for this user is entered and the dial-pad is displayed to control the voice mail using the conventional phone key presses. The larger part of the "voice-mail" screen should bring up buttons to access each feature of the mail system 10, for example Next Message, Previous Message, Play Message, Forward Message, Reply to Message, call sender, etc. with all the equivalents of key presses within each function e.g. start recording stop recording review recording delete recording etc. All the functions need to be on buttons, converted to the respective DMF tones.

[0295] It is desirable that the "Forward to" number or any voice mail command that requires a list of users numbers to be entered can be selected from the Speed Dial or Directory views and that selection automatically inserts just the appropriate part of the users number. This could be particularly useful in forwarding a voice message to a group. It is possible for the user to set the time and date on the videophone 15. It is desirable that the time and date can be set automatically by appropriate network 40 services.

[0296] It is desirable that Calendar functionality is available that is integrated with the users Outlook/Palm/Notes Schedule/Calendar application. The minimum requirement would be simply to view the appointments at any date, by day, week or month (as per Outlook or Palm screens) with changes and new entries only possible via the Outlook or Palm database.

[0297] It is likely that quite a few of the users will not maintain their own calendars and indeed may NOT have PCs 68 on their desk, but do need to view the information. Touching the User Status area of the status part of the screen allows a user to set his status. The user will have a range of Status options to choose from, including:

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i) Available
ii) Busy - on a call where another call will not be accepted
iii) Do not disturb - not on a call but not interruptable
iv) Back in five minutes
v) Out of the office
vi) On Holiday

[0298] A single call instance on the videophone 15 terminal supports from one incoming stream to the maximum number of streams in a conference. For Video conferencing, the Terminal will support at least four connections to other parties as part of a single conference call. It is possible to accept at least two independent audio only calls, even when a maximum size video conference call is present, so that an audio call can be consultation hold transferred. The videophone 15 is able to support at least three simultaneous "call instances", i.e. up to three independent calls. Only one call can be active, i.e. the call controls can be applied only to one call at a time. More than one call can be accepted, i.e. users audio and video are being transmitted on each accepted call, whether active or not. Calls in progress may also be placed on HOLD, when the users audio and video is not transmitted to the user on HOLD and the audio and video from that user is also suppressed.

[0299] Incoming calls status is shown in Control display 54 area. Calls themselves and in-call controls are shown in the main section of the display 54.

[0300] Call states are:

i) Incoming call

ii) Accepted and active - the user's audio (and video if a video call) are, subject to the various mute controls, connected to this call. Call controls apply to this call.

iii) Accepted and not active - as above, but the call controls do not apply to this call.

iv) Accepted and on hold - users audio (and video if a video call) are not being transmitted to this call.

v) Accepted and being transferred

[0301] Call states are indicated on each call. Only one accepted call can be active. An accepted call is made active by touching in the call display 54 area associated with that call, or the call status in the control panel. Any previous active call is set not active. A second touch will turn off the active state. An incoming call indication indicates if the call is offering a video connection. No indication implies an audio only call. The incoming call indication will show the name(s) of the parties associated with that incoming call. This shows immediately if the user is being called one on one, or being invited to join a conference.

[0302] The user has the following options to handle an incoming call:

i) Accept the call as a voice only call
ii) Accept the call as a video call (voice is implied)
iii) Send to voice mail

[0303] A setting is available to set the videophone 15 terminal to auto-answers incoming calls, up to the maximum number of supported calls. Auto-answer creates an audio and video connection if one is offered. Once a call is in progress, the Users status should be automatically changed to "In a call". The Users status will revert back to its previous state (typically "Available") once no calls are active.

[0304] The user is able to configure if call user data is also distributed. If the user already has one or more calls accepted and if all calls are on HOLD or not active, this call will create a new call instance if accepted. All the accepted but not active calls will continue to see and hear the user as he deals with this new call. If one of the accepted calls is accepted and active, the new call will be joined to that call and all parties to the call will be conferenced to the new caller, if the call is accepted.

[0305] If the user does not pick up after (>10) seconds, the call will automatically be forwarded as determined by the "Forward on No Answer" settings. As above the forwarding is specific to the user to whom the call is addressed. If the users status is marked "Do not disturb" or "Busy" or the "Busy" state has been set by there being the maximum number of calls being handled, the call is forwarded "immediately" as determined by the "Forward on Busy" and "Forward on Do not disturb" settings, as modified by the "show forwarded calls" setting if implemented.

[0306] Depending on the "show forwarded calls" settings, the user can chose to see the incoming call indication for

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(>5 seconds) before it is forwarded. (This means the user needs to take no action unless he wishes to pick up the call, rather than the positive action required on a call above.) This does not function if the Busy state is due to the videophone 15 already handling the maximum number of calls.

[0307] The ability to generate a (very short) text message that is sent with the call is a useful way of conveying more information about the importance of the call and how long it will take. The requirements associated with generating and adding a message to an outgoing call are dealt with below. If present, the incoming call text message should be displayed associated with the incoming call. The display 54 copes with the display of text messages on multiple incoming calls simultaneously. The text message is also stored in the incoming or missed call log.

[0308] Call parameter negotiation is limited to that needed to establish the call within the network 40 policy parameters and the current network 40 usage. Settings are provided to allow the user to specify his preference for calls to other videophone 15 terminals, for example always offer Video, never offer video, ask each call if I want to offer video or not.

[0309] Camp on Available is supported for calls to other videophone 15 users. This will initiate a call to the user once his status changes to "available". If the user to be called is a group, the calls will only be initiated once all members of the group are 'Available'.

[0310] A conference call is when one location in the Speed Dial or Directories list represents a group of people, each of which are to be participants in a call. The suggested process of implementing this feature is to make each call in turn and once active request confirmation that the call should be added to the conference. This gives an escape route if the call goes through to voice mail. Once the actions on the first caller are completed, i.e. in the call or rejected the next number is processed.

[0311] It is possible to create an outgoing call that is half-duplex, in other words that requests audio and or video from the called party, but does not transmit either on this type of call. This is pull mode. Equally, it is possible to create a push mode, where the outgoing call does send audio and or video, but does not require any audio or video back. This mode may be used to selectively broadcast content to unattended terminals, or terminals with users playing only a passive role in the conference.

[0312] The overall volume of the speakers 64, the handset and the headset are independently adjusting. The speaker can be turned ON and OFF. Turning the speaker off will also turn off the microphone. Status indicators show the status of the Speaker and Microphone.

[0313] The microphone can be turned off and turned back on. Status indicators show the status of the microphone mute.

[0314] The camera can be turned off and turned back on. Status indicators show the status of the camera mute.

[0315] In call controls work only on the active call. An accepted call is made active if it is not active, either by touching the call in progress status indicator in the control panel, or anywhere in the call display 54 area except for the specific in-call control function areas. Any other currently active call is turned in-active. The active call can be turned in-active by a subsequent press in the same area. A control is provided that hangs up the active call. In a conference call it clears all elements of the call instance.

[0316] A call must be accepted and active for the Conference control to function. Touching the Conference control will join the currently active call instance to the next call made active. Conference control will indicate it is active either until it is pressed again, making it inactive, or another call instance is made active. After all the calls in the now active call are joined to the Conferenced call instance the call becomes a single conferenced call and the Conference control active indication goes out. Just to re-state, conference selects the call to which other calls will be joined and then selects the call to join to that call.

[0317] The method of terminating one party to a conference call is for that party to hang-up. For a variety of reasons, the user may wish to have independent control on each part of a call instance. This can be achieved by a de-conference capability. For example, by touching the call instance for longer than three seconds, a sub-menu appears that allows the individual members of the call instance be identified and selected for deconferencing. This call is then removed from the conference and established as a separate call instance, where all the normal controls apply, specifically it can be cleared.

[0318] The transfer function transfers the active call. When the transfer control is touched, the integrated dialing screen is displayed and the active call is placed on hold, but indicating that it is engaged in an in-call operation. The Transfer control indicates it is active, until it is pressed a second time, canceling the Transfer, or until the user selects and presses dial on the number to which he wishes the call to be transferred.

[0319] Once the outgoing call has been initiated, the Transfer control indicates a change of state, so that touching the control cause a 'blind' transfer and the call instance is removed from the screen. Alternatively, the user can wait until the called number answers, at which point a new call instance is created, allowing the user to talk to the called party, and the Transfer function changes state again, to indicate that pressing it again will complete the transfer and terminate both calls. Otherwise, the requirement is to go back to talking to the caller being transferred and re-start the transfer process or terminate the call. Transfer is the main mechanism whereby an 'admin' sets up a call and then transfer it to the 'boss'. In this case, it is essential that it is not possible for the admin to continue to 'listen into' the transferred call. This will be especially true in a secure environment.

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[0320] The active call can be placed on HOLD by touching the HOLD control. In HOLD, the outgoing video and audio streams are suspended and an indication given to the remote end it is on HOLD The incoming audio and video streams are no longer displayed. The HOLD state is indicated on the call status display 54 on the control bar. The Hold control indicates hold is active if any call is on hold. Pressing HOLD again when the active call is in HOLD removes the HOLD and returns the call to the displayed state.

[0321] There is a control on the main control panel that brings up the home screen and gives access to all the other non-call functions. There is an indication that Main has been selected. Pressing Main a second time re-establishes the current call displays and de-selects Main. Separate controls are provided for each accepted and displayed party within a call, and for each call displayed. Adjusting the volume of the audio from each particular user is required. It is possible to individually mute audio and or video of each user displayed on the screen. There is a status indicator to indicate if audio or video mute is ON.

[0322] If more than one call instance can be displayed at any one time, for example, a conference call with two others, plus a new call to one other user, then it is possible to mute audio and or video for a complete call instance, for example mute the two party conference for audio, whilst speaking to the second call.

[0323] Requesting video on an audio only connection that could support video is provided. Accepting or rejecting a video request is provided. A video connection is established if the connection is agreed. A settings page item enables the user to always accept or always reject video requests.

[0324] It is possible to display the bearer channel parameters for each connection, i.e. the incoming and outgoing encoding rates for video if present and audio. In a call, controls work only on the active call. An accepted call is made active if it is not active.

[0325] It is possible to enable a 'bearer channel quality monitor' for any user. This monitor, a bit like a signal strength meter on a mobile, would show, for example, 100% Green bar when there were no errors or lost packets on the audio and video channels, a yellow bar once loss rate or the latency exceeds a predetermined rate and a red bar once it exceeds a higher rate. The time integral should be short, say 50 milliseconds as errors in this timeframe will affect the users video. So, for example, if the receiver sees video artifacts, but at the same time sees the monitor bar move yellow or red, he knows it is network 40 congestion induced.

[0326] Requesting a change in video encoding parameters, i.e. increase or decrease encoding rate, within the call is provided. Accepting or rejecting this request and a method of changing the outgoing video rate is provided. The videophone 15 generates a single outgoing encoding rate to all participants. It is possible for it to accept different incoming rates on all of the incoming streams.

[0327] A request for a side-bar with the ability to accept or reject the request is provided. If accepted, sidebar turns off the audio stream from both participants to everyone else, so they can have a private conversation, whilst continuing to hear all the discussion and continue to see and be seen by all the participants. The ability to send short messages both ways with the video and sidebar requests is provided.

[0328] Irrespective of whether the call is an incoming or outgoing call, the screen transition to the video view should be smooth. The audio may anticipate the video. The video should not be displayed until this transition can be made. (i.e. there should be no jumpy pictures, half formed frames etc in the transition to the video.) The transition to the user display 54 video screen should only start after the call is "In progress" and not at the time of initiating the call. The display of the video from the user should make maximum use of the area of the display 54 allocated to user display 54. An in display 54 control is able to convert this single call instance single user display 54 to a full screen display 54. Touching anywhere inside the "full screen" display 54 will revert to the standard display 54. In addition to the in call controls already mentioned, the users name should be displayed. The display 54 and the call instance on the control panel must indicate if the call is active or not, i.e. if the in call general controls will operate or not. With one call instance up, active inactive is by pressing on the call instance or anywhere on the main display 54 apart from the in call specific control areas.

[0329] The transition from a one call instance two party call should be smooth and should be initiated once the second call is "in progress". The display 54 should make maximum use of the display 54 area allocated to user display 54. If necessary, the videos can be clipped at each edge, rather than scaled, to fit the available area. There is no requirement for a full screen display 54 for two or more up. In addition to the in call controls already mentioned, the user name should be displayed for each party. There must be an indication that both parties are part of a single call instance. The display 54 and the call instance on the control panel must indicate if the call is active or not. The incoming video can be progressively clipped to fit the available display 54 area as more parties are added to the video call.

[0330] In two call instances both single party calls, there are two separate calls to single users, both of which are displayed. The on-screen display 54 and the call control indication clearly indicate these are two separate and independent calls and also indicate which if any is active. If either call is placed on HOLD, that call is no longer displayed and the display 54 reverts to a single call instance single call display 54.

[0331] The user area should be capable of displaying any of the following combinations in addition to those described above.

[0332] Four call instances each single party calls;

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[0333] Three call instances where one call can be two party and the others are single party calls;

[0334] Two call instances where one can be up to three party or two can be two party call.

[0335] The requirements of a "CNN" style display 54 are those of the single call instance single call above, including the ability to have a full screen display 54. It is also possible to display "CNN" style call in half the screen and use the other half for one or two user display areas, the latter as two independent call instances or a single two party call instance.

[0336] The ability to provide various levels of encryption for the voice and data streams is provided. Access to diagnostic, test, measurement and management facilities shall make use of SMF (simple management framework), in other words access will be possible to all facilities in three ways, via SNMP, via the web and via a craft interface. The videophone 15 terminal must be remotely manageable, requiring no on site IT expertise for every day operation, or for software upgrades that do bug fixes. Fault diagnosis is also possible remotely and be able to determine if the problem is with the unit hardware, the units configuration, the units software, the network 40 or the network 40 services. Management can assume IP connectivity, but must assume a relatively low bandwidth connection to the videophone 15.

[0337] Under normal operation, the videophone 15 should perform a shortened version of hardware system 10 test as it powers up. If this fails, the videophone 15 should display a boot failure message on the main screen. The terminal can be forced into an extended hardware diagnostic mode. This could be by attaching a keyboard to a USP port, or by pressing in the top right hand corner of the touch screen 74 as the unit powers up. This mode would give access to the underlying operating system 10 and more powerful diagnostics, to determine if the there is a hardware failure or not.

[0338] A series of simple tests can be included that the user can run in the event that the videophone 15 passes the boot-up test but is not providing the correct functionality for the user. The terminal provides a technical interface, in association with a local keyboard (and mouse) to assist in diagnosing unit or system 10 problems. This would give access to the various diagnostics for audio and video, etc.

[0339] It is possible to download safely new versions of the videophone 15 terminal software under remote control. By safely, it means being able to revert to the previous version if faults occur in the downloaded version, without local intervention (i.e. someone having to install a CD). It is possible to read the software version number of the software on a particular videophone 15 terminal, and the units hardware serial number, assembly revision number and the serial number and assembly revision number of key sub-assemblies via the management interfaces. In the event of a system 10 crash, the videophone 15 should store or have stored information to assist in the diagnosis of the cause of that crash. This information must be retrievable on line from a remote site for analysis once the videophone 15 has re-booted.

[0340] The videophone 15 keeps a running log of all actions, events and status changes since power up, within the limits of the storage that can be allocated to this feature. It should enable at least one month's worth of activity to be stored. This data may need to be in a number of categories, for example a secure category that contains the users data, such as the numbers he called would only be releasable by the user. Generic data, such as number of calls, call state (i.e. number of call instances and endpoints per instance, encoder 36 and decoder 34 characteristics, bearer channel error reports and so on are not so sensitive information. It may be useful to be able to record every key press as a way of helping diagnose a system 10 level issue and re-create the chain of events.

[0341] It is possible for the videophone 15 to copy the exchanges at the control plane level at both the IP level and the SIP level, to a remote diagnostic terminal (the equivalent of having a line monitor remotely connected to the videophone 15 terminal). Terminal management will monitor a number of parameters, for example, network 40 quality. It must be possible to set thresholds and generate alarms when those thresholds are exceeded. Both the ATM interface and the Ethernet interface have standard measurements (rmon like, for example) that should be available for the videophone 15. The videophone 15 should be able to send those alarms to one or more Network Management Systems.

Audio Mixer

[0342] In regard to the audio mixer, a first node 80 which can produce an audio stream and a video stream, and which is part of an ATM network having quality of service capability, wishes to form a point to point call with a second node 82. The second node 82 only has audio capability and is, for instance, a PSTN phone. The second node 82 is not a part of the ATM network.

[0343] The first node 80 begins the formation of the call to the second node 82 by sending signaling information to an SIP server, also part of the ATM network, which identifies to the server that the second node 82 is the destination of the call that the first node 80 is initiating. The server, which already has address information concerning the second node 82, adds the address information to the signaling information received from the first node 80, and transmits the signaling information with the address information of the second node 82 to an audio mixer 20 that is also part of the ATM network.

[0344] When the mixer 20 receives the signaling information that has originated from the first node 80, it determines from this information that it is the second node 82 with which the first node 80 wishes to form a connection. The mixer 20 then sends an invitation to the second node 82 through which it is somehow in communication, such as by a T1 line or ethernet but not by way of the ATM network, to identify itself in regard to its features and the form that the data needs to be provided to it so it can understand the data. In response, the second node 82 identifies to the mixer 20 the specific

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form the data needs to be in so that the second node 82 can understand the data, and also indicates to the mixer 20 it is OK to send data to it so the connection can be formed.

[0345] The mixer 20 then sends a signal to the first node 80 that it is ready to form the connection. To the first node 80, the mixer 20, which is part of the ATM network, represents the second node 82 and gives the impression to the first node 80 that the second node 82 is part of the ATM network and is similar to the first node 80. To the second node 82, the mixer 20, which is also part of the network or connectivity that the second node 82 belongs, represents the first node 80 and gives the impression to the second node 82 that the first node 80 is part of the same network or connectivity to which the second node 82 belongs and is similar to the second node 82.

[0346] The first node 80 then initiates streaming of the data, which includes audio data, and unicast packets of the data to the mixer 20, as is well known in the art. When the mixer 20 receives the packets, it buffers the data in the packets, as is well known in the art, effectively terminating the connection in regard to the packets from the first node 80 that are destined for the second node 82. The mixer 20, having been informed earlier through the invitation that was sent to the second node 82, of the form the data needs to be in so that the second node 82 can understand it, places the buffered data into the necessary format, and then subject to proper time constraints, sends the properly reformatted data effectively in a new and separate connection from the mixer 20 to the first node 80. In this way, a point to point call is formed, although it really comprises two distinct connections, and neither the first node 80 nor the second node 82 realize that two connections are utilized to create the desired point to point call between the first node 80 in the second node 82. Similarly, when data is sent from the second node 82 back to the first node 80, the process is repeated, although in reverse so that after the data from the second node 82 is received by the mixer 20, the mixer 20 reformats the data into a form that the first node 80 can understand and unicasts the data from the second node 82, that has been buffered in the mixer 20, to the first node 80. If IP instead of ATM is used, then the mixer 20 sends unicast IP packets to the first node 80, as is well known in the art.

[0347] A scenario involving conferencing, otherwise known as a point to multi point connection, will now be described using the present invention. Continuing the discussion involving a point to point connection from above, the first node 80 desires to join in the connection to form a conference, a third node 84 that is part of the ATM network and has essentially the same characteristics as the first node 80. The first node 80 sends a signaling invitation to a host node 22 that will host the conference. The host node 22 can be the first node 80 or it can be a distinct node. The first node 80 communicates with the host node 22 through the server to form a conference and join the third node 84 into the conference. The host node 22 invites and then forms a connection for signaling purposes with the mixer 20 and causes the original signaling connection between the first node 80 and the mixer 20 to be terminated. The host node 22 also invites and forms a connection with the third node 84 in response to the request from the first node 80 for the third node 84 to be joined into the connection. In each case that a node which is part of the ATM network is to be joined into the connection, signaling goes through the server and is properly routed, as is well known in the art. The host node 22 acts as a typical host node for a conferencing connection in the ATM network. The mixer 20 represents any nodes that are not part of the ATM network, but that are to be part of the overall conferencing connection.

[0348] In regard to any of the nodes on the ATM network, the mixer 20 makes any nodes that are part of the connection but not part of the ATM network appear as though they are just like the other nodes on the ATM network. Through the signaling connections, that are formed between the host and the mixer 20, and the mixer 20 and the second node 82 (as represented by the mixer 20), the required information from all the nodes of the connection is provided to each of the nodes so that they can understand and communicate with all the other nodes of the connection. In fact, the host node 22 informs all the other nodes, not only the information of the characteristics of the other nodes, but also returns the information to the nodes that they had originally provided to the host node 22 so that essentially each node gets its own information back. Once this information is distributed, the streaming information is carried out as would normally be the case in any typical conferencing situation. In an ATM network scenario, the first node 80 and the third node 84 would ATM multicast using PMP tree the information in packets to each other and to the mixer 20. In an IP environment, the first node 80 and the third node 84 would IP multicast packets to all nodes (the mixer 20 being a node for this purpose) in the network, and only those nodes which are part of the connection would understand and utilize the specific packet information that was part of the connection.

[0349] The mixer 20 receives the packets from the first node 80 and the third node 84 and buffers them, as described above. The packets from the different nodes that are received by the mixer 20 are reformatted as they are received and mixed or added together according to standard algorithms well known to one skilled in the art. At a predetermined time, as is well known in the art, the reformatted data by the mixer 20 is then transmitted to the second node 82. In the same way, but only in reverse, the data from the second node 82 is received by the mixer 20 and buffered. It is then multicast out in a reformatted form to the first node 80 and the third node 84.

[0350] When a fourth node, that only has audio capability, like the second node 82, and which is not part of the ATM network, is joined into the conference, the host node 22 forms a second signaling connection with the mixer 20. The mixer 20 in turn forms a distinct connection with the fourth node separate from the connection the mixer 20 has formed with the second node 82. The mixer 20 maintains a list of sessions that it is supporting. In the session involving the

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subject conference, it identifies two cross connects through the mixer 20. The first cross connect is through the signaling connection from the host node 22 to the second node 82, and the second cross connect is from the host node 22 to the fourth node. In this way, the first and third nodes 80, 84, as well as the host node 22, believes that there are two separate nodes, representing the second node 82 and the fourth node, to which they are communicating. In fact, the mixer 20 represents both the second node 82 and the fourth node and separately multicasts data from each of them to maintain this illusion, as well as the illusion the second node 82 and the fourth node are like the first node 80 and the third node 84, to the first node 80 and the third node 84.

[0351] The ViPr system is a highly advanced videoconferencing system providing 'Virtual Presence' conferencing quality that far exceeds the capabilities of any legacy videoconferencing systems on the market today. The ViPr system relies on point-to-multipoint SVCs (PMP-SVC) and IP multicast to establish point-to-multipoint audio/video media streams among conference participants. While users participating in a ViPr conference enjoy an unprecedented audio and video quality conference, there is a need to enable other non-ViPr users to join a ViPr conference. The system 10 enables a unicast voice-only telephone call (i.e. PSTN, Mobile phones and SIP phones) to be added to a multi-party ViPr conference.

[0352] The current ViPr system provides support for telephony systems through SIP-based analog and digital telephony gateways. This functionality enables ViPr users to make/receive point-to-point calls to/from telephone users. However, they do not allow a ViPr user to add a telephone call to a ViPr conference. This is due to the unicast nature of telephone calls and the inability of the telephony gateways to convert them to PMP/multicast streams. The ViPr UAM will enhance the ViPr system's support for telephony by enabling ViPr users to add unicast telephone calls to ViPr conferences.

[0353] In order to support this functionality, the ViPr UAM adds seamless conferencing functionality between the ViPr terminals and telephone users (i.e. PSTN, Mobile phones and SIP phones) by converting an upstream unicast telephone audio stream to point-to-multipoint audio streams (i.e. PMP-SVC or IP Multicast) and mixing/converting downstream PMP/multicast ViPr audio streams to unicast telephone audio streams as well as performing downstream audio transcoding of ViPr audio from the wideband 16bit/16KHz PCM encoding to G.711 or G.722.

[0354] An additional functionality provided by the UAM is that of an Intermedia gateway that converts IP/UDP audio streams to ATM SVC audio streams and vice-versa. This functionality enables the interoperability between ViPr systems deployed in ATM environments and SIP-based Voice-over-IP (VoIP) telephony gateways on Ethernet networks.

[0355] The UAM allows one or more ViPr phones to work with one or more phone gateways.

[0356] The UAM will support ViPr Conference calls with unicast audio devices present in following configurations:

- Type 1: Support one conference call with only one audio unicast device present as a participant.
- Type 2: Support multiple conference calls. Each conference call could potentially have multiple audio Unicast devices present as a participant.
- Type 3: Support multiple conference calls with each conference call having exactly one audio unicast device present as a participant.

[0357] Preferably, 20 participants (unicast devices plus ViPr phones) can be serviced by a single Unicast Manager application.

[0358] The unicast device will be used in the configuration shown in figure 1.

[0359] As shown in figure 1, all calls to and from a unicast device to a ViPr are always sent to the UAM. The UAM implements a B2B SIP UA to connect the unicast device to a ViPr.

Example: User A at POTS1 calls user B at VIPr V1. The following sequence of events takes place:

1. UD1 (Mediatrics or whatever unicast device) receives the request from **User A** to connect to **User_B.**
2. UD1 sends an INVITE to UAM. The To field or the Display Name in the INVITE identifies the call is for **User B.**
3. UAM receives INVITE as incoming call C1.
4. UAM extracts the sip address of User_B from the INVITE on C1 and initiates a call C2 to this user by sending out an INVITE to V1.
5. UAM also cross connects C1 to C2.
6. V1 sees an incoming INVITE from UAM, which is identified by the SDP as a ViPr class device. Thus software on V1 knows that the peer software is capable of supporting all the functionality expected of a ViPr device including Replaces/Refers etc.
7. Say **User_B** at V1 replies back to INVITE with OK.
8. The UAM will mark the connection C2 as up. It then sends OK on C1.

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Media Streams in this example

[0360] The media streams between V1 and UD1 are sent in either of following ways:

1. The media is sent directly from V1 to UD1. This can be done by UAM writing the right SDP. Thus while sending INVITE to V1 it puts the IP address, port of UD1 for receive. And while sending OK to UD1 it puts the IP address, port of V1 as receive address.
2. The media is relayed by UAM. In this case, UAM relays data from V1 to UD1 and vice-a-versa. It is easy to see that if UAM and ViPr communicate are connected via an ATM cloud, then an SVC between V1 and UAM could be set up. Thus, the UAM acts as an ATM to Ethernet gateway for media traffic.

[0361] Extending the example 1 further, User_A decides to join User_B at V2 into the conference. The following events happen:

1. The Sip connection between UAM and V1 is replaced by A conference call C3 with V1, V2 and UAM as participants. Thus, the B2B UA is now cross connecting a conference call (C3) with a unicast call (C1).
2. UAM always relays traffic between C3 and C4. Option 11 above. It mixes the traffic from V1 and V2 and relays it to UD1. It also multicasts traffic from UD1 to V1 and V2.

The functionality performed by the UAM can be broken into following components:

- SIP B2B UA Unit [SBU]. This unit performs the sip signaling required to implement the B2B SIP UA.
- Media Cross Connect and Mixer [MCMU].

[0362] The UAM functionality will be decided across three processes: SBU, Unicast Mixer Manager and Sip stack, as shown in figure 2.

[0363] The SipServer process will implement the SIP functionality and would provide the SBU with an abstracted signaling API (Interface Ia). Interface Ia also stays unchanged.

[0364] The SBU implements the call control and glue logic for implementing the B2B UA. This unit derives from Callmanager/Vupper code base. The SBU is responsible for setting up the right mixer streams too. For this purpose, SBU interfaces with the UMM process through RPC.

[0365] UMM implements the functionality for cross-connecting media streams as well as implementing the audio mixing functionality.

[0366] The SBU implements the call control and glue logic for implementing the B2B UA. The SBU is responsible for setting up the right mixer streams too. For this purpose, SBU interfaces with the UMM process through RPC.

```
Session
Class MediaSession
{
  int SelfID // Self ID
  CVString GUID // Conference Call ID
  CVList XIDList; // List of cross connects
  GUID
}

SIPB2BCrossConnect
Class SIPB2BCrossConnect
{
 int SelfID // Self ID
 int SessionID // Of session of which it is a
member
 Int ViPrLegID // SiPCallLeg connected to ViPr
 Int UDLegID // Leg connected to unicast device.
}

SIPB2BCallLeg
Class SIPB2BCrossConnect
{
 int SelfID // Self ID - returned by
```


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```
callmanager
 int XID // ID of Cross Connect who owns
this leg
 SipCallLeg ViPrLeg // Leg connected to ViPr
 SipCallLeg UDLeg // Leg connected to unicast device.
}
```

[0367] The SBU unit is internally structured as follows:

[0368] As can be seen from figure 3, the design for SBU reuses and extend the SIP/Media Stream interface offered by the CallManager to implement the signaling call control logic for UAM.

[0369] The following text presents the flow of control when the user A initiates a call to User_B.

[0370] In the following SipServer refers to SipServer at UAM, SBU refers to SBU at UAM and UMM refers to UMM at UAM.

[0371] To clarify the example further, assume the following:

- The entire network is Ethernet network
- IP address of V1 is 172.19.64.101
- IP address of V2 I 172.19.64.101
- IP address of interface of UAM which is connected to V1/V2 cloud is 172.19.64.51, IP interface of UAM connected to UD1 cloud is 169.144.50.100
- IP address of UD1 is 169.144.50.48
- Address is represented as <IpAddress, port> tuple
- All the addresses and ports in the example are illustrative, they are not required to be fixed but are rather allocated by OS.
- In the following example, all the SIP events received by SBU (at UAM) are actually received by SipServer and than passed to SBU. However, the Sipserver receiving the event and passing it to SBU is not shown for brevity.

Flow of control for a P2P call between UD1 and V1

#	Loc	Action
1	UD1	INVITE sent from UD1 to SD1. This invite contains the Address < 169.144.50.48, 50000 > for receiving stream from UD1 for this call.
2	SBU	SBU gets an incoming call C1. SBU examines the call and sees it is from a Unicast device. It then performs the following actions. -Extracts the address (User_B) of final destination UD1 is trying to reach. -It allocates address <172.19.64.51, 40002> for receiving media stream from V1. -It initiates an outgoing call (C2) to User_B by asking sipserver to send an INVITE to User_B. This invite contains the address <172.19.64.51, 40002>. -It also allocates a sip cross connect (XID=1) and binds C1 and C2 to XID=1. At this point sip cross connect XID=1 C1 and C2 as a back-to-back calls. It also stores XID=1 in the calls C1 and C2. This is to enable retrieving XID from Call ID.
3	V1	V1 receives an incoming INVITE and accepts the call by sending an OK to UAM. The OK contains address <172.19.64.101, 10002> for receiving traffic from UAM.

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#	Loc	Action
4	SBU	SBU Gets OK (call accept event) on C2. It the performs following steps: -Receives the cross connect (XID=1) of which C2 is a member. -Allocates an address for use of C2. <169.144.50.100, 40001> -Instructs SipServer to send OK On call C2. This OK contains address <1169.144.50.100, 40001> for receiving media from UD1. -Allocates a Session with ID (say, SID=100). This session ID is stored in Sip Cross connect XID=1. The SipCross connect with XID=1 is also added to the list of Cross-connects part of this session. At this time, there is just one SIP cross connect in the list. -SBU then allocates a media channel to be used for receiving and sending data from UD1, say with CHID=0. -SBU allocates a media channel to be used for sending and receiving data from V1, say CHID-1. -SBU then informs UMM to setup channels for sending and receiving data from V1 and UD1 as follows: ≅ SBU informs UMM that channel = 0 should be used to send/receive data to/from UD1. This is done by asking UMM to associate channel=0 with send address <169.144.50.48, 50000> and Receive address <169.144.50.100,40001>. ≅ SBU informs UMM that channel = 1 should be used to send/receive data to/from V1. This is done by asking UMM to associate channel=0 with send address <172.19.64.101, 10001> and Receive address <172.19.64.51, 40002>. -SBU then instructs the UMM to construct a media cross connect by informing UMM that Channels CID=0 and CID=1 are part of same session SID=100. It should be noted that UMM is not informed (nor does it care) about the SIP calls C1 and C2.
5	UD1	Receives an OK from UAM. It knows from OK that for sending audio media to UAM it must use the address <169.144.50.100, 40001>.

[0372] The above table explains what happens for a pass through call. The following is the control flow when this call is converted into a conference call. In this case, say User_B conferences User_C at V2 into the call.

[0373] Further assume the following:

- IP address of V2 is 171.19.64.102

Initiating a conference with a user on unicast device.

#	Loc	Action
6	V1	V1 # Sends an INVITE to Conference Host H (at V1) to initiate conference. The INVITE contains the multicast IP address <239.192.64.101, 10002> on which V1 would multicast its audio stream.
7	H	Host Gets an INVITE to start a conference call. It sends an OK back to V1. H also constructs a globally unique ID for this conference call. (say, GUID=900).
8	V1	Refers UAM into the conference (with Replaces=C2).
9	H	Sends an INVITE to UAM with following information: - GUID=900 Replaces=C1 - Stream information for V1(User_B) <239.192.64.101, 10002>

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#	Loc	Action
10	SBU	On getting Invite for a conference call (C3) SBU performs following: -Sees that Replace ID = C2. It thus knows that V1 wants to bring POTS1(UD1) into Conference GUID=100. -It Retrieves the SIP Cross-connect XID=1 from C2. -It retrieves the Session ID from the SipCross Connect, SID=100. And sets the GUID member of the Session to GUID=900. -It Sets the GUID in Sip Cross-connect XID=1 to GUID=100. -It releases the sip connection C2 by informing SipServer to send a Bye on C2. -Removes C2 from SIP Cross-connect XID=1 and replaces it with C3. It also sets the SIP cross connect ID in C3 to XID=1. It also sets the XID member within C3 to point to XID=1. -It allocates address <239.192.64.51, 40003> for transmitting data on behalf of UD1. -It informs UMM to delete channel CID=1. Thus UMM will now stop transmitting media to address <172.19.64.101, 10001> and stop receiving media at address <172.19.64.51, 40002>. -It sends an OK back to the Host. The OK contains information that everyone on the conference should send receive media streams from POTS1(UD1) on address <239.192.64.51, 40003>. -SBU then instructs UMM to set up the right audio streams for conference (GUID=900) with V1 and UD1 present as participants as follows: ≅ SBU informs that channel = 2 should be used to send/receive data to/from V1. Thus channel = 2 is associated with send address <239.192.64.51, 40003> and Receive address <239.192.64.101, 10002>. ≅ SBU informs UMM to associate channel = 2 with Session SID=100. ≅ SBU informs the UMM to set the retransmit address field for channel = 0 <239.192.64.51, 40003>. It should again be noted that UMM is not aware of either the presence of SIP calls C1 and C3, nor does not it know that there is a conference call with GUID=900. Internally, UMM does not really look at the send address in channel = 2 to relay data from UD1 to conference. Rather, it looks at the retransmit address in the Channel ID = 2.
11	Host	Gets OK from UAMD. It sends a RE_INVITE to V1 indicating the presence of stream from User_A at <239.192.64.51, 40003>.
12	V1	Refers User_C at V2 into the conference.
13	H	Sends an INVITE to V2 indicating presence of streams from User_A at and User_B.
14	V2	V2 sends an OK. The OK contains the multicast IP address <239.192.64.102, 20001> on which V1 would multicast its audio stream. At this point, User_C can start listening to audio from User_A and User_B by registering to appropriate multicast addresses.
15	H	Sends a RE_INVITE to V1 and UAMD indicating presence of a new participant User_C sending audio at <239.192.64.102, 20001>.
16	V1	Gets a RE_INVITE and sees that party User_C is now on the call. It sends an OK back to H.

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(continued)

#	Loc	Action
17	SBU	Gets a RE_INVITE and sees that a new party User_C is also on conference call with GUID=900. It then performs following steps: -Sends an OK back to the Host through sip server. -Allocates a media channel CID = 3 for receiving traffic from User_C. -Informs UMM to join media from User_C into the conference call identified by GUID=900 as follows: ≅ SBU informs UMM that channel = 3 should be used to send/receive data to/from (User_C) at V2. Thus, channel = 3 is associated with send address <239.192.64.51, 40003> and Receive address <239.192.64.102, 20001>. ≅ SBU informs UMM to associate channel = 2 with Session SID=100. It should be noted again that all UMM knows is that there are three channels (CID=0,2 and 3) which all belong to the same session. UMM knows that CID=2 and 3 are streams from ViPr phone and CID=0 are from a unicast device. Thus, UMM reads multicast data from channels CID=2 (<239.192.64.102, 20001> and CID=3 (<239.192.64.101, 10002>) mixes them and sends it on channel = 0<169.144.50.48, 50000>. Also the data read from channel CID = 0, is retransmitted on retransmit address associated with CID=0 <239.192.64.51, 40003>. The details of how UMM performs this appropriate mixing are in a different section.
18	H	Gets the OK for re-invites sent in step 16. The conference call is now up.

[0374] To add another ViPr user to the conference, steps 12 through 18 are repeated. Consider the steps that are required to another Unicast Device user say User_D on POTS2.

[0375] Assume the following:

- User_C on ViPr V2 decides to conference in User_D on POTS2 into the conference.

Flow of control for adding second unicast user to a conference.

#	Loc	Action
19	V2	Refers User_D at POTS2 into the conference.
20	H	Sends an INVITE to UAM with following information: -User_A, User_B and User_C call along with the addresses on which they are generating media streams. -GUID = 900

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(continued)

#	Loc	Action
21	SBU	Gets Request for an incoming conference call (C4) with -GUID = 900 -To address = Address of User_D It then performs following tasks: It allocates a SIP Cross-connect with ID, XID=2. -It adds C4 to the sip cross connect XID=2. It also sets the XID member within C4 to XID=2. -It searches all the Session structures to see if there is a session with GUID = 900. It finds that a session with ID=100 is associated with this conference call. -It then adds SIP cross connect with XID=2, to the list of cross connects attached to Session SID = 100. At this point there are two SIP cross connects (XID =1,and XID =2) which are part of the SIP session SID=100. -It also stores information within sip cross connect XID=2, to indicate it is associated with Session = 100. -It allocates an address <169.144.50.51, 40011> for receiving traffic from User_D. -It allocates a media channel CHID=4 for receiving traffic from User_D <239.192.64.51, 40012>. -It initiates a connection C5 by sending an INVITE to UD1 for User_D. The INVITE contains the information that UD1 should send audio media streams for this call at <169.144.50.51, 40004>. -It adds C5 to the sip cross connect of XID=2. Thus XID=2 is now connecting CID=4 and CID=5 as back to back SIP calls. -It also sets XID member of C5 to XID=2.
22	UD1	Receives INVITE from UAM and sends back an OK to UAM. It indicates in the OK that the address on which it should be sent data for call C5 is <169.144.50.48, 50002>.

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(continued)

#	Loc	Action
23	SBU	Receives OK from UAM for C5. It then performs following steps: -It retrieves the sip cross connect of which C5 is a member, XID=2. -It retrieves the session from sip cross connect, SID=100. -It then allocates an address <239.192.64.51, 40012> to relay data received on User_D into the conference, GUID=900. -It then sends an OK to Host indicating that User_D would be generating traffic on <239.192.64.51, 40012>. -It then allocates channels for receiving traffic User_A (CHID=5), User_B (CHID=6) and (CHID=7). -It then asks UMM to add User_D into the conference as follows: ≅ SBU informs UMM that channel = 4 should be used to send/receive data to/from User_D. Thus channel=3 is associated with send address <169.144.50.51, 40011> and Receive address <169.144.50.48, 50002>. -SBU also informs UMM to set the retransmit address of CHID=4 to <239.192.64.51, 40012>. ≅ SBU informs UMM that Channel =5, 6 and 7 should be used to exchange traffic with User_A, User_B and User_C. The following information is provided for these channels. -CHID=5 [Rx = <239.192.64.102, 20001>, Tx = <239.192.64.51, 40012> -CHID=6 [Rx = <239.192.64.101, 10001>, Tx = <239.192.64.51, 40012> -CHID=7 [Rx = <<239.192.64.51, 40012>, Tx = <239.192.64.51, 40012> ≅ SBU informs UMM to associate channel =4, 5, 6, 7 with Session SID=100 (Please note that CHID=5 the information for receiving packets from User_A is same as one present in CHID=2 and would seem like a waste and troublesome but this has in fact has a desirable effect of not requiring any change in call manager and also eliminates needs for book keeping in SBU. Same holds for CHID=3 and CHID=6. The UMM would never receive anything on CHID=7 because multicasts are not received by the host which transmitted them.} In the UMM there are two channels CHID=2 and 5 which are referring to the same receive multicast address, now since both the channels belong to the same session = 100, it is not a problem. Since the UMM will not read packets from duplicate channels. However, If Channel=2 is deleted then UMM will go and read packets from CHID=5.
24	H	Host receives the OK on C5 (from UAM) with information added to receive audio streams from User_D. It Sends a Re-Invite to User_A, User_B and User_C indicating presence of a new stream from User_D.

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(continued)

#	Loc	Action
25	SBU	Gets a REINVITE on C3 indicating presence of another user User_D transmitting on multicast address - <239.192.64.51, 40012> It then performs following tasks: -Sends an OK back to host on C3 through sip server. -It retrieves the sip cross connect of which C3 is a member, XID=1. -It retrieves the session SID=100 from sip cross connect XID=1 -It allocates channel CHID = 8 to receive audio from the User_D. -It then instructs UMM to receive and mix traffic from User_D into the Session SID=100. as follows: -SBU informs UMM that channel = 8 should be used to send/receive data to/from User_D. Thus channel=8 is associated with send address and Receive address <239.192.64.51, 40012>. -SBU also sets the session ID for channel CHID=8 to SID=100. [NOTE: Since UAMD programs the IP sockets to never receive packets it has transmitted on a multicast address, no traffic would be received on CHID=8. Which is exactly what is desired.].
26	V1 and V2	Sends an OK to re-invite sent by Host
27	H	Receives OK from all the participants, the conference call now has 4 parties on call. Two of which are unicast devices.

[0376] UMM implements the functionality for cross-connecting media streams as well as implementing the audio mixing functionality.

Deployment Scenario 1:

[0377] Referring to figure 4, this scenario covers two cases:

[0378] A ViPr user in a multi-party ViPr audio/video conference adding a unicast audio-only telephone user to the conference:

[0379] In this case, ViPr users in multi-party ViPr conference decide to add a unicast telephone user to the conference. As a result, one of the participants initiates a call to the destination telephone number. The ViPr SIP server redirects the call to the ViPr UAM. The ViPr UAM terminates the ViPr audio-only call and establishes a back-to-back call to the destination telephone via the telephony gateway.

[0380] Once the call is established, the ViPr UAM converts the unicast G.711/G.722 audio stream received from the telephone into a PMP/multicast stream and forwards it to the ViPr terminals without any transcoding. On the other hand, the ViPr UAM performs transcoding and mixing of the wideband 16bit/16KHz PCM ViPr audio streams received from the various ViPr terminals into one G.711 or G.722 unicast audio stream and forwards it to the telephone destination.

[0381] A ViPr user in point-to-point audio-only conference with a telephone user adding another ViPr user to the conference:

[0382] In this case, a ViPr user (V1) in point-to-point audio-only call with a telephone user (T) decides to add another ViPr user (V2) to the conference. As a result, the ViPr user V1 initiates an audio/video call to the destination ViPr user V2. The ViPr system tears down the established point-to-point call between V1 and the ViPr UAM and re-establishes a PMP/multicast call between V1, V2 and the ViPr UAM.

[0383] The ViPr UAM terminates the new ViPr audio/video call and bridges it to the already established back-to-back telephone call. Throughout this process, the telephone call remains active and the switching is transparent to the telephone user.

[0384] Once the call is established, the ViPr UAM converts the unicast G.711/G.722 audio stream received from the telephone into a PMP/multicast stream and forwards it to the ViPr terminals without any transcoding. On the other hand, the ViPr UAM performs transcoding and mixing of the wideband 16bit/16KHz PCM ViPr audio streams received from the various ViPr terminals into one G.711 or G.722 unicast audio stream and forwards it to the telephone destination.

[0385] ViPr uses Session Initiation Protocol (SIP) as a means of establishing, modifying and clearing multi-stream multi-media sessions. The UAM will add conferencing capabilities between the ViPr terminals and telephone users (i.e. PSTN, Mobile phones and SIP phones) by converting upstream unicast voice-only telephone streams into point-to-

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multipoint streams (i.e. PMP-SVC or IP Multicast) and converting downstream ViPr multicast/PMP audio streams to unicast telephone voice-only streams as well as performing downstream audio transcoding of ViPr audio from wideband 16bit/16KHz PCM encoding to G.711 or G.722.

Deployment Scenario 2:

[0386] Referring to figure 5, this scenario covers two cases:

A telephone user calling a ViPr user:

[0387] In this case, a telephone user initiates a call (audio only) to a ViPr user. The telephony gateway redirects the call to the VIPr UAM. The ViPr UAM terminates the telephone call and establishes a back-to-back VIPr audio-only call to the destination ViPr terminal.

[0388] Once the call is established, the ViPr UAM forwards the G.711/G.722 audio stream received from the telephone to the ViPr terminal without any transcoding. On the other hand, the ViPr UAM performs transcoding of the ViPr audio stream from wideband 16bit/16KHz PCM to G.711 or G.722 and forwards it to the telephone destination.

A ViPr user calling a telephone user:

[0389] In this case, a ViPr user initiates a call to a telephone user. The ViPr SIP server redirects the call to the ViPr UAM. The ViPr UAM terminates the ViPr audio-only call and establishes a back-to-back PSTN call to the destination telephone via the telephony gateway. Transcoding is done in the same way as described in the previous paragraph.

[0390] Figure 6 gives a typical usage context for UAM. The features provided by the UAM are the following.

Feature 1

[0391] Say that ViPr V1 and V2 are in a point-to-point call and they wish to engage Unicast Device UD1 in a conference call. Put in other words the intent is to form a conference call with UD1, V1 and V2 in conference. Say user at V1 requests that user at UD1 be joined into the conference call with V1 and V2 as other parties. This request is forwarded by one of the SIP servers to the UAM.
UAM then performs the following tasks:

- It joins the conference call on behalf of UD1. Call this conference call C1.
- It also makes a point-to-point call with the Unicast Device. Call this conference call C2.
- It relays audio data received on C2 to C1.
- It accepts the audio data from V1 and V2 parties in call C2, mixes and forwards this data to UD.

Feature 2

[0392] Consider the case where vipr-net in the figure above is ATM and UD-net is an IP network. Also, suppose that it is desired that to the extent possible only SVCs be used over the ATM network for audio rather than LANE/CLIP. This could be for security concerns or for performance issues.

[0393] In this case, if a ViPr V1 on vipr-net wishes to engage a unicast device (UD1) in an audio conversation, than UAM is used to provide functionality to use SVC in the ATM network and IP in the IP network.

[0394] To do this **all call** from V1 to UD1 is broken into two calls from V1 to UAMD and from UAMD to V2.

[0395] The configuration required for features supported by UAM can be broken into following categories:

- Configuration for ViPr to UD calls.
- Configuration for UD to ViPr calls.
- General configuration

General configuration

[0396] The B2BUA SIP UA is made to run on any desired port (other than 5060). This is done by modifying the vipr.ini file to include following parameter:
SIP_Port=7070[any valid port number]

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Configuration for ViPr to UD calls

[0397] For a typical ViPr call when a user dials a "number" its "call-request" is sent to SIP Server which than forwards it to the appropriate destinations. However, this case is different. In this case, when a user says I wish to talk to unicast device (UD1) the SIP Server forwards the request to UAM. In addition, it also puts information in the request to identify that this call should be forwarded to UD1. Thus, the SIP Server is programmed to route calls made to the SIP-URIs serviced by the UAM devices to the appropriate UAMD Server.

[0398] It is also possible to specify a default unicast device SIP address to which to forward all calls received by the UAM. This default address can be specified in vipr.ini file by adding following lines:

```
UD_SERVER_ADDRESS=169.144.50.48
X_FORMARD_AVAILABLE=0
```

[0399] It should be noted that when a call is made from a unicast device to a ViPr, the call has to be delivered to the UAM. To do this, appropriate configuration is performed at unicast device, please refer to unicast device specific documentation for this.

Configuration for UD to ViPr call

[0400] The calls originating at the UD for a ViPr are routed to the UAM. One way to achieve this is by programming the UD to direct/forward all calls to UAM. Also, the eventual destination of the calls (say V1) is specified in the call request to UAM. Typically, this address will be the To field in the SIP message. These configurations are performed at the UD or the SIP Server.

[0401] In addition, when UAM receives a call request from a UD, it forwards it to a gateway Marshall server for performing sanity checks on the called party. This gateway address can be specified in the vipr.ini file GatewayMarshallServer=sip.eng.fore.com:5065

List of Acronyms

[0402]

ATM	Asynchronous Transfer Mode
ISDN	Integrated Services Digital Network
IP	Internet Protocol
LAN	Local Area Network
MC	Multicast (IP)
MCMU	Media Cross Connect and Mixer
MCU	Media Conferencing Unit
PBX	Private Branch Exchange (private telephone switchboard)
PCM	Pulse-Code Modulation
PMP	Point-to-Multipoint (ATM)
POTS	"Plain Old Telephone System"
PRI	Primary Rate Interface (ISDN)
PSTN	Public Switched Telephone Network
SBU	SIP back-to-back user agent
SIP	Session Initiation Protocol
SVC	Switched Virtual Circuit (ATM)
UAM	Unicast Audio Mixer
ViPr™	Virtual Presence System
WAN	Wide Area Network

[0403] Although the invention has been described in detail in the foregoing embodiments for the purpose of illustration, it is to be understood that such detail is solely for that purpose and that variations can be made therein by those skilled in the art without departing from the spirit and scope of the invention except as it may be described by the following claims.

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Claims

1. A teleconferencing system comprising:

   a network; and
   a plurality of nodes in communication with each other to form a conference of live scenes at each node, each node having a video display with a display layout, at least one of the nodes individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

2. A system as described in Claim 1 wherein each node is forced to display video in the specific format.

3. A system as described in Claim 2 wherein each node is locked into the specific format.

4. A system as described in Claim 3 wherein each node is forced to display certain video streams from the other nodes of the conference at specific locations on the display.

5. A system as described in Claim 4 wherein each node controls what is displayed on any portion of the screen not controlled by the one of the nodes.

6. A system as described in Claim 5 wherein the one of the nodes completely controls the display layout of each node.

7. A method for providing a teleconference comprising the steps of:

   forming a conference with a plurality of nodes in communication with each other through a network of live scenes at each node, each node having a video display with a display layout; and
   controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

8. A teleconferencing node for a network with other nodes comprising:

   a network interface which communicates with the other nodes to form a conference of live scenes at each node; and
   a controller individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

9. A method for conducting a telecommunications conference between at least three nodes comprising the steps of:

   establishing a conference between the nodes of live scenes at each node;
   making a change to the conference; and
   communicating only the change to the nodes.

10. A method as described in Claim 9 wherein the communicating step includes the step of communicating only the change only to the nodes affected by the change.

11. A method as described in Claim 10 wherein the making step includes the step of making the change to one of the nodes' status.

12. A method as described in Claim 11 wherein the making step includes the step of making the change to the conference's state.

13. A method as described in Claim 12 including the step of sending a directed message from one of the nodes to only certain of but less than all of the parties.

14. A method as described in Claim 13 wherein the establishing step includes the step of establishing the conference based on SIP NOTIFY/OK techniques.

15. A teleconferencing system comprising:

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a network; and
a plurality of nodes in communication with each other through the network to form a conference of live scenes at each node, each node communicating only a change to the other nodes when the change occurs.

16. A system as described in Claim 15 wherein each node communicates only the change only to the nodes affected by the change.

17. A system as described in Claim 16 wherein the change to the conference includes a change to one of the nodes' status.

18. A system as described in Claim 17 wherein the change to the conference includes a change to the conference's state.

19. A system as described in Claim 18 wherein one of the nodes sends a directed message to only certain of but less than all of the nodes.

20. A system as described in Claim 19 wherein the plurality of nodes establishes the conference based on SIP NOTIFY/OK techniques.

21. A system as described in Claim 20 wherein each node has a controller and a Network Interface in communication with the controller and the network, the controller effecting any change to its node and sending the change through the network interface to through the network to the other nodes of the conference.

22. A teleconferencing node for a network with other nodes comprising:

a network interface which communicates with the other nodes to form a live conference of live scenes at each node; and
a controller which communicates only a change to the other nodes when the change occurs.

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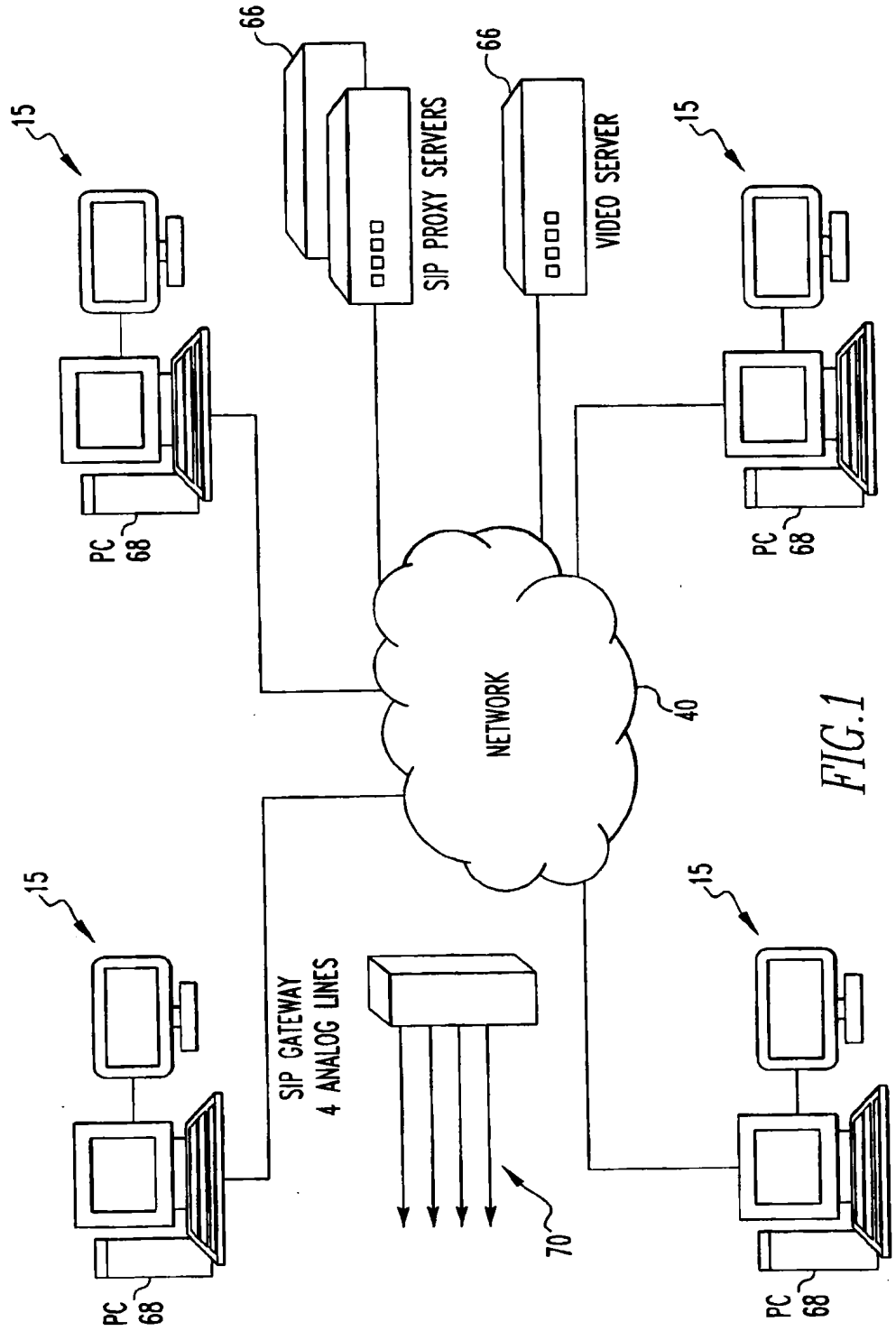

66
SIP PROXY SERVERS
66
VIDEO SERVER
15
15
PC
68
PC
68
NETWORK
40
15
15
SIP GATEWAY
4 ANALOG LINES
70
PC
68
PC
68

FIG.1

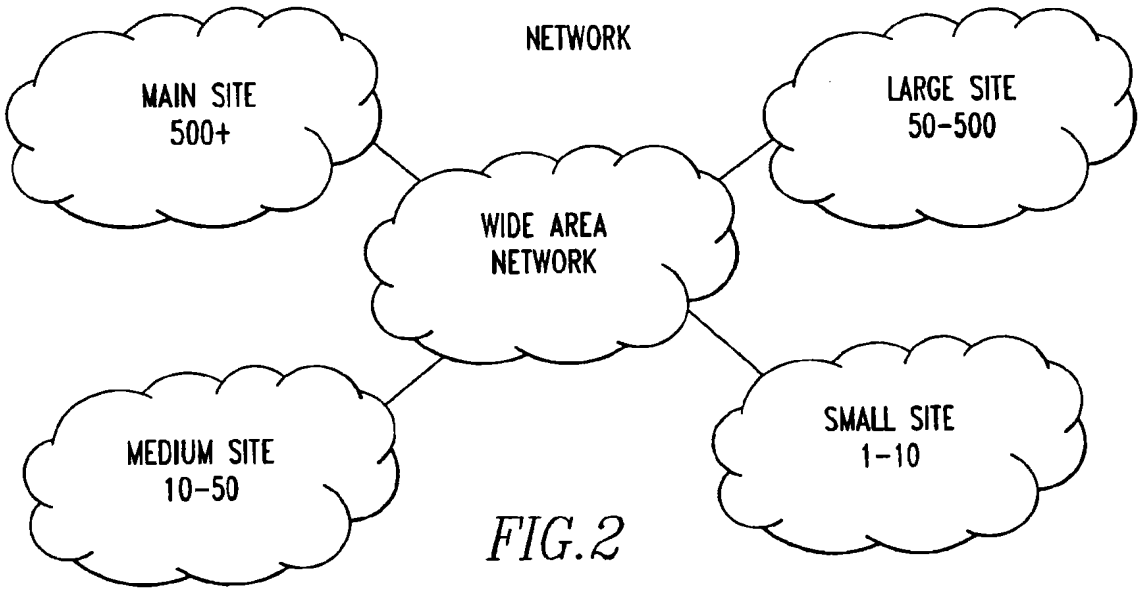

NETWORK
MAIN SITE
500+
LARGE SITE
50-500
WIDE AREA
NETWORK
MEDIUM SITE
10-50
SMALL SITE
1-10

FIG.2

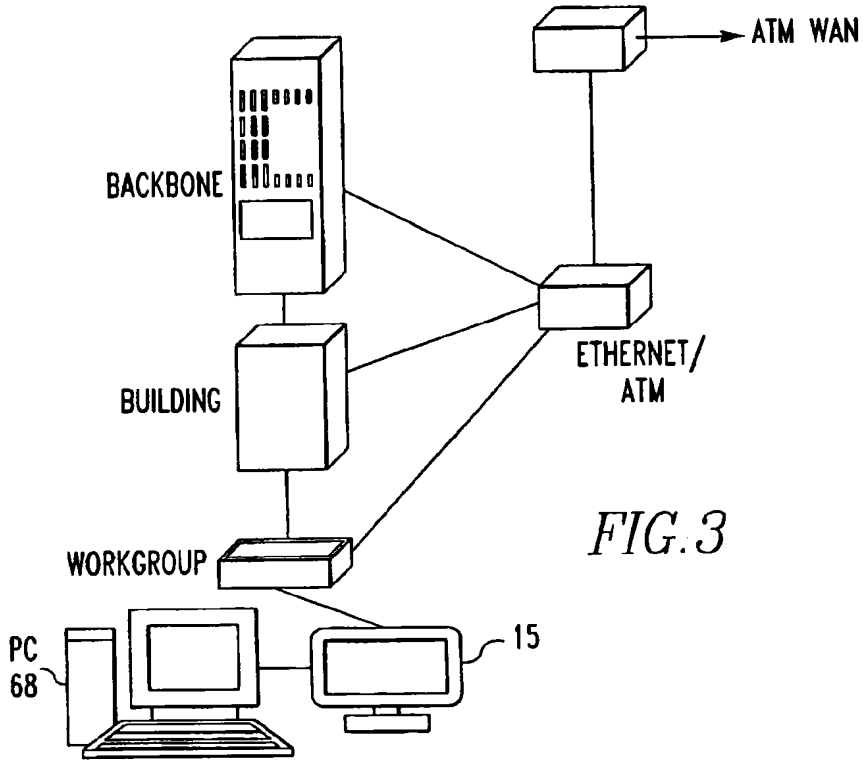

ATM WAN
BACKBONE
ETHERNET/
ATM
BUILDING
WORKGROUP
PC
68
15

FIG.3

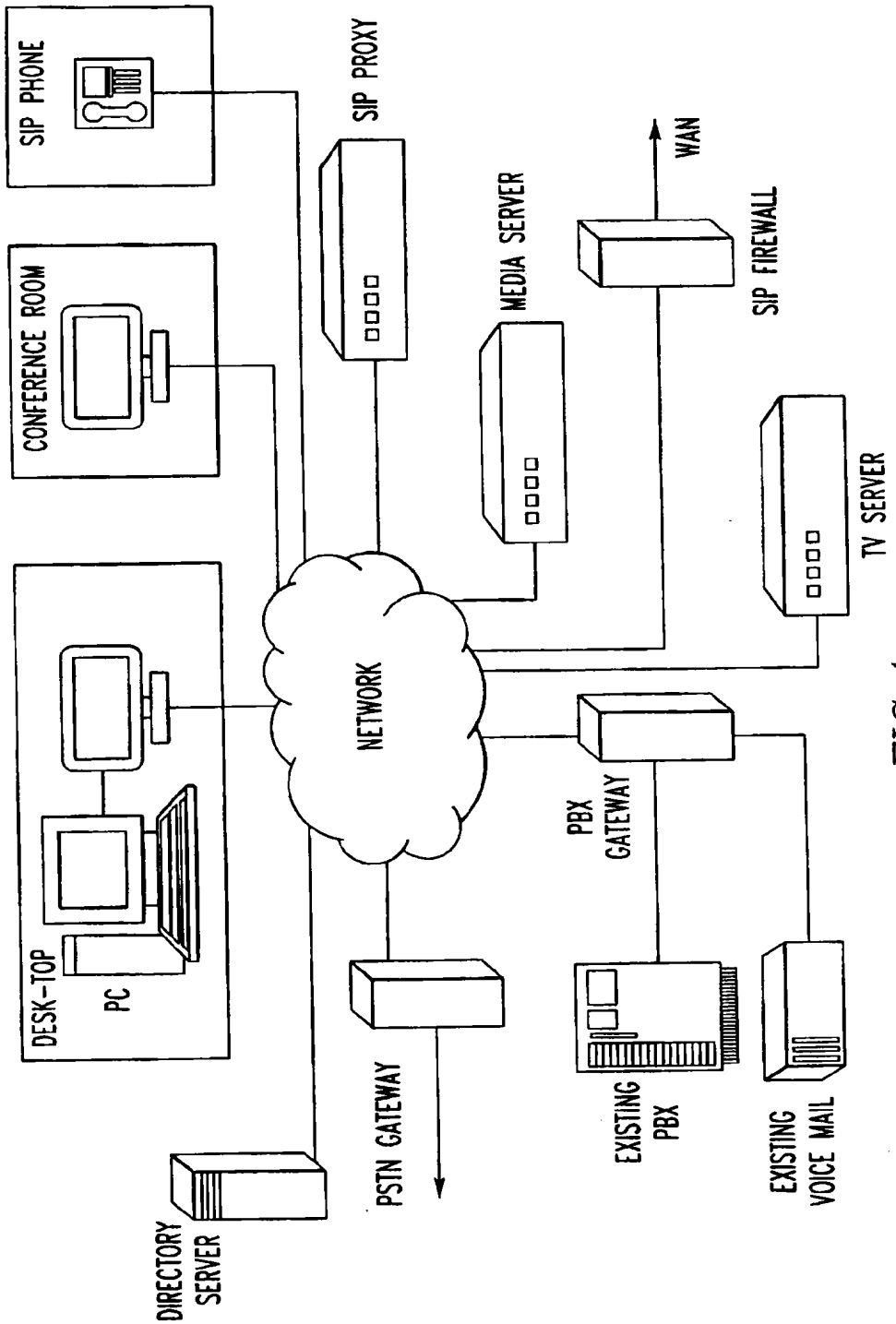


FIG. 4

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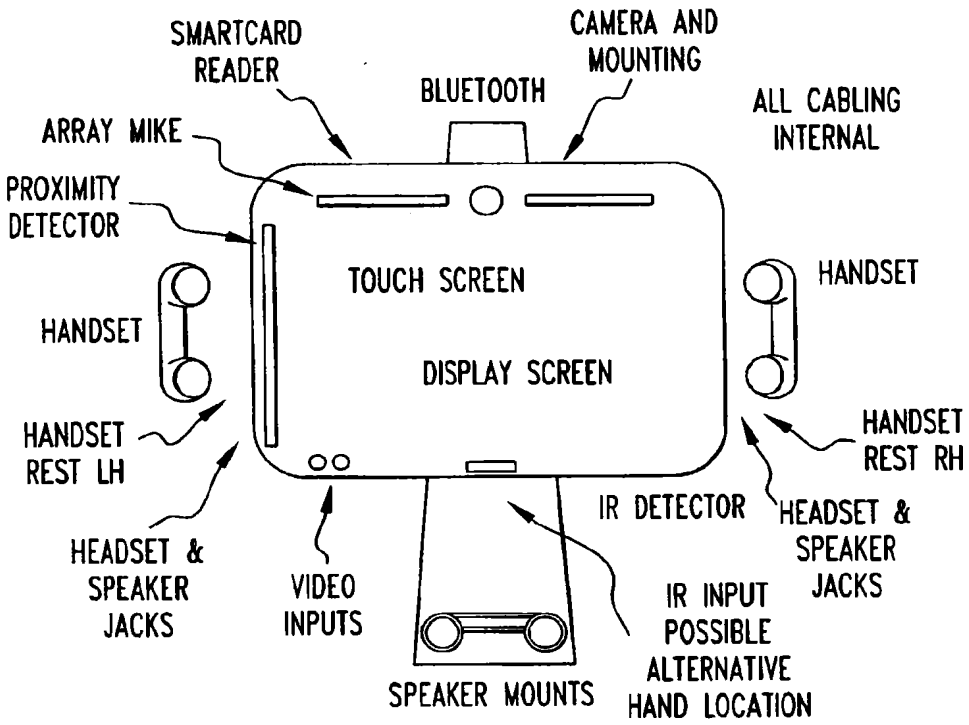


FIG.5a

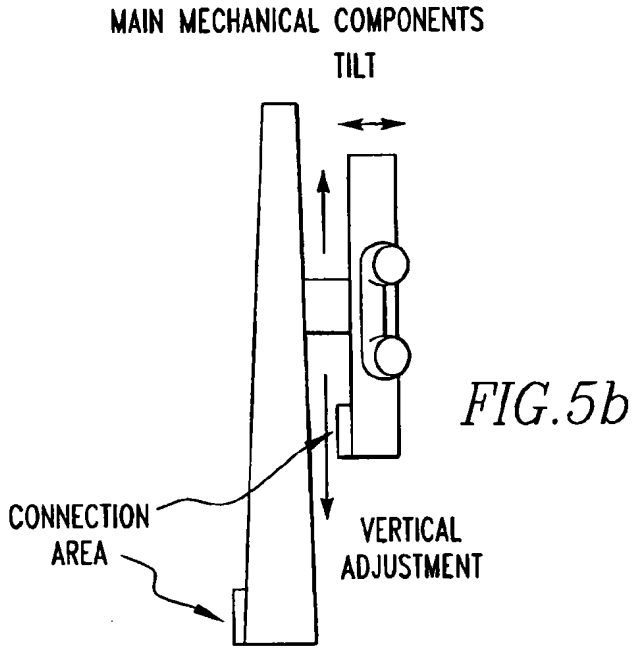


FIG.5b

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CONNECTION PANEL

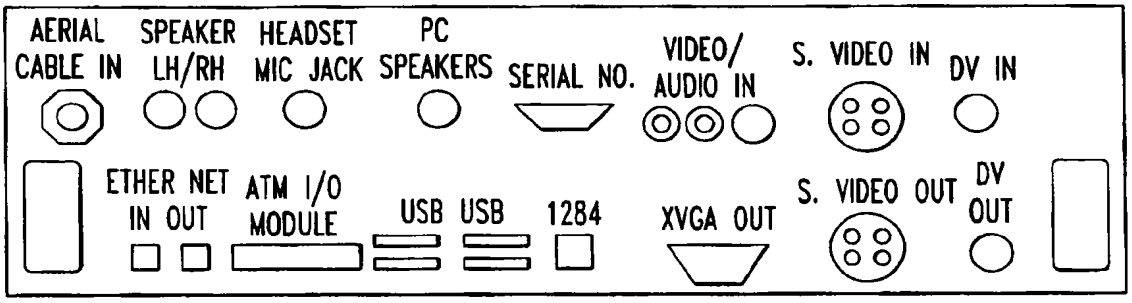


FIG. 6

MULTI-SCREEN CONFIGURATIONS

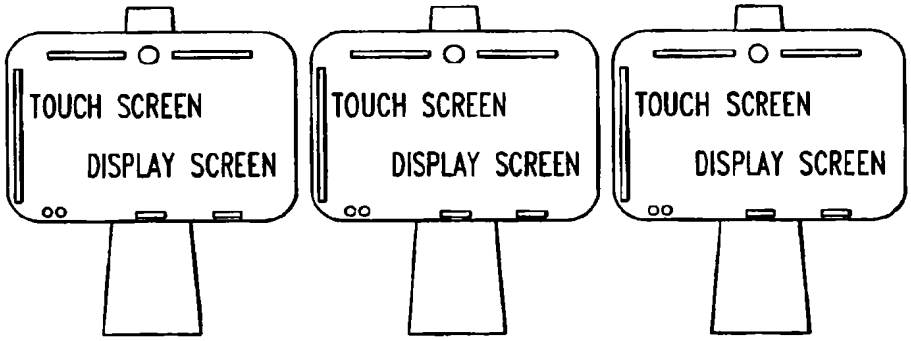


FIG. 7

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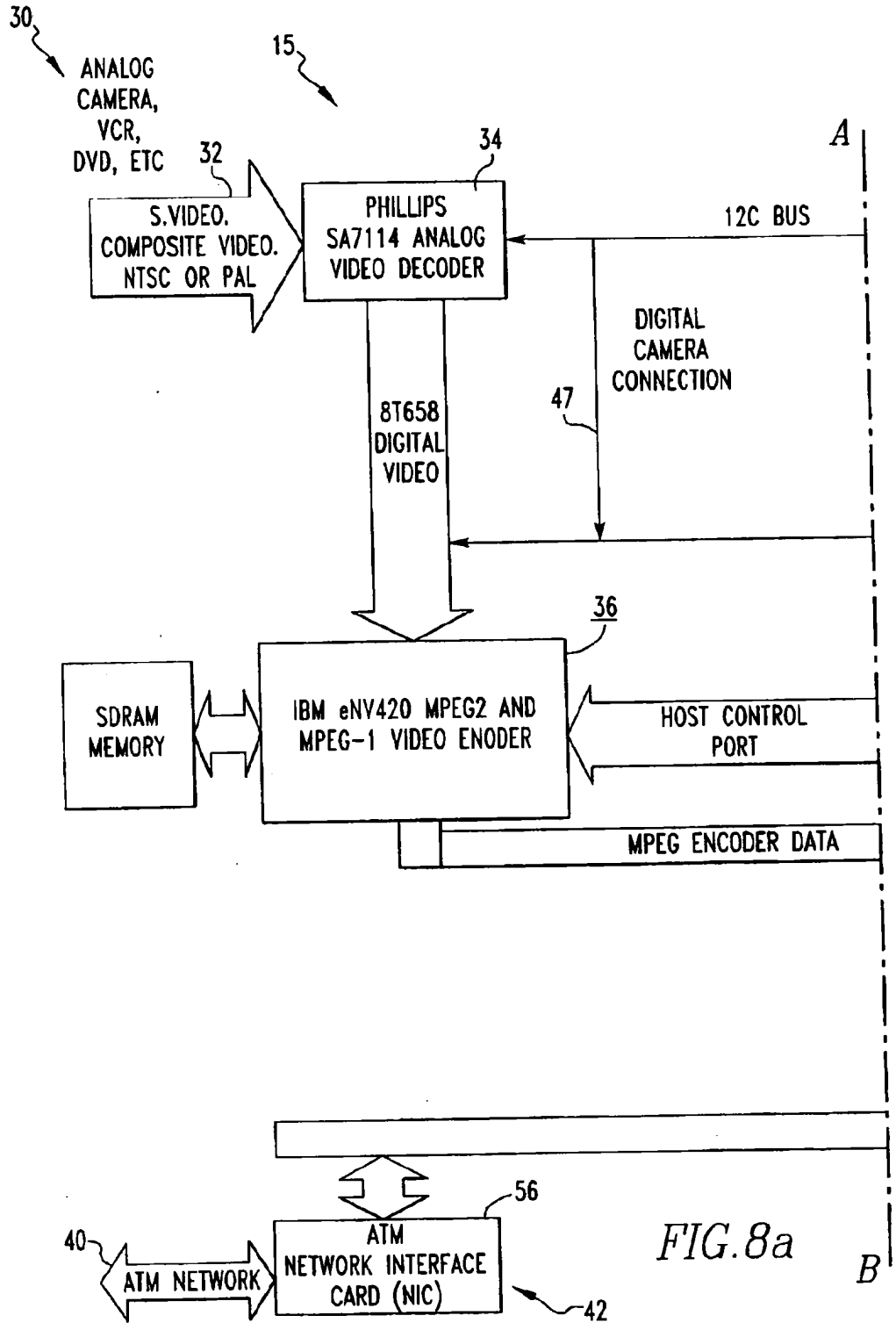


FIG.8a

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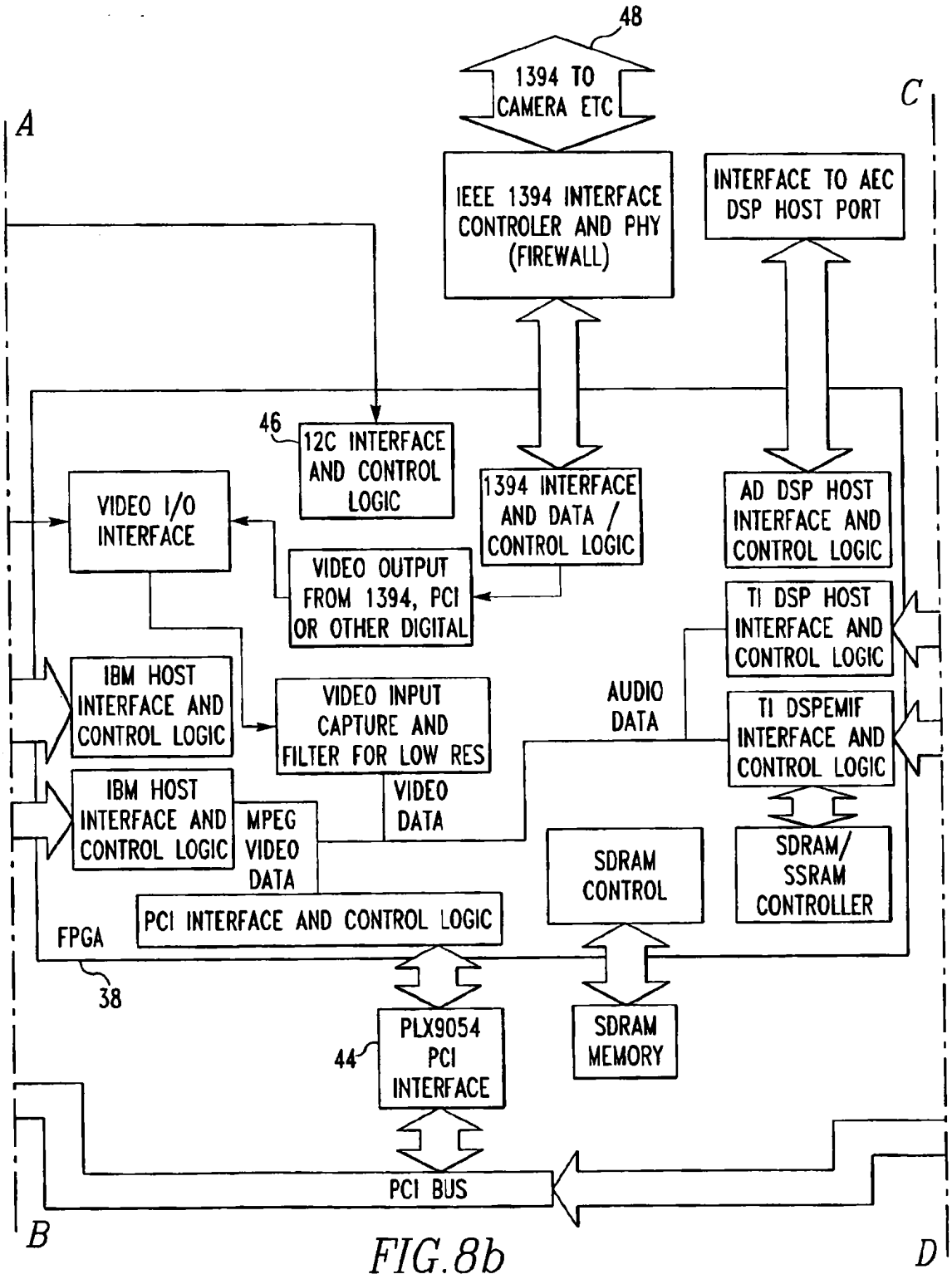


FIG.8b

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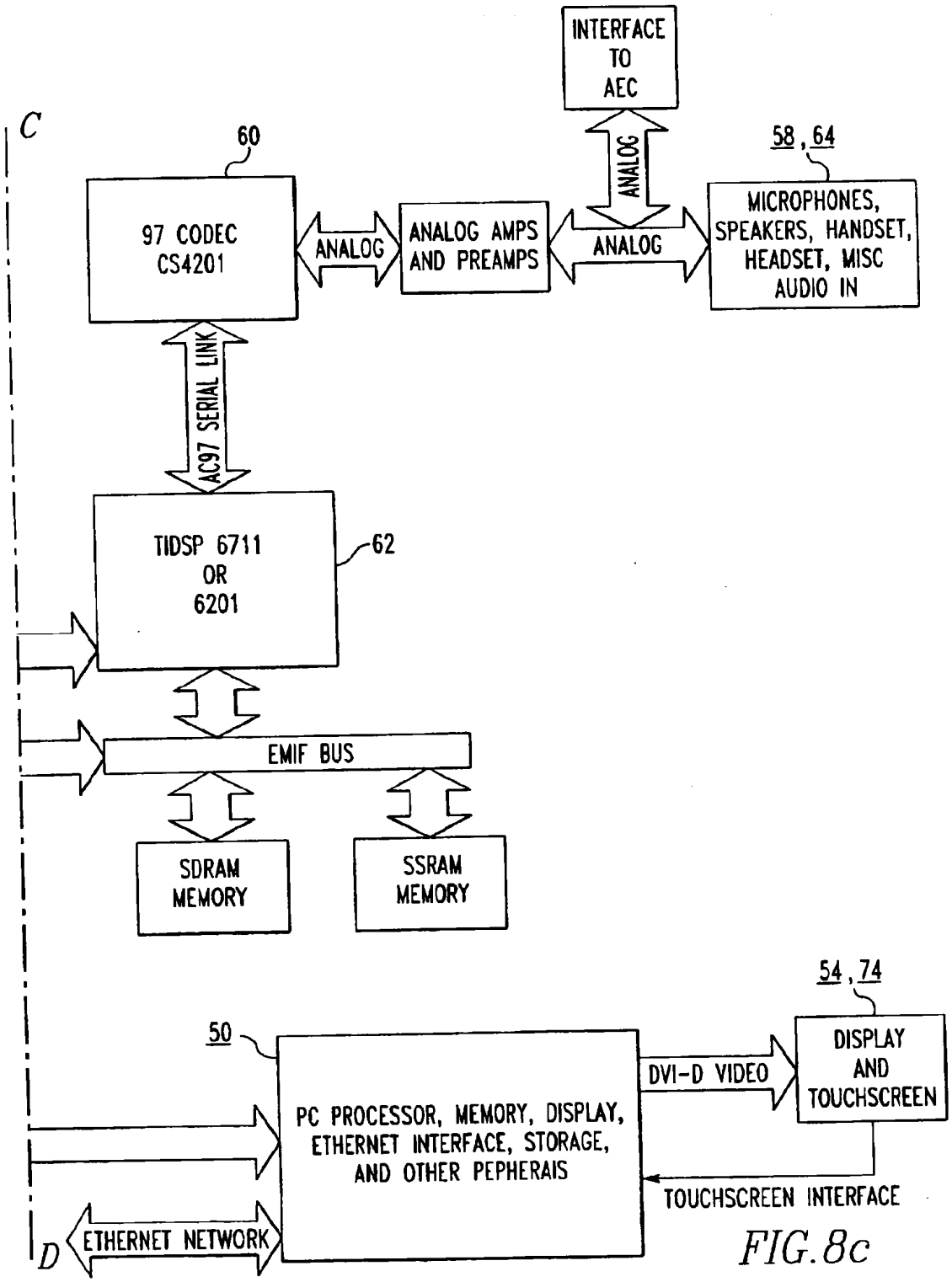


FIG. 8c

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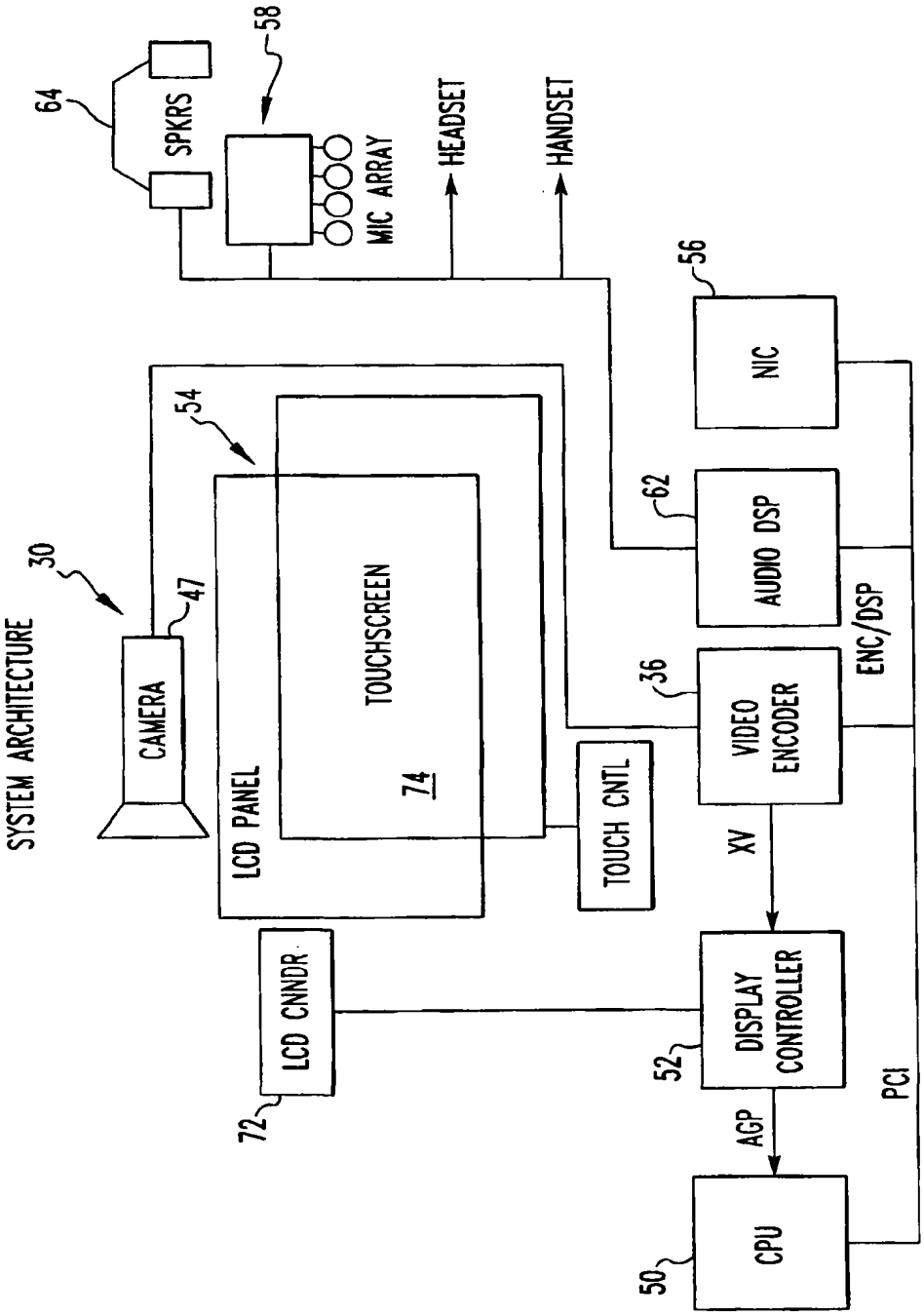

SYSTEM ARCHITECTURE
30
CAMERA
47
LCD PANEL
54
TOUCHSCREEN
74
TOUCH CNTL
LCD CNNDR
72
SPKRS
64
MIC ARRAY
58
HEADSET
HANDSET
NIC
56
AUDIO DSP
62
VIDEO ENCODER
36
ENC/DSP
XV
DISPLAY CONTROLLER
52
AGP
PCI
CPU
50

FIG. 9

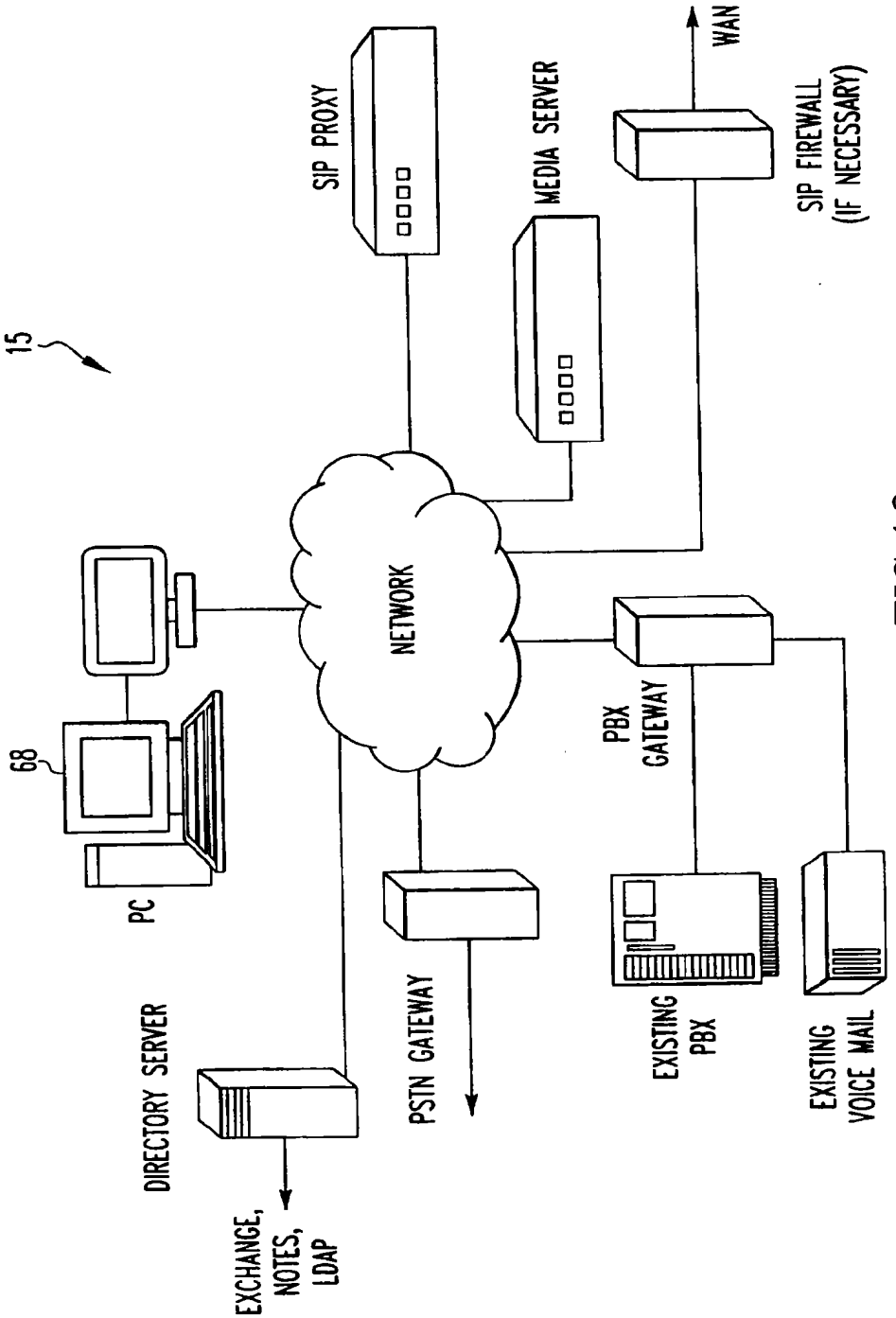


FIG.10

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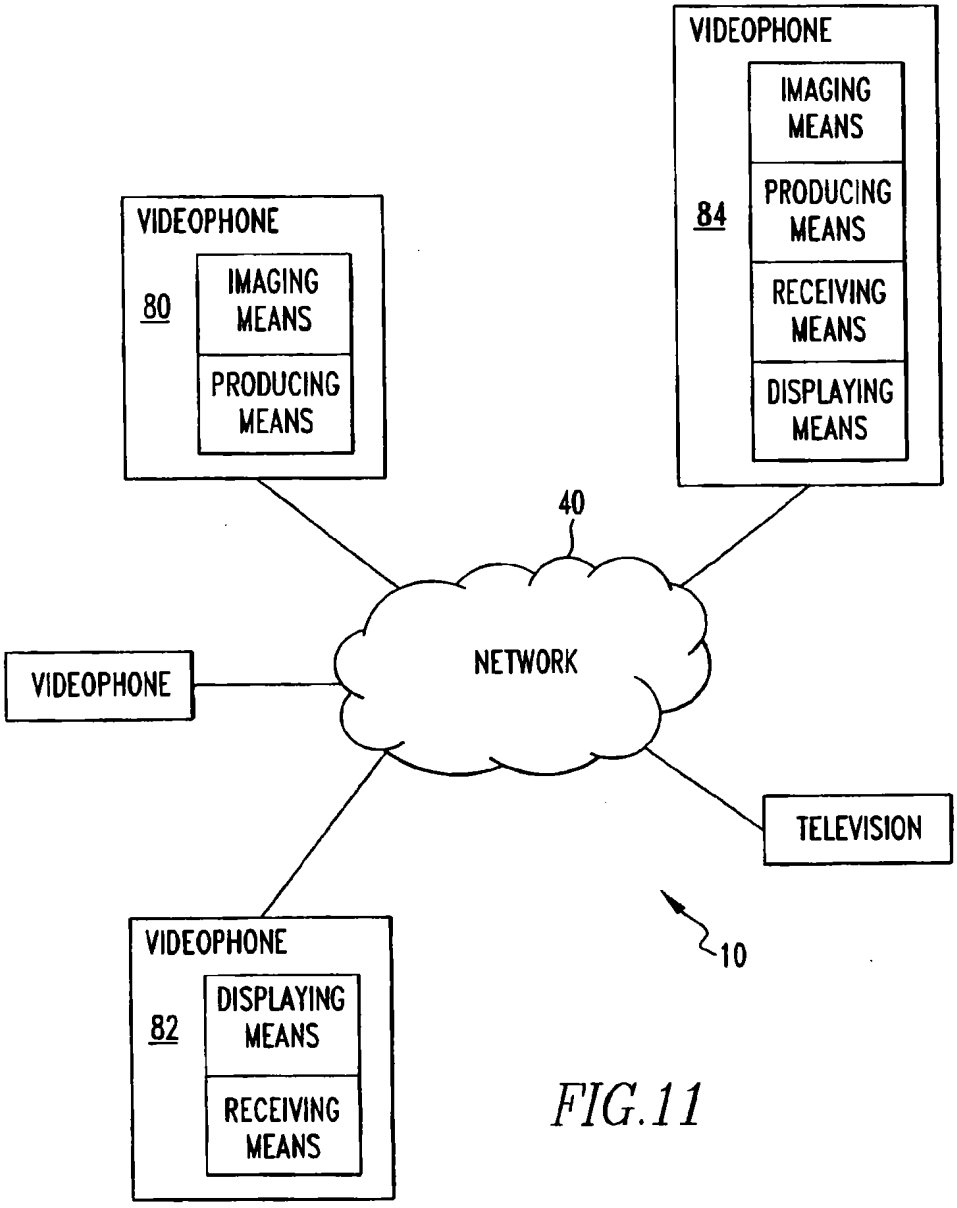


FIG.11

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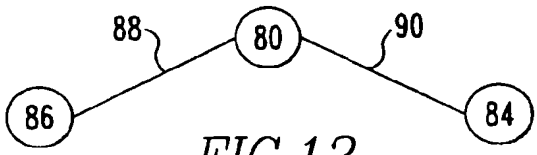


FIG.12

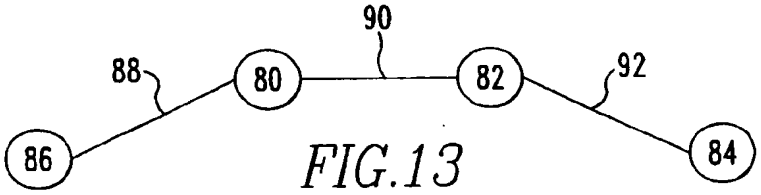


FIG.13

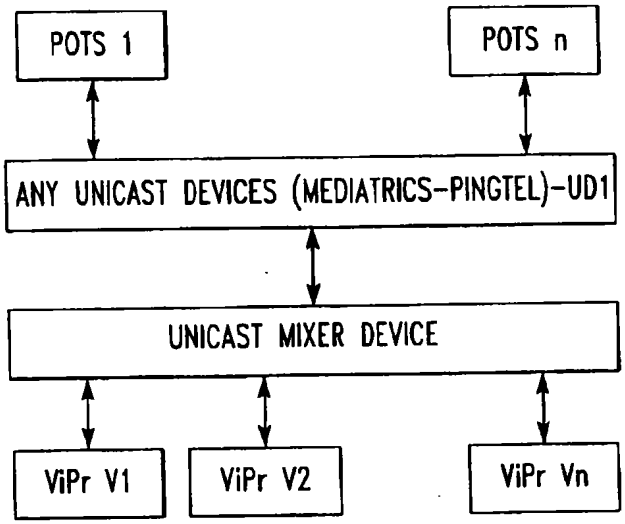


FIG.14

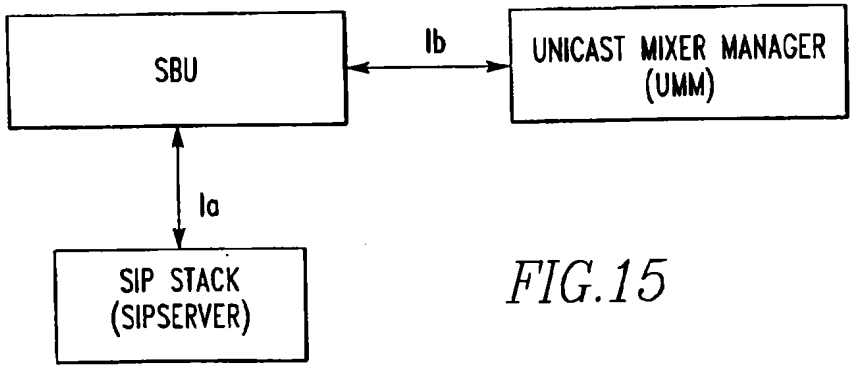


FIG.15

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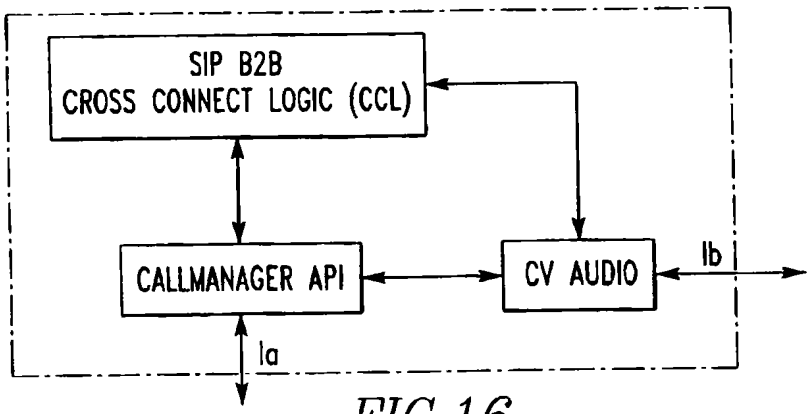

SIP B2B
CROSS CONNECT LOGIC (CCL)
CALLMANAGER API
CV AUDIO
Ib
Ia

FIG.16

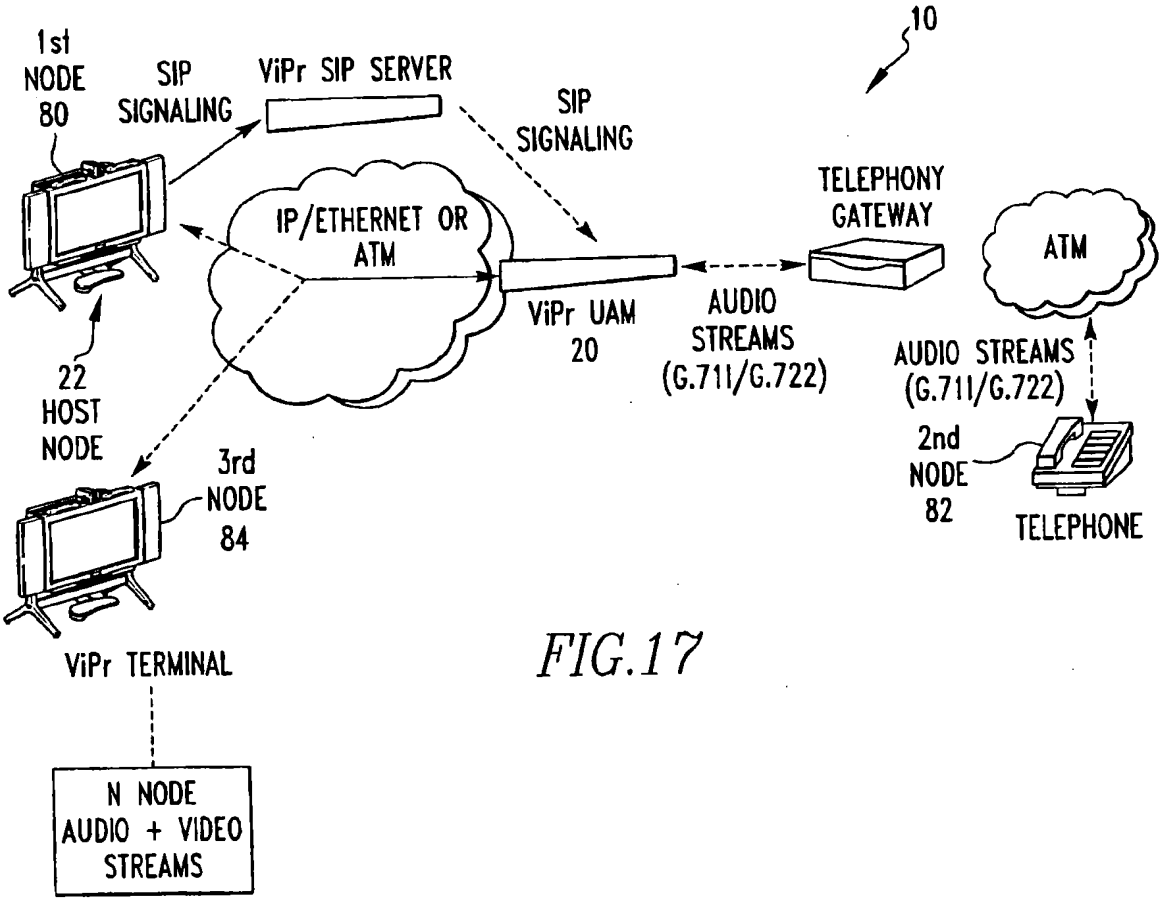

10
1st
NODE
80
SIP
SIGNALING
ViPr SIP SERVER
SIP
SIGNALING
IP/ETHERNET OR
ATM
TELEPHONY
GATEWAY
ATM
ViPr UAM
20
AUDIO
STREAMS
(G.711/G.722)
AUDIO STREAMS
(G.711/G.722)
22
HOST
NODE
3rd
NODE
84
2nd
NODE
82
TELEPHONE
ViPr TERMINAL
N NODE
AUDIO + VIDEO
STREAMS

FIG.17

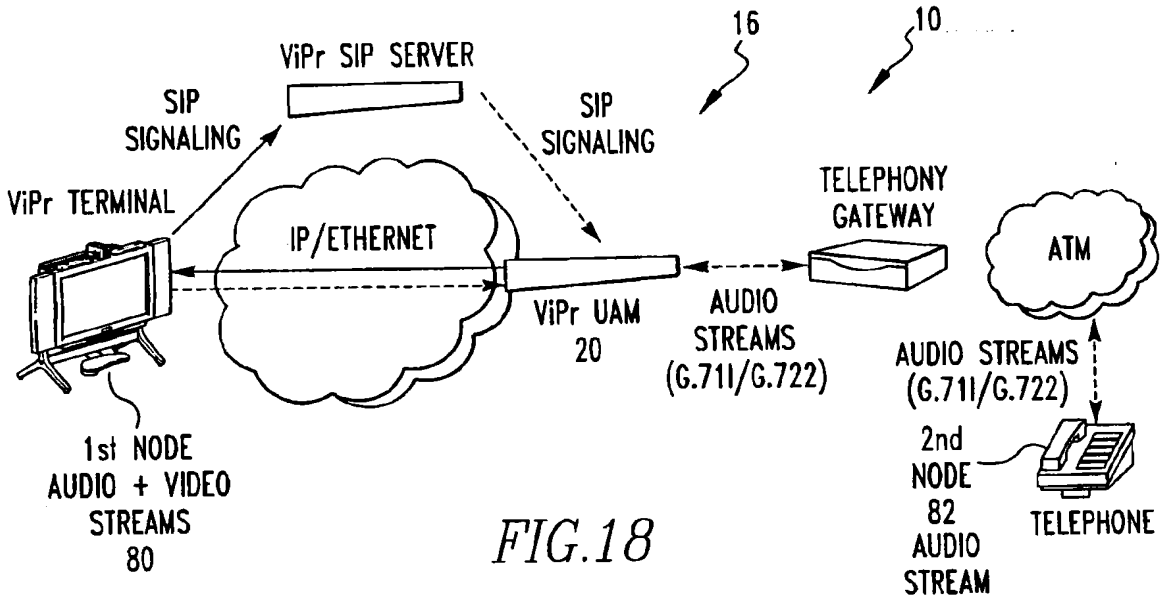


FIG.18

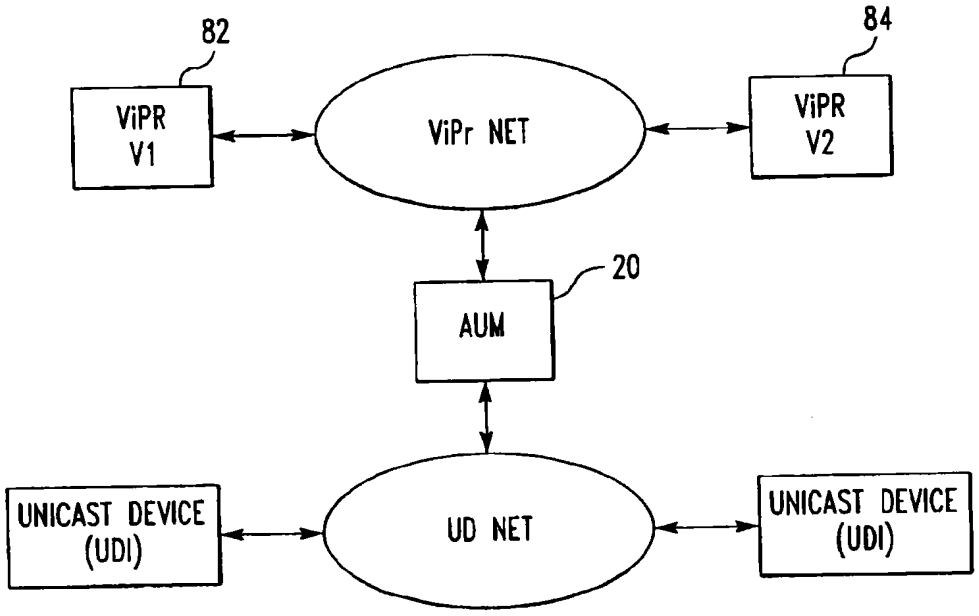


FIG.19

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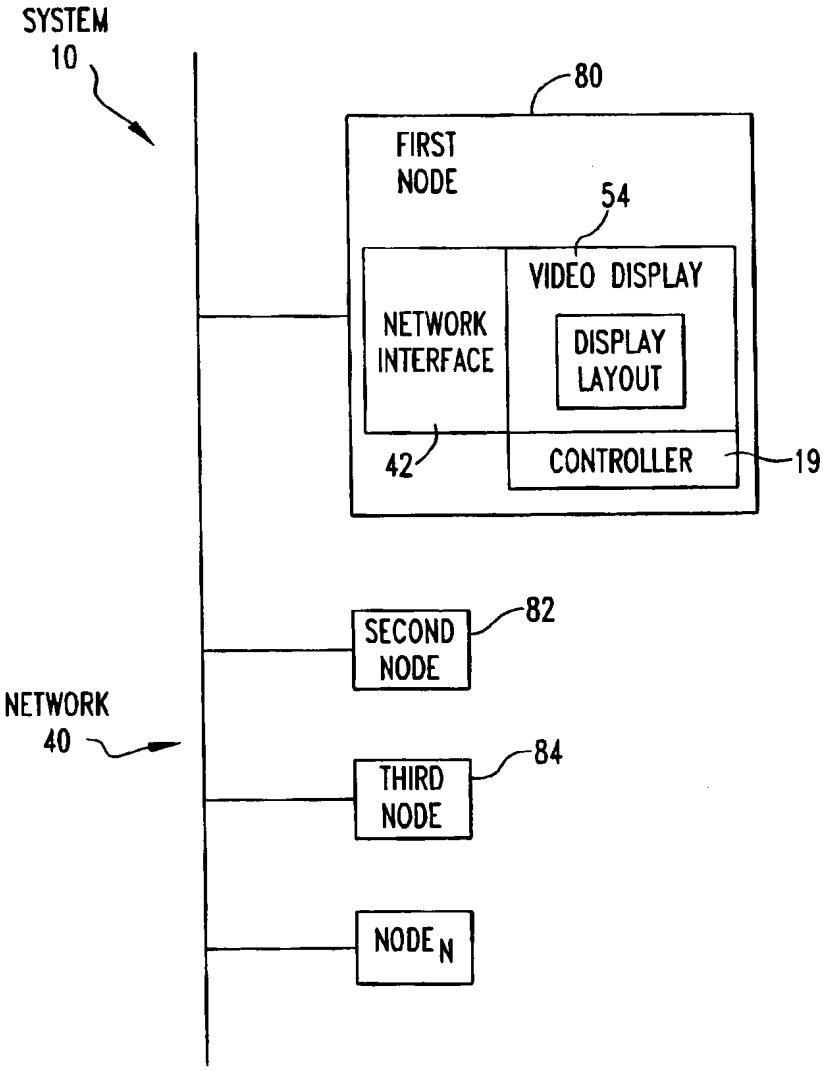
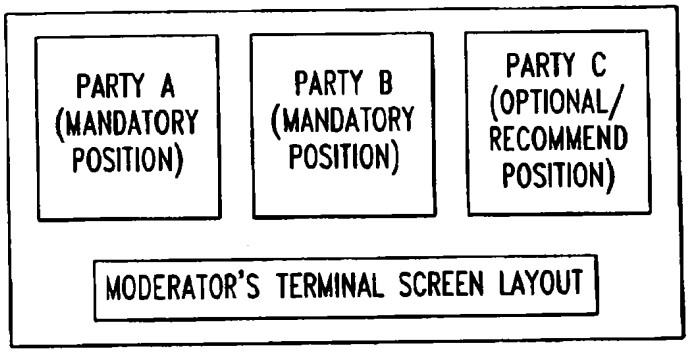
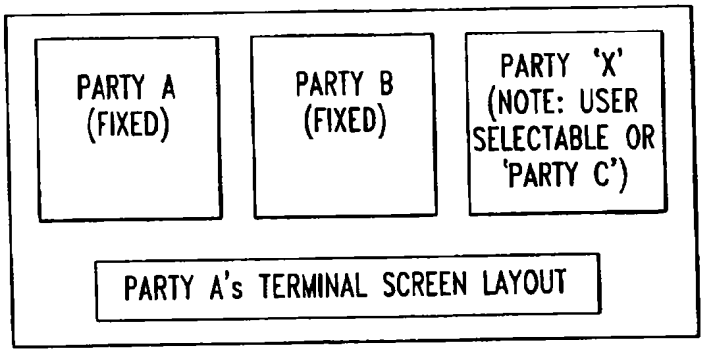


FIG.20

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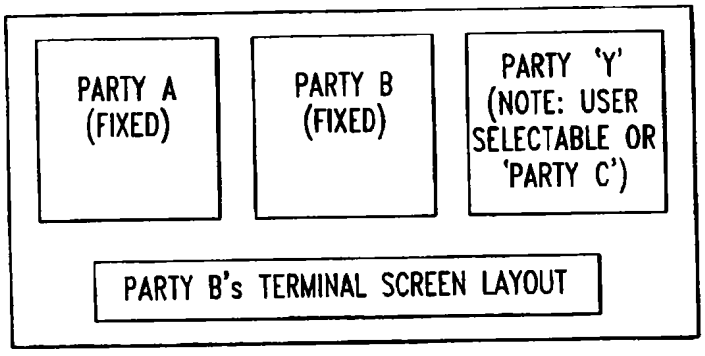


FIG.21

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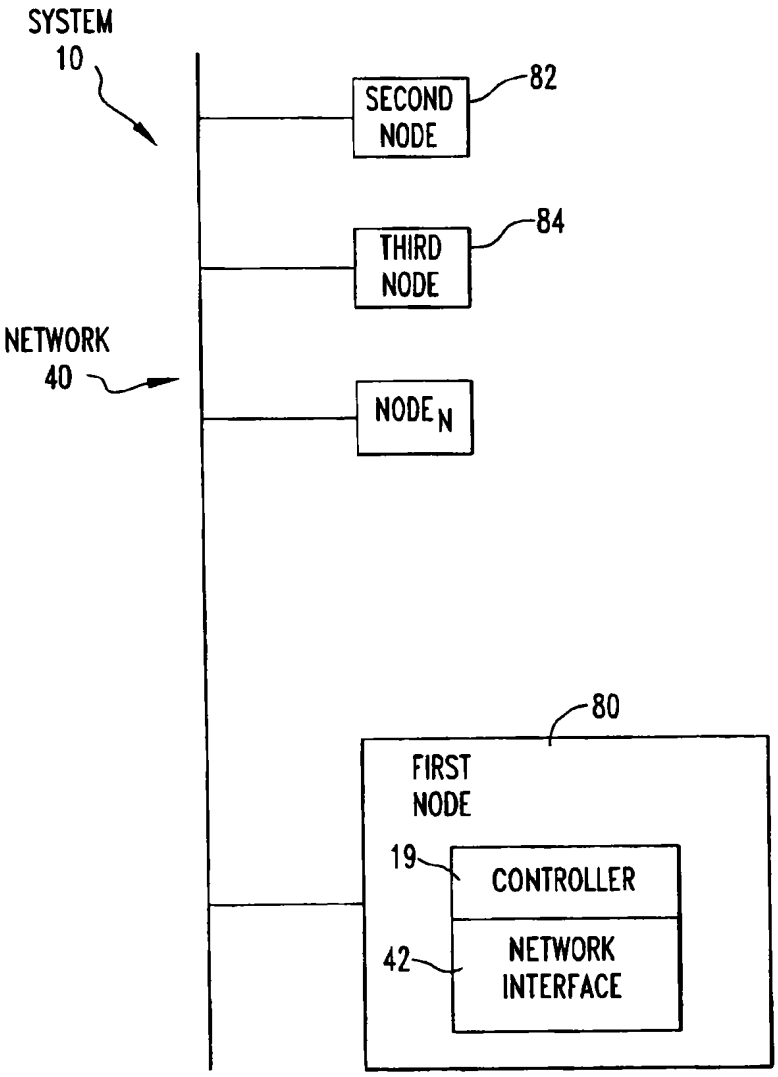


FIG.22

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 814477 P **[0001]**
- US 60814491 B **[0001]**
- US 114402 A **[0053]**
- US 871852 A **[0053]**
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European Patent Office
Office européen des brevets

(11) EP 1 868 348 A3

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H04L 29/06 *(2006.01)* ***H04N 7/15*** *(2006.01)*

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(54) Conference layout control and control protocol

(57) A teleconferencing system includes a network. The system includes a plurality of nodes in communication with each other to form a conference. Each node having a video display with a display layout, at least one of the nodes individually controlling at least partially the display layout of each node in the conference with a specific format able to be unique for each node. A method for providing a teleconference including the steps of forming a conference with a plurality of nodes in communication with each other through a network. Each node having a video display with a display layout. There is the step of controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node. A teleconferencing node. A teleconferencing system includes a network. The system includes a plurality of nodes in communication with each other through the network to form a conference. Each node communicating only a change to the other nodes when the change occurs. A method for conducting a telecommunications conference between at least three parties includes the steps of establishing a conference between the party. There is the step of making a change to the conference. There is the step of communicating only the change to the parties.

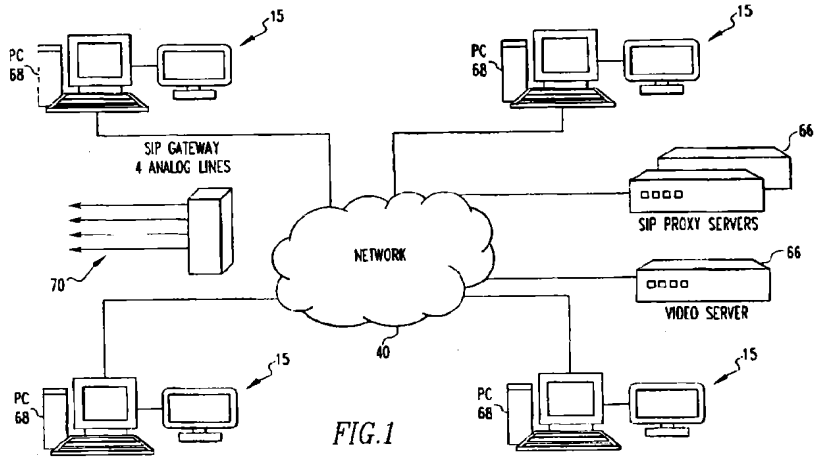


FIG.1

EP 1 868 348 A3

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 07 25 2423

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EVEN POLYCOM N ISMAIL CISCO SYSTEMS R ET AL: "Conferencing Scenarios; draft-ietf-xcon-conference-scenarios-05.txt" IETF STANDARD-WORKING-DRAFT, INTERNET ENGINEERING TASK FORCE, IETF, CH, vol. xcon, no. 5, 6 September 2005 (2005-09-06), pages 1-16, XP015040623 ISSN: 0000-0004 * page 9 - page 10 *	1-8	INV. H04L29/06 H04N7/15
X	EP 1 578 129 A1 (MARCONI INTELLECTUAL PTY [US]) 21 September 2005 (2005-09-21) * paragraph [0001] * * paragraph [0142] - paragraph [0148] * * paragraph [0212] - paragraph [0215] * * paragraph [0273] - paragraph [0275] *	1-8	
X	US 2004/008249 A1 (NELSON STEVE [US] ET AL) 15 January 2004 (2004-01-15) * paragraph [0035] - paragraph [0069] * * abstract; figure 8 *	1-8	TECHNICAL FIELDS SEARCHED (IPC) H04L H04N H04M

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	7 June 2010	Jurca, Alexandru

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 07 25 2423

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-8

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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European Patent Office
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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 25 2423

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-8

Claims 1-8 are directed to teleconference video layout display. This is done by forming a teleconference with a plurality of nodes, each node having a video display with a display layout; and controlling individually with at least one of the nodes at least partially the display layout of each node in the conference with a specific format able to be unique for each node.

---

2. claims: 9-22

Claims 9-22 are directed to dealing with changes in a conference between at least three nodes. This is done by establishing a conference between the nodes of live scenes at each node; making a change to the conference; and communicating only the change to the nodes.

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 25 2423

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1578129 A1	21-09-2005	JP 2005318534 A	10-11-2005
US 2004008249 A1	15-01-2004	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(19) Europäisches Patentamt
European Patent Office
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(11) EP 2 288 104 A1

(12) EUROPEAN PATENT APPLICATION

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23.02.2011 Bulletin 2011/08

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H04L 12/18 *(2006.01)*

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BA ME RS

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- **Nicol, John**
  Framingham, MA 01701 (US)

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(54) Flexible decomposition and recomposition of multimedia conferencing streams using real-time control information

(57) A multimedia conferencing system is presented that can modify the composite multimedia stream into separate multimedia streams. Two or more video conference participants send multimedia streams, capturing and encoding the conference at the participant's location, to a multimedia server. The multimedia server includes a multipoint control unit that creates a composite multimedia display, which includes video regions corresponding to at least two of the multimedia streams from the participants. A composite multimedia stream describes the composite multimedia display. The ancillary server receives the composite multimedia stream from the multipoint control unit together with static and dynamic control information, which describes the format and layout of the composite multimedia display and the composite multimedia stream. Using the dynamic and static control information, the ancillary server decomposes the composite multimedia stream into two or more constituent streams. The two or more constituent streams may then be separately processed.

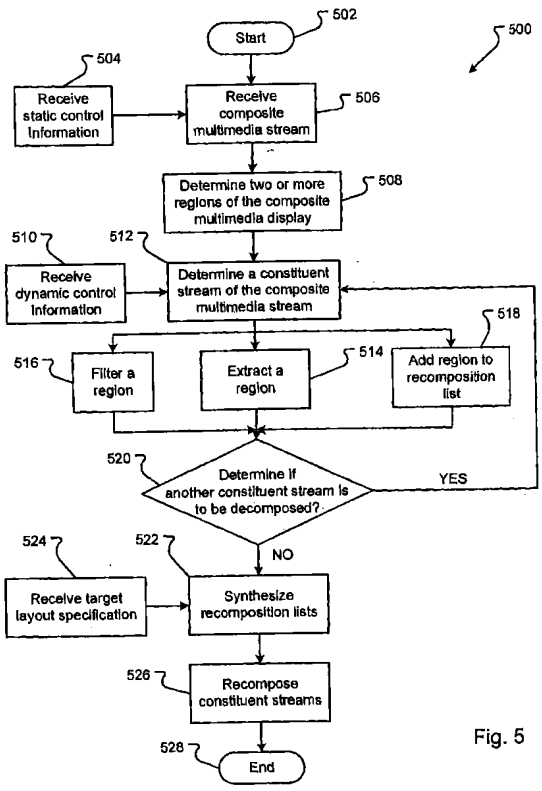


Fig. 5

EP 2 288 104 A1

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Description

BACKGROUND

[0001] Video conferencing servers, operating in "continuous presence" mode, use a composite image to display some or all of the parties involved in a video conference. A composite image has two or more areas (or "regions") of the display that show different video images from the different participants. Generally, this composite image may be constructed by a server and transmitted in real-time to the participants. This single composite image stream allows every participant to view all or a subset of the conference participants from their terminal during the video conference

[0002] While this system provides a useful communication system, it is inflexible. Sometimes the end user (or application) could better utilize one or more sub-regions from the composite image in preference to the entire composite image. For example, an end user may want to record any communications from one of the participants but disregard content from the other participants. Unfortunately, the server providing the composite image may not support the functionality required to provide different composite multimedia images to the different participants. Or, if the server does include that functionality, it is generally very expensive and causes the server to perform inefficiently.

SUMMARY

[0003] It is with respect to the above issues and other problems that the embodiments presented herein were contemplated. Herein, a multimedia conferencing system is presented that can modify the composite multimedia image stream into separate multimedia streams. The conferencing system includes two or more participants, a multimedia server, and one or more ancillary servers. Each video-enabled participant sends a multimedia stream, capturing and encoding the conference at the participant's location, to the multimedia server. The multimedia server includes a multipoint control unit ("MCU") that creates a composite multimedia stream, from the separate participant streams, into a composite multimedia image, which shows at least two of the multimedia streams from the participant locations. An ancillary server receives the composite multimedia stream from the MCU together with static and dynamic control information. The static and dynamic control information describes the format and layout used in the construction of the composite multimedia image and the composite multimedia stream. With the dynamic and static control information, the ancillary server decomposes the composite multimedia stream into two or more constituent streams. The two or more constituent streams may then be separately processed.

[0004] Exemplary applications for the embodiments include supporting an enterprise quality/integrity policy or set of policies (e.g., record video streams of all company employees engaged in inter-enterprise video conferences, or call center agents engaged in conferences with particular customers or partners) or in support of government legal interception requirements to record video streams of specific conferees or participants from particular locations. Other applications will be readily apparent to one of ordinary skill in the art.

[0005] The embodiments can have a number of advantages. For example, the system can provide flexible, real-time or near real-time decomposition and/or recomposition processing of multimedia conferencing streams without unduly burdening the supporting MCUs. Using real-time control information exchanged between network elements as part of their normal operation, the system can map from segments of one communication medium or modality to segment another (different) medium or modality. In one configuration, it performs spatial segmentation by mapping voice activity in an audio stream of a call to the spatial location of the speaker in the video stream of the call. It can regenerate video display layouts flexibly building on decomposed video elements. It can index a multimedia stream using timing information indicating when a given participant is active and/or inactive, such that the corresponding video element can be determined (even for conferencing mixes for which spatial layout changes dynamically driven by changes of the active speaker). These are significant accomplishments as the relative locations of the video elements may change dynamically with the active speaker. Information technology benefits are realized, particularly information storage overhead reduction in case of recording servers or targeted speaker mixes for legal intercept applications. It can provide these benefits by monitoring and collecting the control information required for decomposition and ancillary servers (e.g. via techniques such as network traffic sniffing), which not only are transparent to either the endpoints or the media server but also do not add an unacceptable level of processing burden to an expensive resource, such as a media server or MCU. Ancillary servers can provide additional desirable operations, including the application of video transforms, such as scaling, block extraction, transcoding, and filtering, to generate new, application-specific display layouts. The phrases "at least one", "one or more", and "and/or" are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions "at least one of A, B and C", "at least one of A, B, or C", "one or more of A, B, and C", "one or more of A, B, or C" and "A, B, and/or C" means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

[0006] The term "a" or "an" entity refers to one or more of that entity. As such, the terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein. It is also to be noted that the terms "comprising", "including",

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and "having" can be used interchangeably.

[0007] The term "automatic" and variations thereof, as used herein, refers to any process or operation done without material human input when the process or operation is performed. However, a process or operation can be automatic, even though performance of the process or operation uses material or immaterial human input, if the input is received before performance of the process or operation. Human input is deemed to be material if such input influences how the process or operation will be performed. Human input that consents to the performance of the process or operation is not deemed to be "material".

[0008] The term "computer-readable medium" as used herein refers to any tangible storage that participates in providing instructions to a processor for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media includes, for example, NVRAM, or magnetic or optical disks. Volatile media includes dynamic memory, such as main memory. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, magneto-optical medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, a solid state medium like a memory card, any other memory chip or cartridge, or any other medium from which a computer can read. When the computer-readable media is configured as a database, it is to be understood that the database may be any type of database, such as relational, hierarchical, object-oriented, and/or the like. Accordingly, the invention is considered to include a tangible storage medium and prior art-recognized equivalents and successor media, in which the software implementations of the present invention are stored.

[0009] The terms "determine", "calculate" and "compute," and variations thereof, as used herein, are used interchangeably and include any type of methodology, process, mathematical operation or technique.

[0010] The term "module" as used herein refers to any known or later developed hardware, software, firmware, artificial intelligence, fuzzy logic, or combination of hardware and software that is capable of performing the functionality associated with that element. Also, while the invention is described in terms of exemplary embodiments, it should be appreciated that individual aspects of the invention can be separately claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present disclosure is described in conjunction with the appended figures:

[0012] Fig. 1 is a block diagram of a multipoint control unit that can create a composite multimedia stream;

[0013] Fig. 2 is a block diagram of an embodiment of a multimedia system operable to decompose and recompose composite multimedia streams;

[0014] Fig. 3 is a block diagram of an embodiment of an ancillary server operable to decompose and recompose composite multimedia streams;

[0015] Figs. 4A-4D are block diagrams of data structures that are stored, sent, or received by one or more computer systems when decomposing and/or recomposing composite multimedia streams;

[0016] Fig. 5 is a flow diagram of an embodiment of a process for decomposing and processing a composite multimedia stream;

[0017] Fig. 6 is a block diagram of an embodiment of a computer system environment in which the systems and methods may be executed; and

[0018] Fig. 7 is a block diagram of a computer system in which the systems and methods may be executed.

[0019] In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a letter that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION

[0020] The ensuing description provides embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the ensuing description will provide those skilled in the art with an enabling description for implementing the embodiments. It being understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention as set forth in the appended claims.

[0021] The embodiments presented herein provide a system and methods for decomposing a composite multimedia stream (which forms a composite multimedia image) into two or more constituent streams using control information. In embodiments, control information can be metadata received before, with, or after the composite multimedia stream. With the metadata and the constituent streams, the system can then form or provide different presentations of the data forming the original composite image.

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[0022] Fig. 1 shows a video conference image 112 with six participants. Video conferencing equipment located at each participant's location captures and encodes video, audio, and/or other data and forms a multimedia stream 102, 104, 106, 108, etc. A multimedia stream 102, 104, 106, 108, etc. defines an on-going stream or flow of data that captures the actions of the participants. The multimedia streams 102, 104, 106, 108, etc. are generally sent to a multipoint control unit (MCU) 110.

[0023] The multipoint control unit 110 may then create a composite image 112 from the multimedia streams. A composite image 112 is a display for a display device that includes two or more regions 114, 116, 118, 120, 122, and/or 124 within the display area 112. A region 114, 116, 118, 120, 122, and/or 124 is a portion of the display defined by some control information (for example, coordinates, dimensions, etc.). For example, the composite display 112 in Fig. 1 has six regions 114, 116, 118, 120, 122, and/or 124, one for each multimedia stream 102, 104, 106, 108, etc. As the video conference is conducted, each of the multimedia streams 102, 104, 106, 108, etc. can be displayed in the regions 114, 116, 118, 120, 122, and/or 124 of the composite image 112. The composite multimedia data for the composite image 112 can be packaged into a composite multimedia stream and sent back to the participants for display on each participant's terminal video conferencing equipment.

[0024] An embodiment of a system 200 operable to decompose and recompose a composite multimedia stream is shown in Fig. 2. The several components of the system 200 may be hardware, software, or a combination of hardware and software. Descriptions of the computer system environment and the computer systems which may embody the several components of system 200 are described in conjunction with Figs. 6 and 7. As such, a functional description of the several components of system 200 shall follow.

[0025] In embodiments, a multimedia server 202 creates a composite multimedia stream. During a video conference, two or more participants 204 and 206 can create a multimedia stream. Video conferencing equipment at each participants' location may capture and encode the video for the conference, the audio of those speaking during the conference, and presentations of other materials (slide shows, video playback, etc.). The captured and encoded media form the multimedia streams. The multimedia streams may be a stream of video, audio, or other data that represents the conference at the participants' location. In embodiments, the multimedia stream is a stream of digital data, such as an MPEG-encoded video stream. However, video, audio, and other data can be captured and encoded separately and provided as two or more separate streams of data that are synchronized using time stamps or other information. There may be more participants in the video conference than those shown, as represented by ellipses 208.

[0026] The multimedia server 202 receives the two or more multimedia streams from the conference participants 204 and/or 206. A multimedia server 202 may include a multipoint control unit 210, a controlling server 212, and possibly one or more other components. The MCU 210 receives and composes the two or more multimedia streams into a composite multimedia stream, as explained in conjunction with Fig. 1. To determine the format of the composite multimedia stream, the controlling server 212 provides control information to the MCU 210. The control information can include static control information and dynamic control information. The static control information may be predetermined or user-selected. Dynamic control information, in contrast, includes control information that does change with time. In embodiments, control information is metadata or metainformation. Control information may be embodied as a separate stream of data or as part of the multimedia data created and sent by the multimedia server 202. For example, the metadata can include time stamps or other information in packet headers, data frame or other packetizing information, header information for transport media data packets or video image data packets, etc. The metadata or control information provides the information used to decompose and recompose the multimedia streams as described hereinafter.

[0027] After the composite multimedia stream is formed, the MCU 210 can send the composite multimedia stream back to the conference participants 204 and/or 206 to be displayed on the video conferencing equipment. Further, the MCU 210 can send the composite multimedia stream to a network 214 to be received by one or more ancillary server 216, 218, 220, and/or 222. The network 214 may be as explained in conjunction with Fig. 6. The ancillary servers 216, 218, 220, and/or 222 are computer systems and/or software operable to decompose and recompose the composite multimedia stream. In embodiments, the ancillary servers 216, 218, 220, and/or 222 are computer systems as explained in conjunction with Figs. 6 and 7. An ancillary server 216 can be a hardware computer system operable to execute one or more functional software servers 218 and/or 220. Thus, ancillary server 4 216 may receive data and determine to which server 218 or 220 to send the data for processing. As such, the ancillary server 4 216 is shown receiving data but not sending an output to another application. Embodiments of the system 200 can include fewer or more ancillary servers 216, 218, 220, and/or 222, as represented by ellipses 224.

[0028] An ancillary server 216, 218, 220, or 222 executes to decompose the composite multimedia stream. Further, the ancillary server 216, 218, 220, or 222 may recompose, filter, alter, or otherwise process the decomposed multimedia stream into one or more of the constituent multimedia streams or into a new composite multimedia stream. The recomposition of the new composite multimedia stream may be governed by user-specified control information or by the requirements of a user application. The output from the ancillary server 216, 218, 220, and/or 222 may be sent to one of several components including, but not limited to, consumer module 1 226, consumer module 2 228, or multimedia content store 230.

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[0029] A consumer module 1 226 and consumer module 2 228 can be a user application or other system operable to process or use the output from the ancillary server 216. For example, consumer module 1 226 may be a video review function required by the government to eliminate objectionable language from video broadcasts. In other examples, consumer module 2 228 can be another video participant that desires to view a different composite image than the composite image provided by the MCU 210. Further, a separated multimedia stream or recomposed multimedia stream can also be stored into multimedia content store 230. As shown, two or more ancillary servers 220, and 222 may share the multimedia content store 230. Thus, the different outputs from different ancillary servers 216, 218, 220, or 222 can be stored. The system 200 can include more or fewer consumer modules, as represented by ellipses 232 and/or more or fewer ancillary servers 216, 218, 220, and/or 222, as represented by ellipses 224.

[0030] An embodiment of an ancillary server 300 is shown in Fig. 3. The ancillary server 300 can be the same as or similar to ancillary servers 216, 218, 220, and/or 222 (Fig. 2). In embodiments, the ancillary server 300 is a computer system as described in conjunction with Fig. 7. The ancillary server 300 can have one or more components, which may execute as computer modules. The ancillary server 300 can include one or more of, but is not limited to, a control information database 302, a decomposer module 304, a recomposer (and/or filter) 306, a preferences database 308, and/or an interface 310.

[0031] The control information database 302 can store control information 312 that describes a format for the composite multimedia stream 314. The control information 312 may be static control information that does not change over time. As such, the control information database 302 need not update the control information 312. Rather, the control information 312 can be received once from the MCU (Fig. 2) or the controlling server 212 (Fig. 2) and stored permanently for use in decomposing the composite multimedia stream 314. The control information 312 can describe a format for a composite multimedia display provided by the composite multimedia stream 314. The format of the composite multimedia display can include a layout for the composite multimedia display, The layout may have two or more regions in the composite multimedia display, as described in conjunction with Fig. 1. The control information database 302 can send or provide the control information 312 to the decomposer 304.

[0032] The decomposer module 304 receives the control information 312, the composite multimedia stream 314, and dynamic control information 316. The decomposer module 304 can determine the format for the composite multimedia stream 314 from the control information 312 and the dynamic control information 316. Then, the decomposer module 304 may decompose or separate the composite multimedia stream 314 into two or more constituent streams or constituent parts based on the control information 312 and/or 316. One or more of the constituent streams decomposed from the composite multimedia stream 314 can be sent to an interface module 310 to be sent to a user module 226 or 228 (Fig. 2). In another embodiment, the one or more of the constituent streams decomposed from the composite multimedia stream 314 are sent to a recomposer 306.

[0033] A recomposer module 306 can recompose two or more constituent streams of the decomposed composite multimedia stream 314 into a second composite multimedia stream. In other words, the recomposer 306 can create a new composite multimedia stream for a new composite multimedia display from the decomposed parts of the original composite multimedia stream 314. Further, the recomposer 306 may include a filter module operable to filter out one of the constituent streams of the composite multimedia stream 314 to create the second composite multimedia stream. The second composite multimedia stream may include only one of the constituent parts of the composite multimedia stream 314 or fewer constituent streams than the composite multimedia stream 314. The second or new composite multimedia stream can be sent to the interface module 310 to be sent to a user module 226 or 228 (Fig. 2) or to a multimedia content store 230 (Fig. 2). The interface module 310 is any hardware and/or software that allows the ancillary server 300 to communicate with another component or system.

[0034] The ancillary server 300 may also include a preferences database 308. The preference database 308 can store a preference for the second or recomposed composite multimedia stream. A preference can be control information from the user module 226 or 228 (Fig. 2) or a multimedia content store 230 (Fig. 2). The preference describes a desired format for the second composite multimedia stream or the second composite multimedia display. The preference database 308 may store the preferences and provide the preferences to the recomposer 306 to assist in recomposing, filtering, or processing the decomposed multimedia stream. In embodiments, the preference multimedia content store 230 can include two or more sets of preferences. Each set of preferences may match the requirements of different and distinct applications.

[0035] An embodiment of a data structure embodying a composite multimedia stream 416a is shown in Fig. 4C. A composite multimedia stream 416a can be composed of two or more constituent streams included in two or more data fields. There may be more or fewer constituent streams than those shown in Fig. 4C, as represented by ellipses 426. Each constituent stream or constituent part can be a multimedia stream. For example, composite multimedia stream 416a comprises multimedia streams 418a, 420a, 422a, and 424a. The separate multimedia streams 418a, 420a, 422a, and 424a are compiled and formatted into a single composite multimedia stream 416a that has two or more constituent streams.

[0036] In contrast, the composite multimedia stream 416a is shown as two or more data structures embodying a

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decomposed multimedia stream 416b in Fig. 4D. The decomposed multimedia stream 416b includes at least one of the same constituent streams or data fields as the composite multimedia stream 416a. For example, the decomposed multimedia stream 416b includes multimedia streams 418b, 420b, 422b, and 424b. However, unlike composite multimedia stream 416a, the decomposed multimedia stream 416b separates the multimedia streams 418b, 420b, 422b, and 424b into separate and discrete multimedia streams. Thus, the constituent streams of the composite multimedia stream 416a may be processed apart for the other constituent streams of or the composed composite multimedia stream 416a.

[0037] Embodiments of data structures 400 and 402 embodying the information received by the ancillary server 300 for decomposing a composite multimedia stream 416a are shown in Figs. 4A and 4B. The data structures 400 and 402 may include two or more data fields; the data structures 400 and 402 can have fewer or more data fields than those shown in Figs. 4A and 4B, as represented by ellipses 408 and 414. In embodiments, the data structure 400 includes data fields for video data 404 and/or audio data 406. The video and audio data may be encompassed in a single multimedia data field. Generally, the video data field 404 includes the visual video data for the composite multimedia stream. The audio data field 406 includes the audio data for the composite multimedia stream.

[0038] Control data 402, shown in Fig. 4B, represents the control data received by or stored and retrieved by the ancillary server 300 (Fig. 3). Control data 402 can thus include static control data field 410 and dynamic control data field 412. As explained in conjunction with Fig. 2, static control information or data 410 is control information that does not change with time. For example, static control information 410 can include one or more of, but is not limited to, the composite image format, the size of the regions in the composite image, which region a multimedia stream is assigned, etc. An example of static control information 410 may be as follows:

```
<msml version="1.1">
 <createconference name="qsplit">
 <audiomix>
   <asn/>

  <n-loudest n=" 1"/>
</audiomix>
<videolayout type="text/msml-basic-layout">
   <root size="CIF"/>
   <region id="1" left="0" top="0" relativesize="2/3"/>
   <region id="2" left="67%" top="0" relativesize="1/3"/>
   <region id="3" left="67%" top="33%" relativesize="1/3">
   <region id="4" left="67%" top="67%" relativesize="1/3"/>
   <region id="5" left="33%" top="67%" relativesize="1/3"/>
   <region id="6" left="0" top="67%" relativesize="1/3"/>
 </videolayout>
</createconference>
</msml>
```

Above, the static control information 410 generates or describes a layout for the composite multimedia image as shown in Fig. 1. Another example of static control information 410 is shown below:

```
<!- Join to region 1 -->
<msml version=" 1.1">
  <join id1="conn:1" id2="conf:qsplit">
  <stream media="audio"/>
  <stream media="video" dii="to-id1"/>
  <stream media="video" dir="from-id1" "display="1"/>
  </join>
</msml>
<!- Join to region 2 -->
<msml version=" 1.1">
  <join id1="conn:2"id2="conf:qsplit">
  <stream media="audio"/>
  <stream media="video" dir="to-id 1"/>
  <stream media="video" dir="from-id1" "display="2"/>
  </join>
</msml>
<!- Join to region 3 -->
<msml version=" 1.1">
  <join id1="conn:3" id2="conf:qsplit">
```


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```
    <stream media="audio"/>
    <stream media="video" dir="to-id 1"/>
    <stream media="video" dir="from-id1" display="3"/>
    </join>
</msml>
<!- Join to region 4 -->
.........
<!- Join to region 5 -->
.........
 <!- Join to region 6 -->
```

Above, the static control information 410 assigns each predetermined multimedia stream received from each participant to at least one region of the composite image as shown in Fig. 1. As such, the static control information 410 helps determine how the composite image will be rendered.

[0039] Dynamic control information 412 includes control information that does change with time or in response to an action or event. Examples of dynamic control information 412 can include one or more of, but is not limited to, which multimedia stream may be highlighted in a main or expanded region 114 (Fig. 1) of the composite image 112 (Fig. 1), algorithms to determine the highlighted multimedia stream, to which region of the composite multimedia display layout a constituent stream of the composite multimedia stream is assigned, etc. In other words, the dynamic control information 412 temporally describes which constituent stream of the composite multimedia stream 416 is displayed in which region of the composite multimedia display 112. An example of dynamic control information 412 is as follows:

```
<?xml version=" 1.0" encoding="US-ASCII"?>
<msml version=" 1.1">
        <event name="msml.conf.asn" id="conf:example">
                <name>speaker</name>
                <value>conn:hd93tg5hdf</value>
                <name> speaker</name>
                <value>conn:w8cn59vei7</value>
                <name>speaker</name>
                <value>conn:p78fnh6sek47fg</value>
        </event>
</msml>
```

The above dynamic control information 412 alerts the MCU 210 (Fig. 2) to which speaker at which participant location is active. For example, the speaker having the highest volume input may be the active speaker. With different speakers participating at different times, this information can change during a video conference. The multimedia stream having the active speaker may be shown in the expanded section 114 (Fig. 1) of the composite image 112 (Fig. 1). The example of dynamic control information above dictates changing the display according to the active speaker. Thus, the dynamic control information 412 changes in response to an assignment change to the composite multimedia display layout. Both the static control information 410 and the dynamic control information 412 can assist the ancillary server 300 (Fig. 3) in decomposing and recomposing the composite multimedia stream. It should be noted that the data structures 400 and 402 are shown as two separate data structures encompassing different data. However, the data may be embodied in a single data stream. For example, control data 402 may be sent and received with or in-band with the video data 404 or the audio data 406.

[0040] An ancillary server 218 can also request types of control data. For example, the ancillary server may send the request AUDIT_CONFERENCE to the MCU 210. The MCU 210 can return a list of all participants in a teleconference to the ancillary server 218; the list can include one or more connection identifiers for the participants. To provide information about certain named participants, the ancillary server 218 may also send a MAP_CONNECTION request to the MCU 210. The MUC 210 can response to the MAP_CONNECTION request by providing a username associated with the connection identifiers provided in response to the AUDIT_CONFERENCE request. A consumer module 1 226 may be interested in inputs to the teleconference from one or more selected participants. With the information from the AUDIT_CONFERENCE and MAP_CONNECTION requests, the ancillary server 218 can provide the information about the selected participants by username.

[0041] An embodiment of a method 500 for decomposing and recomposing a composite multimedia stream 416 is shown in Fig. 5. Generally, the method 500 begins with a start operation 502 and terminates with an end operation 528. While a general order for the steps of the method 500 are shown in Fig. 5, the method 500 can include more or fewer steps or arrange the order of the steps differently than those shown in Fig. 5. The method 500 can be executed as a set of computer-executable instructions executed by a computer system and encoded or stored on a computer readable

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medium. Hereinafter, the method 500 shall be explained with reference to the systems, components, modules, data structures, etc. described in conjunction with Figs. 1-4D.

[0042] The ancillary server 300 (similar to ancillary server 216, 218, 220, or 222) receives static control information 410 from an MCU 210 through a network 214 in step 504. The static control information 410 may be received before a composite multimedia stream 416a and stored in a control information database 302. Further, the ancillary server 300 receives the composite multimedia stream 416 from the MCU 210 through a network 214 in step 506. The composite multimedia stream 416 provides a composite multimedia display 112.

[0043] The decomposer 304 determines two or more regions for the composite multimedia display 112 using the static control information 410 in step 508. To determine the regions, the decomposer 304 reads the static control information 410 to determine the regions 114, 116, 118, 120, 122, and/or 124 forming the composite multimedia display 112. For a particular composite multimedia stream 416, the decomposer 304 can also determine to which region each constituent stream of the composite multimedia stream 416 shall be assigned.

[0044] Either during (substantially in real time) or after the video conference, the ancillary server 300 also receives the dynamic control information 412 in step 510. In embodiments, the ancillary server 300 receives new dynamic control information 412 as the dynamic control information 412 changes during the video conference. For example, the dynamic control information 412 can change as the multimedia stream having the active microphone changes; new dynamic control information 412 can be pushed to the ancillary server 300 from the MCU 210. In other embodiments, the ancillary server 300 may receive the dynamic control information 412 periodically (for example, every second or minute) or continuously.

[0045] For a predetermined time in the video conference, the ancillary server 300 determines a constituent stream of the composite multimedia stream 416 associated with a region of the composite multimedia display 112 in step 512. To determine the constituent stream, the decomposer 304 reads the dynamic control information 412 to determine which constituent stream 418a, 420a, 422a, and 424a of the composite multimedia stream 416 is assigned to which region 114, 116, 118, 120, 122, and/or 124 forming the composite multimedia display 112. For example, if the decomposer 304 is interested in the first constituent stream 418a of the composite multimedia stream 416, the decomposer 304 may determine if the first constituent stream 418a has the active microphone from the dynamic control information 412. If the 418a does have the active microphone, the decomposer 304 can determine to which region 114 the multimedia stream 418b with the active microphone is assigned. Similarly, the decomposer 304 can determine a second constituent stream 420a of the composite multimedia stream 416 that may not have the active microphone and is assigned to a second region 116 of the composite multimedia display 112.

[0046] Then, the ancillary server 300 may perform one or more actions on the constituent stream. In an embodiment, the ancillary server 300 can extract at least a one or more constituent streams 418a, 420a, 422a, and 424a (a discrete multimedia stream) from the composite multimedia stream 416a in step 514. The process of extraction is to separate one or more streams from the group of constituent streams 418a, 420a, 422a, and 424a. For example, the decomposer 304 can extract or copy the data associated with the first constituent stream 418a of the composite multimedia stream 416a from that region 114 of the composite multimedia display 112 and assemble the extracted data into a constituent multimedia stream 418b. The decomposer 304 can extract a second or more constituent streams from the composite multimedia stream 416a and create other constituent multimedia stream 420b, 422b, or 424b from the other extracted constituent streams of the composite multimedia stream 416b. The ancillary server 300 may extract the first constituent stream 418a from a first determined region of the composite multimedia display 112 when a microphone is active and a second determined region when the microphone is not active. In embodiments, the ancillary server 300 extracts only the audio or only the video from a composite multimedia stream 416a. The extracted audio or video data may be associated with one or more of the constituent streams 416b.

[0047] A filter 306 can filter a constituent stream 418b from the group of constituent multimedia streams 418b, 420b, 422b, and 424b in step 516. The process of filtration removes one or more constituent streams from the group of constituent streams. For example, the filter 306 can delete all data related to the first constituent stream 418b included in the group of separate multimedia streams 418b, 420b, 422b, and 424b. Then, the filter 306 may pass the non-filtered constituent streams (e.g., a second constituent stream 420b and/or third constituent stream 422b) to the interface 310. In embodiments, the ancillary server 300 filters only the audio or only the video from a composite multimedia stream 416a. The filtered audio or video data may be associated with one or more of the constituent streams 416b.

[0048] The recomposer 306 may also compile a recomposition list for the constituent multimedia streams 418b, 420b, 422b, and 424b in step 518. A recomposition list is a list of one or more constituent streams that are required for recomposition into a new composite multimedia display. For example, the recomposer 306 may create a new composite multimedia display where only the first constituent stream 418b, second constituent stream 420b, and third constituent stream 422b are included in the display. Then, the recomposer can generate a new composite multimedia stream that includes the first constituent stream 418b, second constituent stream 420b, and third constituent stream 422b. In other embodiments, the recomposer 306 can recompose a new multimedia stream after one or more constituent streams of the separate multimedia streams 418b, 420b, 422b, and 424b is filtered. Yet, before recomposing the new multimedia

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stream, the recomposer must retrieve the constituent streams.

[0049] The ancillary server 300 may then determine if another constituent stream needs to be decomposed in step 520. For example, the ancillary server 300 may extract a first constituent multimedia stream 418b but may still need to extract a second constituent multimedia stream 420b. If the ancillary server 300 does need to decompose another constituent stream, the method 500 flows YES back to the determine step 512. However, if the ancillary server 300 does not need to decompose another constituent stream, the method 500 flows NO where the ancillary server synthesizes the recomposition lists 522.

[0050] The ancillary server 300 can receive one or more target layout specifications for the constituent streams. A target layout specification defines what information the target application (e.g., the consumer module 1 226, database 230, etc.) requires. The layout specification may also define a layout for a new multimedia display which can include two or more constituent streams. In embodiments, the new multimedia display may include constituent streams from two or more different instances of conferences (e.g., a constituent stream from conference A and a constituent stream from conference B). The ancillary server 300 can synthesize these lists by selecting the required constituent streams and providing those streams to the recomposer 306.

[0051] After synthesizing the recomposition lists, a recomposer 306 can recompose the constituent streams. Recomposing the streams can mean creating new composite displays with two or more constituent streams, sending one or more constituent streams to a target application, or processing the one or more constituent streams in one way or another. For example, the recomposer 306 may send the separate multimedia streams 418b, 420b, 422b, and 424b to an interface 310. The interface 310 may send a first multimedia stream 418b to a first user application (i.e., consumer module 1 226) and a second multimedia stream 420b to a second user application (i.e., multimedia content store 230). The recomposer 306 can also send a new composite multimedia stream for a new composite multimedia display to the interface 310 for sending to a target application. The recomposed images can also be reformatted. For example, a region of the display can be changed to increase or decrease the size of regions in the display or change the constituent stream providing the focal point of the display.

[0052] Extracting becomes important when indexing some of the data in a teleconference. Indexing is a process where only a specific participant(s) input is important. The ancillary server 300 can determine to which region of the composite display the participant is assigned. For example, if the only inputs of interest are from Joe Smith in Boston, the Boston feed for the teleconference is noted and the control data for that constituent stream is determined. Then, using the control information, the Boston constituent stream is extracted. Thus, all inputs and only inputs from the Boston stream are retrieved for use. Further, the times of the inputs can be recorded with the extracted stream giving a time-indexed constituent stream. The extracted and indexed stream may then be stored or used by an application.

[0053] The various recomposed streams may be stored. Thus, the new recomposed multimedia displays, the filtered, and the extracted constituent streams may be sent to data storage 230. Without all the other constituent streams, the filtered and extracted streams require far less storage and are not as intensive to process by the applications 226 or 228.

[0054] Example:

[0055] An example of decomposing and recomposing an image is presented hereinafter. First, the example explains how a continuous presence videoconference is created by the multimedia server 202 and explains the control information used by multimedia server 202 to create the videoconference. Then, the example shows how the same control information can also be used by an ancillary server 218 for the purpose of (video) stream decomposition.

[0056] Audio/Video continuous presence conference setup:

[0057] The example describes video conference setup using MSML (a popular media server control protocol). The multimedia server 202 sends a command to create the conference. The command is similar to the control information described above and provided again below:

```
<msml version="1.1">
<createconference name="qsplit">
<audiomix>
  <asn/>
  <n-loudest n="1"/>
 </audiomix>
<videolayout type="text/msml-basic-layout">
    <root size="CIF"/>
    <region id="1" left="0" top="0" relativesize="2/3"/>

   <region id="2" left="67%" top="0" relativesize="1/3"/>
   <region id="3" left="67%" top="33%" relativesize="1/3">
   <region id="4" left="67%" top="67%" relativesize="1/3"/>
   <region id="5" left="33%" top="67%" relativesize="1/3"/>
   <region id="6" left="0" top="67%" relativesize="1/3"/>
```


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```
  </videolayout>
</createconference>
</msml>
```

The control information is an example MSML conference creation command and creates a six-region layout similar to that shown in Fig. 1.

[0058] Following the conference creation, participants are added into the conference. Participants can either be statically assigned to a region in the layout upon joining the conference or the region mapping can be dynamic based on a particular participant attribute, e.g., the loudest speaker always occupies region 1. An example of static control information that can generate a static assignment was described earlier and is repeated below:

```
<!- Join to region 1 -->
<msml version="1.1">
  <join id1="conn:1"id2="conf:qsplit">
  <stream media="audio"/>
  <stream media="video" dir="to-id1"/>
  <stream media="video" dir="from-id1" display="1"/>
  </join>
</msml>
<!-Join to region 2 -->
<msml version=" 1.1 ">
  <join id1="conn:2" id2="conf:qsplit">
  <stream media="audio"/>
  <stream media="video" dir="to-id1"/>
  <stream media="video" dir="from-id1" display="2"/>
  </join>
</msml>
<!- Join to region 3 -->
<msml version="1.1">
  <join id1="conn:3" id2="conf:qsplit">
  <stream media="audio"/>
  <stream media="video" dir="to-id1"/>
  <stream media="video" dir="from-id1" display="3"/>
  </join>
</msml>
<!- Join to region 4 -->
.........
<!- Join to region 5 -->

 .........
 <!- Join to region 6 -->
```

This control information puts each participant into a selected region of the display 112 of Fig. 1.

[0059] Decomposing the conference video stream:

[0060] The ancillary server 218 now accesses the information content of the two commands shown above to deconstruct how the composite conference video frames are created and which stream is mapped to which area of the layout template. Thus, the ancillary server 218 uses the same control information used to create the composite video stream to decompose the composite video stream.

[0061] In the example above, for instance, the composite picture is of 'CIF' resolution, which is 352 X 288 pixels. From the conference create command, the ancillary server 218 can understand that there are six component pictures in the composite frame. Furthermore, the ancillary server 218 can compute the sizes and locations of each component picture with the coordinate information in the control information. The sizes and locations of the regions in the composite layout are as follows:

- Picture 1 114 (Fig. 1) is size 235 by 192 pixels;
- Pictures 2 through 6 116, 118, 120, 122, and 124 (Fig. 1) are each size 117 by 96 pixels;
- Picture 1 114 (Fig. 1) has top left coordinates of [0,0];
- Picture 2 116 (Fig. 1) has top left coordinates of [236,0];
- Picture 3 118 (Fig. 1) has top left coordinates of [236, 97].

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Similarly, the ancillary server 218 can find the top right, bottom left, and bottom right coordinates for each component picture.

[0062] Although the above control information allows the ancillary server 218 to decompose various regions in the composite image, static control information does not specify how participants joining the conference are mapped to the regions of the layout. The "display = n" field in the join command identifies the region to which a particular stream is assigned. But the ancillary server 218 performing the video decomposition needs additional knowledge to map dynamically a conference participant to a given region in the layout. This information is provided by dynamic control information. Examples of dynamic control information includes two real-time control messages exchanged between the ancillary server 218 and the MCU 210. The example real-time control messages are:

[0063] AUDIT CONFERENCE message:

[0064] The AUDIT_CONFERENCE message is sent by the ancillary server 218 to the MCU 210. Upon receipt, the MCU 210 responds by sending a list of all conference participants to the Recoding UA.

[0065] MAP CONNECTION message:

[0066] The MAP_CONNECTION message is also sent by the ancillary server 218 to the MCU 210. Upon receipt, the MCU 210 responds with the Username associated with the connection identifier.

[0067] These message exchanges allow the ancillary server 218 to determine, for example, that "conn:1" is "User1". This information, in turn, allows the ancillary server 218 to handle commands from the consumer module 226, such as, "record all of User1's active participation." Thus, with the control information, both dynamic and static control information, the ancillary server 218 can process the composite video image for the consumer module 226.

[0068] Figure 6 illustrates a block diagram of a system 600 that may function as system 200 to provide decomposed composite multimedia streams. The system 600 includes one or more user computers 605, 610, and 615. The user computers 605, 610, and 615 may be general purpose personal computers (including, merely by way of example, personal computers and/or laptop computers running various versions of Microsoft Corp.'s Windows™ and/or Apple Corp.'s Macintosh™ operating systems) and/or workstation computers running any of a variety of commercially-available UNIX™ or UNIX-like operating systems. These user computers 605, 610, 615 may also have any of a variety of applications, including for example, database client and/or server applications, and web browser applications. Alternatively, the user computers 605, 610, and 615 may be any other electronic device, such as a thin-client computer, Internet-enabled mobile telephone, and/or personal digital assistant, capable of communicating via a network (e.g., the network 620 described below) and/or displaying and navigating web pages or other types of electronic documents. Although the exemplary system 600 is shown with three user computers, any number of user computers may be supported.

[0069] System 600 further includes a network 620. The network 620 may can be any type of network familiar to those skilled in the art that can support data communications using any of a variety of commercially-available protocols, including without limitation TCP/IP, SNA, IPX, AppleTalk, and the like. Merely by way of example, the network 620 maybe a local area network ("LAN"), such as an Ethernet network, a Token-Ring network and/or the like; a wide-area network; a virtual network, including without limitation a virtual private network ("VPN"); the Internet; an intranet; an extranet; a public switched telephone network ("PSTN"); an infra-red network; a wireless network (e.g., a network operating under any of the IEEE 602.11 suite of protocols, the Bluetooth™ protocol known in the art, and/or any other wireless protocol); and/or any combination of these and/or other networks. The network 620 may be the same or similar to network 214.

[0070] The system may also include one or more server computers 625, 630. One server may be a web server 625, which may be used to process requests for web pages or other electronic documents from user computers 605, 610, and 620. The web server can be running an operating system including any of those discussed above, as well as any commercially-available server operating systems. The web server 625 can also run a variety of server applications, including HTTP servers, FTP servers, CGI servers, database servers, Java servers, and the like. In some instances, the web server 625 may publish operations available operations as one or more web services.

[0071] The system 600 may also include one or more file and or/application servers 630, which can, in addition to an operating system, include one or more applications accessible by a client running on one or more of the user computers 605, 610, 615. The server(s) 630 may be one or more general purpose computers capable of executing programs or scripts in response to the user computers 605, 610 and 615. As one example, the server may execute one or more web applications. The web application may be implemented as one or more scripts or programs written in any programming language, such as Java™, C, C#™ or C++, and/or any scripting language, such as Perl, Python, or TCL, as well as combinations of any programming/scripting languages. The application server(s) 630 may also include database servers, including without limitation those commercially available from Oracle, Microsoft, Sybase™, IBM™ and the like, which can process requests from database clients running on a user computer 605.

[0072] The web pages created by the web application server 630 may be forwarded to a user computer 605 via a web server 625. Similarly, the web server 625 may be able to receive web page requests, web services invocations, and/or input data from a user computer 605 and can forward the web page requests and/or input data to the web application server 630. In further embodiments, the server 630 may function as a file server. Although for ease of description, Fig. 6 illustrates a separate web server 625 and file/application server 630, those skilled in the art will recognize that the

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functions described with respect to servers 625, 630 may be performed by a single server and/or a plurality of specialized servers, depending on implementation-specific needs and parameters. The computer systems 605, 610, and 615, file server 625 and/or application server 630 may function as multimedia servers 202, ancillary servers 216, 218, 220, and/or 222, or other systems described herein.

[0073] The system 600 may also include a database 635, which may be the same or similar to multimedia content store 230, 302, or 306. The database 635 may reside in a variety of locations. By way of example, database 635 may reside on a storage medium local to (and/or resident in) one or more of the computers 605, 610, 615, 625, 630. Alternatively, it may be remote from any or all of the computers 605, 610, 615, 625, 630, and in communication (e.g., via the network 620) with one or more of these. In a particular set of embodiments, the database 635 may reside in a storage-area network ("SAN") familiar to those skilled in the art. Similarly, any necessary files for performing the functions attributed to the computers 605, 610, 615, 625, 630 may be stored locally on the respective computer and/or remotely, as appropriate. In one set of embodiments, the database 635 may be a relational database, such as Oracle 10i™, that is adapted to store, update, and retrieve data in response to SQL-formatted commands.

[0074] Figure 7 illustrates one embodiment of a computer system 700 upon which multimedia server 202, ancillary servers 216, 218, 220, and/or 222, or other systems described herein may be deployed or executed. The computer system 700 is shown comprising hardware elements that may be electrically coupled via a bus 755. The hardware elements may include one or more central processing units (CPUs) 705; one or more input devices 710 (e.g., a mouse, a keyboard, etc.); and one or more output devices 715 (e.g., a display device, a printer, etc.). The computer system 700 may also include one or more storage device 720. By way of example, storage device(s) 720 may be disk drives, optical storage devices, solid-state storage device such as a random access memory ("RAM") and/or a read-only memory ("ROM"), which can be programmable, flash-updateable and/or the like.

[0075] The computer system 700 may additionally include a computer-readable storage media reader 725; a communications system 730 (e.g., a modem, a network card (wireless or wired), an infra-red communication device, etc.); and working memory 740, which may include RAM and ROM devices as described above. In some embodiments, the computer system 700 may also include a processing acceleration unit 735, which can include a DSP, a special-purpose processor and/or the like.

[0076] The computer-readable storage media reader 725 can further be connected to a computer-readable storage medium, together (and, optionally, in combination with storage device(s) 720) comprehensively representing remote, local, fixed, and/or removable storage devices plus storage media for temporarily and/or more permanently containing computer-readable information. The communications system 730 may permit data to be exchanged with the network 720 and/or any other computer described above with respect to the system 700. Moreover, as disclosed herein, the term "storage medium" may represent one or more devices for storing data, including read only memory (ROM), random access memory (RAM), magnetic RAM, core memory, magnetic disk storage mediums, optical storage mediums, flash memory devices and/or other machine readable mediums for storing information.

[0077] The computer system 700 may also comprise software elements, shown as being currently located within a working memory 740, including an operating system 745 and/or other code 750, such as program code implementing the ancillary server 300. It should be appreciated that alternate embodiments of a computer system 700 may have numerous variations from that described above. For example, customized hardware might also be used and/or particular elements might be implemented in hardware, software (including portable software, such as applets), or both. Further, connection to other computing devices such as network input/output devices may be employed.

[0078] In the foregoing description, for the purposes of illustration, methods were described in a particular order. It should be appreciated that in alternate embodiments, the methods may be performed in a different order than that described. It should also be appreciated that the methods described above may be performed by hardware components or may be embodied in sequences of machine-executable instructions, which may be used to cause a machine, such as a general-purpose or special-purpose processor or logic circuits programmed with the instructions to perform the methods. These machine-executable instructions may be stored on one or more machine readable mediums, such as CD-ROMs or other type of optical disks, floppy diskettes, ROMs, RAMs, EPROMs, EEPROMs, magnetic or optical cards, flash memory, or other types of machine-readable mediums suitable for storing electronic instructions. Alternatively, the methods may be performed by a combination of hardware and software.

[0079] Specific details were given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits may be shown in block diagrams in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail in order to avoid obscuring the embodiments.

[0080] Also, it is noted that the embodiments were described as a process which is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged. A process is terminated when its operations are completed, but could have additional

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steps not included in the figure. A process may correspond to a method, a function, a procedure, a subroutine, a subprogram, etc. When a process corresponds to a function, its termination corresponds to a return of the function to the calling function or the main function.

[0081] Furthermore, embodiments may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware or microcode, the program code or code segments to perform the necessary tasks may be stored in a machine readable medium such as storage medium. A processor(s) may perform the necessary tasks. A code segment may represent a procedure, a function, a subprogram, a program, a routine, a subroutine, a module, a software package, a class, or any combination of instructions, data structures, or program statements. A code segment may be coupled to another code segment or a hardware circuit by passing and/or receiving information, data, arguments, parameters, or memory contents. Information, arguments, parameters, data, etc. may be passed, forwarded, or transmitted via any suitable means including memory sharing, message passing, token passing, network transmission, etc.

[0082] An alternative embodiment provides for the ancillary server 300 to receive two or more composite multimedia stream 314 from two or more video conference instances. The decomposer 304 can decompose the two or more composite multimedia streams 314. Thus, the decomposer 304 can product constituent parts for two or more video conferences. The recomposer 306 can then recompose the constituent parts from the different video conferences into a third composite image or into a new display. Thus, if an application is interested in parts of separate video conferences, those parts can be placed together for the application.

[0083] While illustrative embodiments of the invention have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed, and that the appended claims are intended to be construed to include such variations, except as limited by the prior art.

Claims

1. A method, comprising:

   a processor receiving control information and a composite multimedia stream, the composite multimedia stream providing a composite multimedia display and the control information describing a characteristic of the composite multimedia stream;
   the processor determining, from the control information, first and second regions of the composite multimedia display;
   the processor determining, for a determined time and with the control information, a first constituent stream of the multimedia stream associated with the first region of the composite multimedia display; and
   the processor extracting the first constituent stream of the multimedia stream from the composite multimedia stream.

2. The method as defined in claim 1, wherein the control information includes static control information and dynamic control information.

3. The method as defined in claim 1, further comprising:

   for the predetermined time, the processor determining, with the dynamic control information, a second constituent stream of the multimedia steam associated with a second region of the composite multimedia display; and
   the processor extracting the second constituent stream of the multimedia stream from the composite multimedia stream.

4. The method as defined in claim 3, further comprising:

   the processor sending the first constituent stream of the multimedia stream to a first user application; and
   the processor sending the second constituent stream of the multimedia stream to a second user application.

5. The method as defined in claim 3, wherein the composite multimedia stream comprises at least three constituent streams, and further comprising:

   the processor filtering out the first constituent stream of the composite multimedia stream; and
   the processor sending at least one of the second constituent stream of the composite multimedia stream or a third constituent stream of the composite multimedia stream to a user application.

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6. The method as defined in claim 5, wherein the user application is a multimedia content store.

7. The method as defined in claim 5, further comprising the user application recomposing the second constituent stream of the composite multimedia stream and the third constituent stream of the composite multimedia stream into a new composite multimedia stream, wherein the new multimedia stream provides a new composite multimedia display.

8. The method as defined in claim 1, wherein the control information describes a layout for the composite multimedia display.

9. The method as defined in claim 1, wherein the control information temporally describes which constituent stream of the composite multimedia stream is displayed in which region of the composite multimedia display.

10. An ancillary server comprising:

a processor operable to read and operable to execute two or more computer executable modules;
a memory in communication with the processor, the memory operable to store and operable to send the two or more computer executable modules to the processor; and
two or more computer executable modules comprising:

a control information database operable to store control information that describes a format for the first composite multimedia stream;
decomposer module in communication with the control information database, the decomposer operable to decompose a first composite multimedia stream into two or more constituent streams of the first composite multimedia stream based on the control information; and
a recomposer module in communication with the decomposer, the recomposer module operable to recompose the two or more constituent streams of the composite multimedia stream into a second composite multimedia stream.

11. The ancillary server as defined in claim 10, wherein the recomposer further comprises a filter module operable to filter out one of the constituent streams of the first composite multimedia stream to create the second composite multimedia stream.

12. The ancillary server as defined in claim 10, further comprising a preferences database in communication with the recomposer, the preferences database operable to store a preference for the second composite multimedia stream, wherein the preference describes a desired format for the second composite multimedia stream.

13. The ancillary server as defined in claim 10, wherein the control information describes a format for a composite multimedia display provided by the composite multimedia stream, wherein the format includes a layout for the composite multimedia display, the composite multimedia display layout having two or more regions.

14. The ancillary server as defined in claim 13, wherein the decomposer is operable to receive dynamic control information, wherein the dynamic control information describes to which region of the composite multimedia display layout a constituent stream of the composite multimedia stream is assigned.

15. The ancillary server as defined in claim 14, wherein the dynamic control information changes in response to an assignment change to the composite multimedia display layout.

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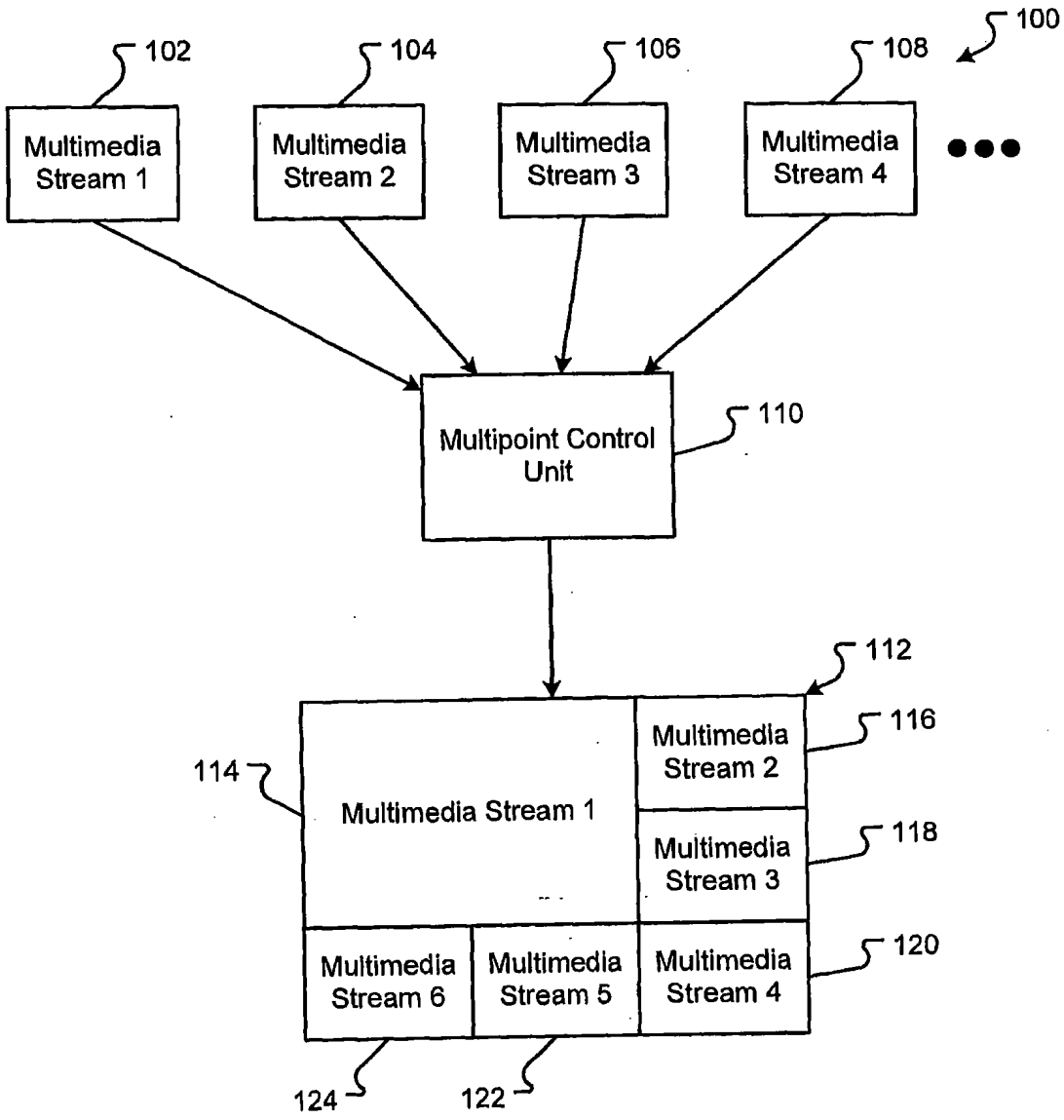


Fig. 1
(Prior Art)

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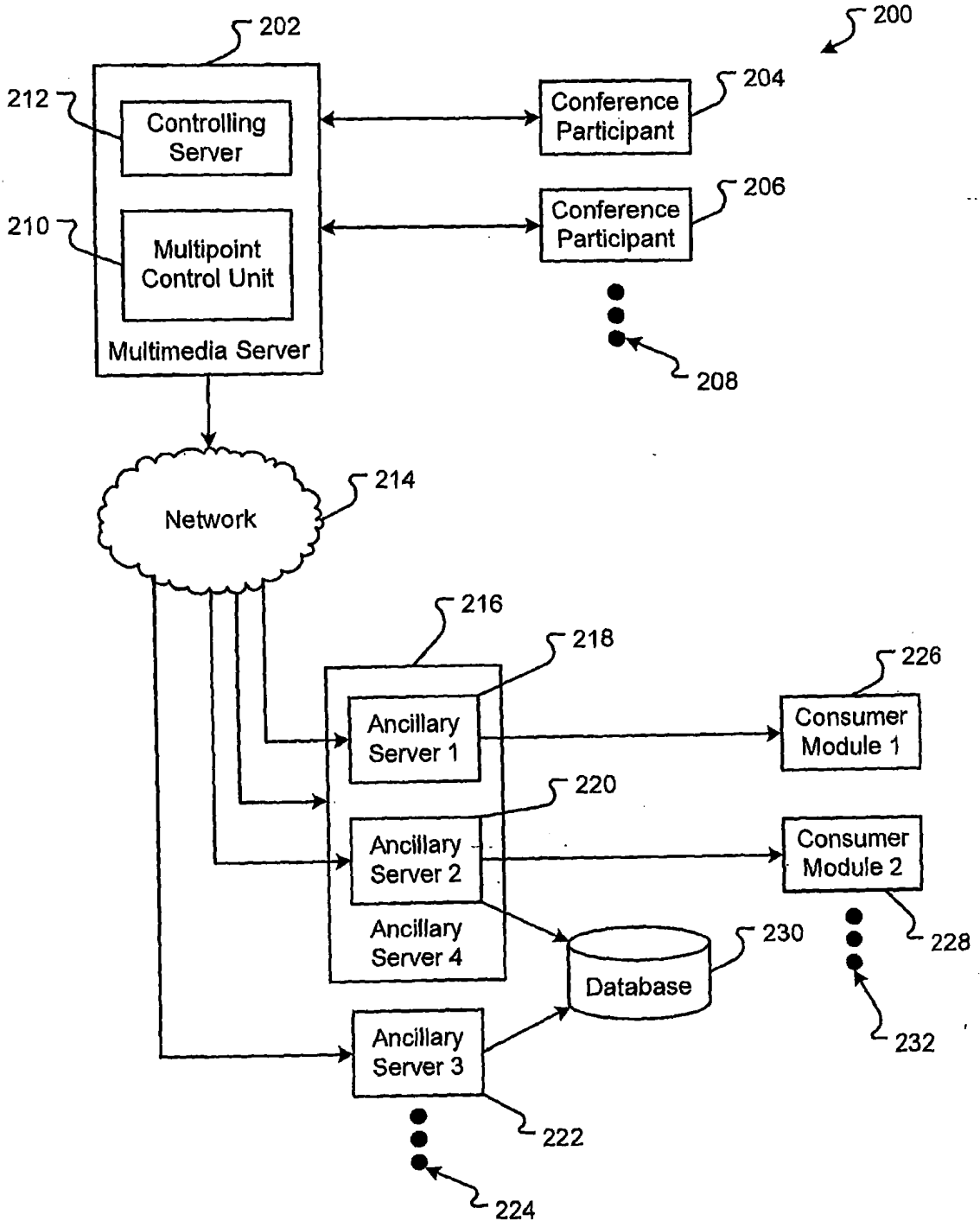


Fig. 2

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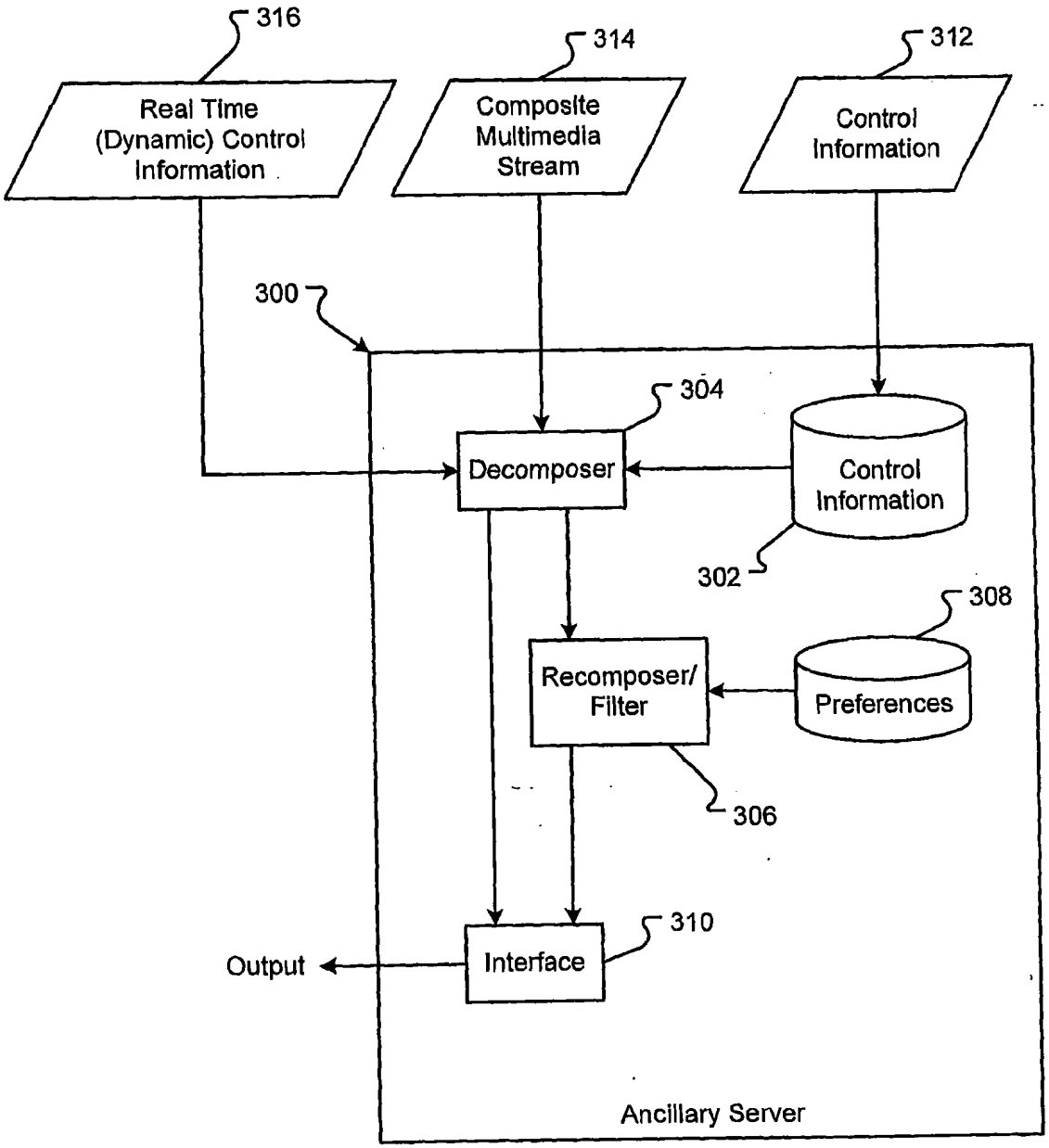


Fig. 3

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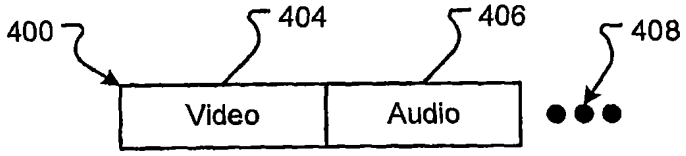


Fig. 4A

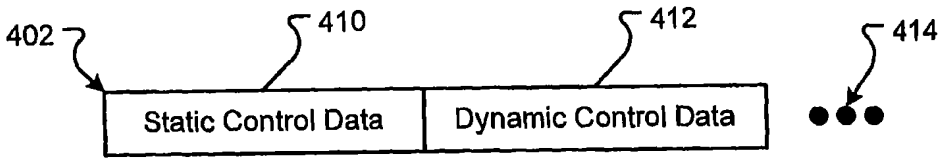


Fig. 4B

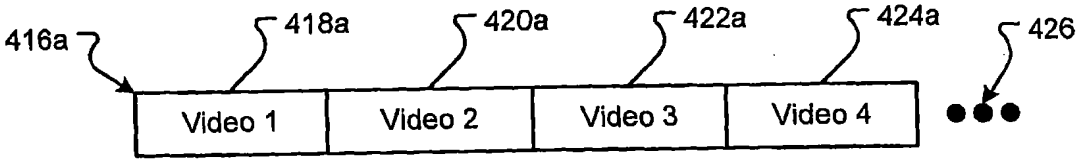


Fig. 4C

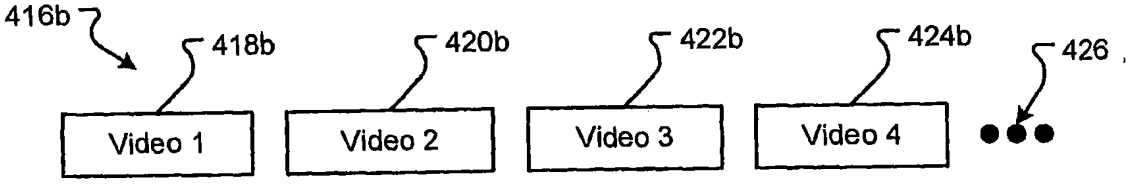


Fig. 4D

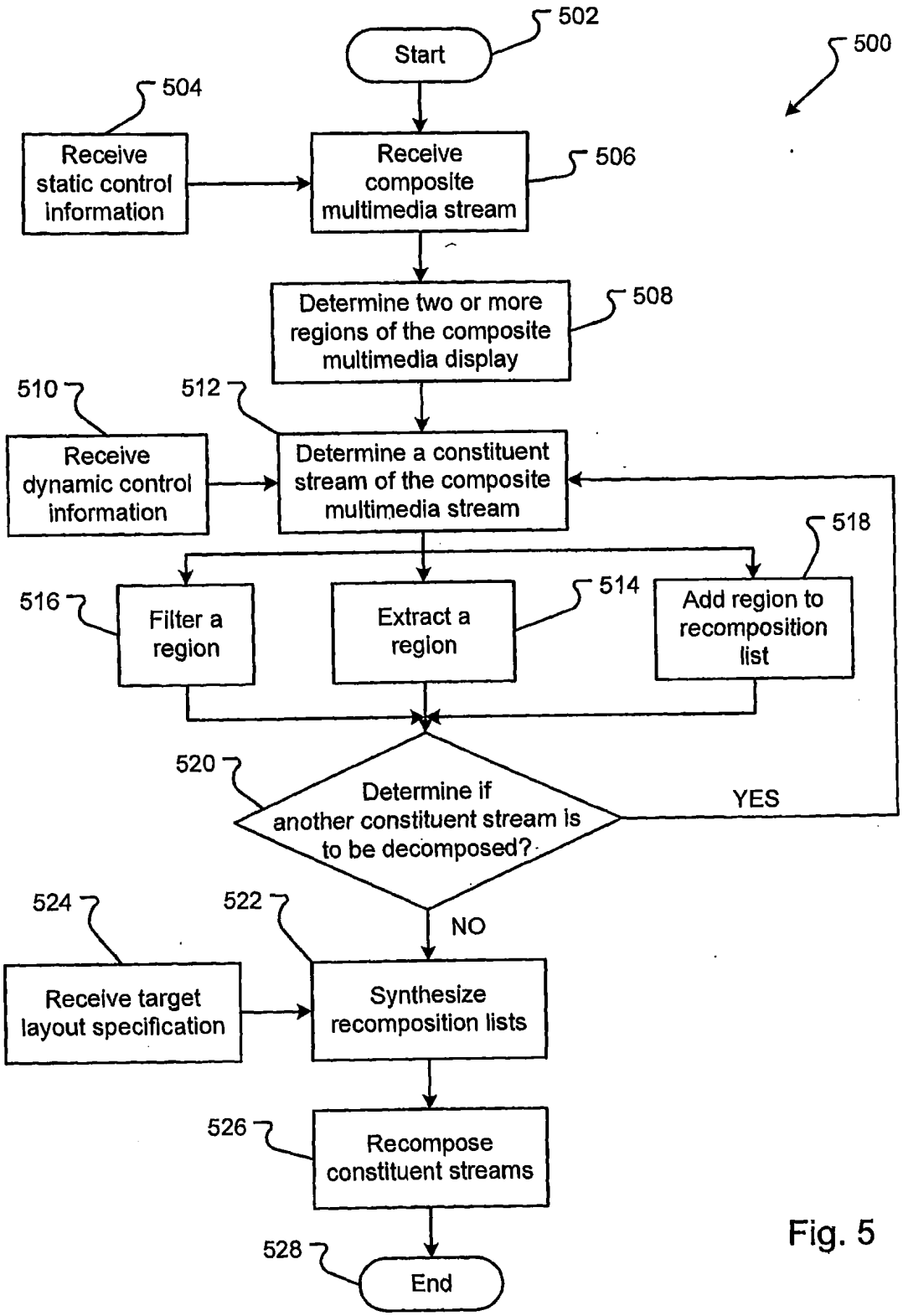


Fig. 5

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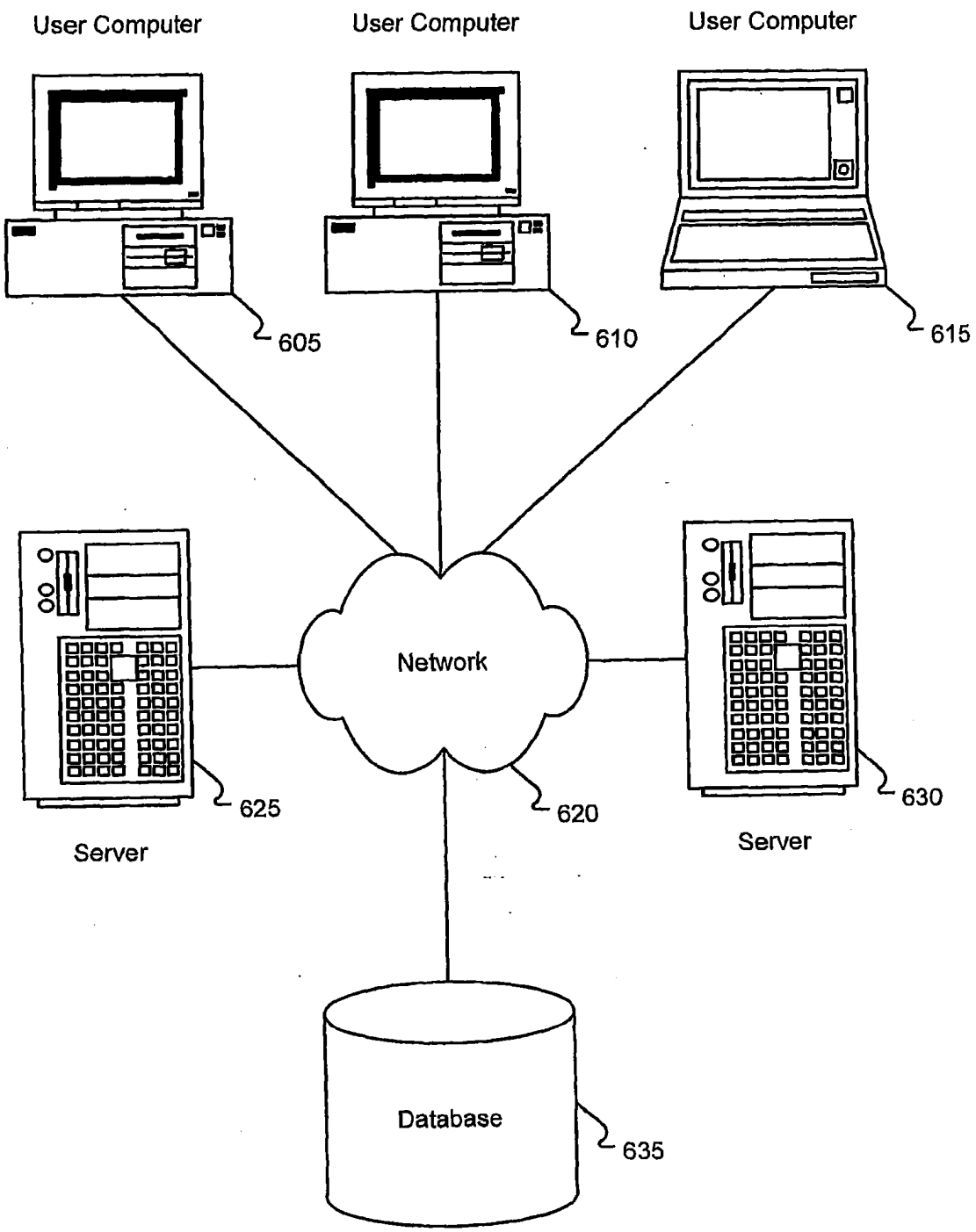


Fig. 6

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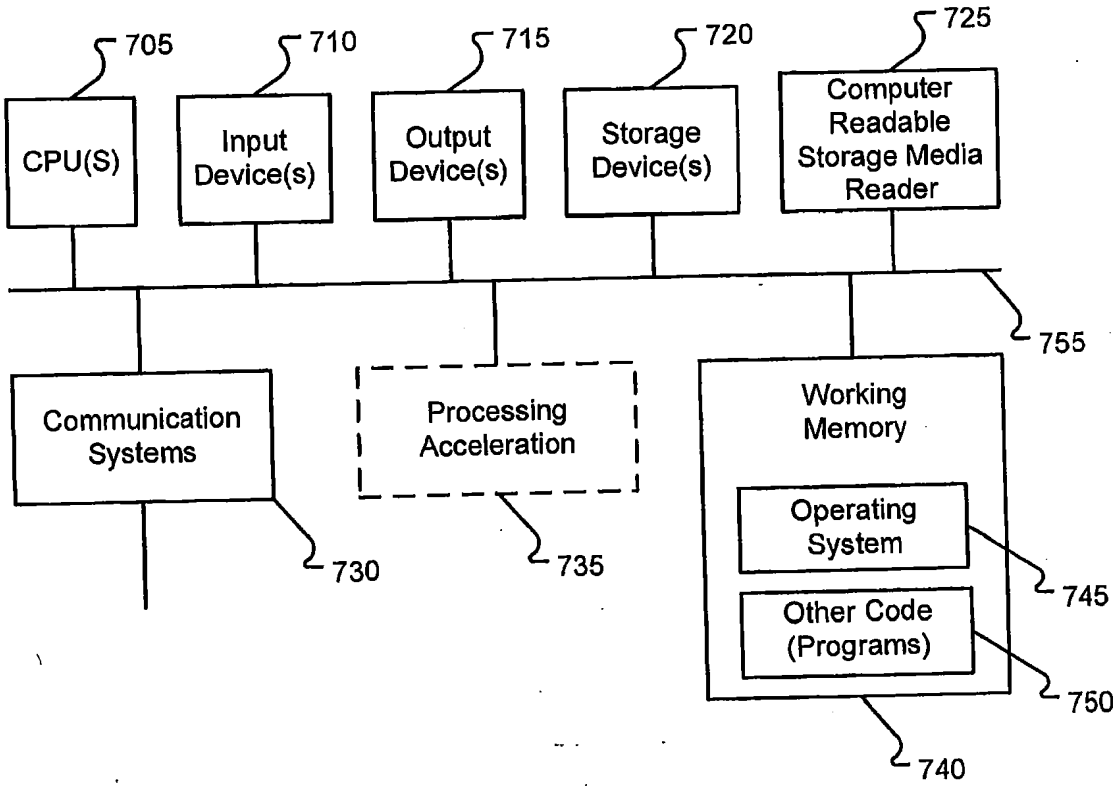


Fig. 7

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Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 17 2581

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 564 992 A1 (SEIKO EPSON CORP [JP]) 17 August 2005 (2005-08-17) * paragraph [0002] - paragraph [0008] * * paragraph [0023] * * paragraph [0031] - paragraph [0033] * * paragraph [0045] - paragraph [0060] * * figures 1, 3-8 *	1-15	INV. H04L29/06 ADD. H04N7/15 H04L12/18
A	US 2003/169330 A1 (BEN-SHACHAR IDO [US] ET AL) 11 September 2003 (2003-09-11) * figures 3a, 3b, 5 * * paragraph [0033] - paragraph [0038] * * paragraph [0051] - paragraph [0061] * * paragraph [0079] - paragraph [0088] *	1-15	
A	US 6 288 740 B1 (LAI JIM JIANSU [US] ET AL) 11 September 2001 (2001-09-11) * column 1 * * column 4 - column 6 * * figures 2,4-8 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)
H04L
H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 October 2010	Riegler, Jörg

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1
EPO FORM 1503 03.82 (P04C01)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 17 2581

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-10-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1564992 A1	17-08-2005	CN 1655609 A	17-08-2005
		JP 2005229601 A	25-08-2005
		US 2005180341 A1	18-08-2005
US 2003169330 A1	11-09-2003	NONE	
US 6288740 B1	11-09-2001	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Electronic Acknowledgement Receipt

EFS ID:	15177792
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	105218
Filer:	Marvin Jay Spivak/Igmar Sorto
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	401318US8
Receipt Date:	11-MAR-2013
Filing Date:	27-JUL-2012
Time Stamp:	16:24:42
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		401318USIDS1.pdf	7097977 e92a62d0d55ab5c3a7dcb40e2e27085c14485744	yes	143

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Information Disclosure Statement (IDS) Form (SB08)	2	2
	Non Patent Literature	3	12
	Foreign Reference	13	52
	Foreign Reference	53	120
	Foreign Reference	121	143

Warnings:	
Information:	
Total Files Size (in bytes):	7097977

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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.

Docket No. 401318US8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:	Hakon SKRAMSTAD		
SERIAL NO:	13/560,767	GAU:	2656
FILED:	July 27, 2012	EXAMINER:	C. A. KUNTZ
FOR:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPRATUS FOR MODIFYING THE LAYOUT USED BY AVIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL		

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

Commissioner:
Applicant(s) wish to disclose the following information.

REFERENCES

- ■ The applicant(s) wish to make of record the reference(s) listed on the attached form PTO-1449 and/or accompanying documents from a corresponding foreign application. Copies of the listed reference(s) are attached, where required, as are either statements of relevancy or any readily available partial or full English translations of pertinent portions of any non-English language reference(s).
- ☐ Credit card payment is being made online (if electronically filed), or is attached hereto (if paper filed), in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☐ Attached is a list of applicant's pending application(s), published application(s) or issued patent(s) which may be related to the present application. In accordance with the waiver of 37 CFR 1.98 dated September 21, 2004, copies of the cited pending applications are not provided. Cited published and/or issued patents, if any, are listed on the attached PTO form 1449.
- ☐ Credit card payment is being made online (if electronically filed), or is attached hereto (if paper filed), in the amount required under 37 CFR §1.17(p).

CERTIFICATION

- ☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.

- ☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- ■ Please charge any additional fees for the papers being filed herewith and for which no payment is enclosed herewith, or credit any overpayment to deposit account number **15-0030**.

Respectfully submitted,

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8

CONFIRMATION NO. 3368

105218
Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

PUBLICATION NOTICE

OC000000058983639

Title:METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

Publication No.US-2013-0027502-A1
Publication Date:01/31/2013

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In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/560,767

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	390
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	620
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	14 minus 20 =	*			OR	x 62 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 250 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1260

APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** 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 found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/560,767	07/27/2012	2614	1380	401318US8	14	3

CONFIRMATION NO. 3368

105218
Oblon, Spivak/Cisco Technology, Inc.
1940 Duke Street
Alexandria, VA 22314

UPDATED FILING RECEIPT

OC000000057230458

Date Mailed: 10/24/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)
Hakon SKRAMSTAD, Oslo, NORWAY;

Applicant(s)
Hakon SKRAMSTAD, Oslo, NORWAY;

Assignment For Published Patent Application
Cisco Technology, Inc., San Jose, CA

Power of Attorney: The patent practitioners associated with Customer Number 105218

Domestic Priority data as claimed by applicant
This appln claims benefit of 61/513,190 07/29/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 08/07/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/560,767**

Projected Publication Date: 01/31/2013

Non-Publication Request: No

Early Publication Request: No

Title

METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

Preliminary Class

348

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage, facilitate, and accelerate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

OBLON SPIVAK

ATTORNEYS AT LAW

Docket No. 401318US8

THIS IS A RESPONSE TO A NOTICE TO FILE MISSING PARTS OF AN APPLICATION

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

Re: Inventor: Hakon SKRAMSTAD
Serial No: 13/560,767
Filed: July 27, 2012
For: METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPRATUS FOR MODIFYING THE LAYOUT USED BY AVIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

Commissioner:

Attached hereto for filing are the following papers:

DECLARATION, POWER OF ATTORNEY AND PETITION

Credit card payment is being made online (if electronically filed), or is attached hereto (if paper filed), in the amount of **$0.00** covering any required fees. In the event that any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 CFR 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 CFR 1.136 for the necessary extension of time.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.

Bradley D. Lytle
Registration No. 40,073

Robert Tarcu
Registration No. 64,622

Customer Number
22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 07/09)

401318US8

Declaration, Power of Attorney and Petition

WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

the specification of which

☐ is attached hereto.

☒ was filed on July 27, 2012 as

Application Serial No. 13/560,767

and amended on _____.

☐ was filed as PCT international application

Number _____

on _____,

and was amended under PCT Article 19

on _____ (if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

We (I) hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed
			☐ Yes ☐ No
			☐ Yes ☐ No

Petitioner Exhibit 1002
Page 231 of 285

We (I) hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

61/513,190	July 29, 2011
(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or under §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No.	**Filing Date**	**Status (pending, patented, abandoned)**

And we (I) hereby appoint the following registered practitioner(s):

The Practitioners Associated With Customer Number

105218

as our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to

The Address Associated With Customer Number

105218

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Hakon SKRAMSTAD
NAME OF FIRST OR SOLE INVENTOR

Residence: Oslo, Norway 0655

Signature of Inventor

Citizen of: Norway

Mailing Address: Joh. H. Andresens v. 14 B, Oslo, Norway 0655

12.10 2012
Date

Petitioner Exhibit 1002
Page 232 of 285

Electronic Acknowledgement Receipt

EFS ID:	13989216
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	22850
Filer:	Marvin Jay Spivak/Maritza Ulloa
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	401318US8
Receipt Date:	15-OCT-2012
Filing Date:	27-JUL-2012
Time Stamp:	17:48:37
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		401318USReponsetoMissingParts.pdf	122845 61f6fa973a8642ff62f3a15b62ef952e3beee447	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Response to Pre-Exam Formalities Notice	1	1
	Oath or Declaration filed	2	3
Warnings:			
Information:			
	Total Files Size (in bytes):	122845	

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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/560,767

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	620
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	14 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 250 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1250

APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** 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 found in the appropriate box in column 1.

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/560,767	07/27/2012	2614	1380	401318US8	14	3

CONFIRMATION NO. 3368

22850
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

FILING RECEIPT



Date Mailed: 08/13/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Hakon SKRAMSTAD, Oslo, NORWAY;

Assignment For Published Patent Application

Cisco Technology, Inc., San Jose, CA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/513,190 07/29/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 08/07/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/560,767**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

Preliminary Class

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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NOT GRANTED

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/560,767	07/27/2012	Hakon SKRAMSTAD	401318US8

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FORMALITIES LETTER

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Date Mailed: 08/13/2012

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
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Docket No. 401318US8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR(S) Hakon SKRAMSTAD

SERIAL NO: New Application ART UNIT:

FILING DATE: Herewith EXAMINER:

FOR: A METHOD AND DEVICE FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

FEE TRANSMITTAL

☐ No additional fee is required

☐ Small entity status of this application under 37 C.F.R. §1.9 and §1.27 is claimed.

☐ Track 1 Prioritized Examination

The Fee has been calculated as shown below:

FOR	NUMBER FILED	NUMBER EXTRA	RATE	CALCULATIONS
TOTAL CLAIMS	14 - 20 =	0	x $60 =	$0.00
INDEPENDENT CLAIMS	3 - 3 =	0	x $250 =	$0.00
UTILITY APPLICATION SIZE FEE	28* - 100 = (* 37 x .75)	0 (each addtl. 50 sheets over 100)	x $310 =	$0.00
☐ MULTIPLE DEPENDENT CLAIMS (If applicable)			+ $450 =	$0.00
■ LATE FILING OF DECLARATION			+ $130 =	$130.00
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■ FILING FEE ($380.00) ■ SEARCH FEE ($620.00) ■ EXAMINATION FEE ($250.00)			BASIC FEES	$1,250.00
			TOTAL OF ABOVE CALCULATIONS	$1,380.00
☐ REDUCTION BY 50% FOR FILING BY SMALL ENTITY				$0.00
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Application Data Sheet

Application Information

Application Type::	Regular
Subject Matter::	Utility
Title::	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
Attorney Docket Number::	401318US8
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This Application	Non-Provisional of	61/513,190	July 29, 2011

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METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of United States Provisional Patent Application No. 61/513,190, filed July 29, 2011, the entire subject matter of which is incorporated herein by reference.

BACKGROUND

TECHNOLOGICAL FIELD

The present disclosure relates generally to a method, computer-readable storage medium, and apparatus that modify the layout used by a video composing unit to generate a composite video signal.

BACKGROUND

Videoconferencing systems comprise a number of end-points communicating real-time video, audio and/or data (often referred to as Duo Video) streams over and between various networks such as Wide Area Network (WAN), Local Area Network (LAN), and circuit switched networks.

Today, users of technical installation are accustomed to and demand systems which are easy to use and provide flexibility in ways of customization of graphical environments and collaboration between devices. Traditional video conferencing systems are not very flexible. For example, regardless of a layout selected by a user

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when initiating a continuous presence and/or a Duo Video call, the positions and sizes of the different video and/or data stream is beyond the user's control. Further, traditional video conferencing systems are operated using on-screen menu systems controlled by a keypad on an infrared (IR) remote control device, allowing for limited flexibility and cumbersome user experience.

BRIEF DESCRIPTION OF THE FIGURES

The disclosure will be better understood from reading the description which follows and from examining the accompanying figures. These figures are provided solely as non-limiting examples of the embodiments. In the drawings:

Figure 1 is a flow chart illustrating a method of the present disclosure for generating a composite video signal;

Figure 2 shows a display area or area of a display for displaying the composite video signal;

Figure 3 is a schematic block diagram illustrating one embodiment of the present disclousre;

Figure 4 is a schematic block diagram illustrating one embodiment of the present disclousre;

Figure 5 is a schematic block diagram illustrating one embodiment of the present disclousre;

Figure 6 illustrates display area(s) according to one embodiment of the present disclosure;

Figure 7 illustrates display area(s) according to one embodiment of the present disclosure;

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Figure 8 illustrates display area(s) according to one embodiment of the present disclosure;

Figure 9 illustrates displays according to one embodiment of the present disclosure;

Figure 10 illustrates displays according to one embodiment of the present disclosure; and

Figure 11 illustrates a computer system upon which an embodiment of the present disclosure may be implemented.

DESCRIPTION OF EXAMPLE EMBODIMENTS

OVERVIEW

In one embodiment, a method that includes providing, on a display, an object configured to be moved by a user along an axis, and associating a plurality of predefined layouts with respective intervals along the axis. The method further includes detecting a user action on the object indicating a position on the axis, and composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

DETAILED DESCRIPTION

Videoconferencing systems comprise a number of end-points communicating real-time video, audio and/or data (often referred to as Duo Video) streams over and between various networks. A number of videoconference systems residing at different sites may participate in the same conference, most often, through one or more Multipoint Control Unit(s) (MCUs) performing, e.g., switching and mixing functions to allow the audiovisual terminals to intercommunicate properly.

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An MCU may be a stand alone device operating as a central network recourse, or could be integrated in the codec of a video conferencing system. An MCU links the sites (where the videoconference systems reside) together by receiving frames of conference signals from the sites, processing the received signals, and retransmitting the processed signals to appropriate sites.

In a continuous presence conference, video signals and/or data signals from two or more sites are spatially mixed to form a composite video signal that is to be viewed by conference participants. The composite video signal is a combined video signal that may include live video streams, still images, menus, or other visual images from participants in the conference. There are an unlimited number of possibilities of how the different video and/or data signals are spatially mixed, e.g., size and position of the different video and data frames in the composite image. A codec and/or MCU have a set of preconfigured composite video signal templates stored on the MCU or video conference codec allocating one or more regions (frames) within a composite video signal for one or more video and/or data streams received by the MCU or codec. These templates may also be referred to as layouts.

The present disclosure associates a set of layouts (or image composition types) that support important scenarios, and enables a user to move between layouts (or image composition types) seamlessly by manipulating an object across a continuum. This facilitates controlling the relative size between the media object that is currently in focus (e.g., active speaker or presentation) and the remaining media objects.

The term "site" is used to refer collectively to a location having an audiovisual endpoint and a conference participant or user, or simply to an endpoint.

The term "composite video signal" is used to refer collectively to a video signal being a spatial mix of one or more video conference streams.

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The term "video composing unit" is used to refer collectively to a device or software running on a processing device configured to receive a number, P, of video conference streams and mix the streams together into one or more composite video streams, and output the one or more composite video streams to one or more endpoints. The position and size of a video conference stream in the composite video signal is dependent upon the layout used by the video composing unit. A non-limiting example of a video composing unit is a Multipoint Control Unit (MCU).

The term "endpoint" is used to refer collectively to a video conference endpoint or terminal (such as a personal endpoint, a meeting room endpoint, an auditorium endpoint, etc.), or a software application running on a personal computer facilitating audiovisual communication with other endpoints.

The term "video conference streams" is used to refer collectively to multimedia streams originating from an endpoint, e.g., video streams, audio streams, images, multimedia from a secondary device connected to the endpoint (such as a computer or a Digital Versatile Disc (DVD) player).

The term "layout" is used to refer collectively to a template, or anything that determines or serves as a pattern, for defining the composition of a composite video signal. According to one embodiment of the present disclosure, a layout is a configuration file, e.g., an XML document, defining the position and size of all the video conference streams in the composite video signal. An exemplary layout or configuration file according to one embodiment of the present disclosure may be represented as follows:

```
<video>
    <layout>
        <frame item=1>
            <PositionX>10000</PositionX>
            <PositionY>10000</PositionY>
            <Width>4084</Width>
```


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```
        <Height>4084</Height>
        <VideoSourceId>1</VideoSourceId>
    <frame item=2>
        <PositionX>5000</PositionX>
        <PositionY>5000</PositionY>
        <Width>4084</Width>
        <Height>4084</Height>
        <VideoSourceId>2</VideoSourceId>
```

Video conference streams from two or more sites are spatially mixed to form a composite video signal. The area occupied by a video conference stream is referred to as a frame. When the video composing unit mixes the video conference signals, the video composing unit needs to know the exact position and size of each frame. Therefore, the layout or configuration file, at least, defines the position, size, and an ID identifying the video conference stream source, for each frame.

Referring to the layout or configuration file above, the <position> of the different frames in the composite video signal is given in top left coordinates. The <Width> and <Height> define the size of the frame in pixel values. The <VideoSourceId> relates to the video conference stream source that should be displayed in a frame.

The present disclosure relates to a method and endpoint for modifying the layout used by a video composing unit to generate a composite video signal (e.g., Duo Video or continuous presence video conference). The method and endpoint according to the present disclosure provides to the user an object on a display, wherein the object is configured to be moved by a user along an axis or continuous line. The method and endpoint associates layouts (or compositions) that support important scenarios to intervals along the continuous line, and enables a user to move between the layouts (or compositions) seamlessly by manipulating the object across the continuous line. The continuous line is only an example. The axis need not be a line nor be continuous. The axis may be an arc, a circle, and/or discontinuous.

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One end of the continuous line is associated with a selected layout, e.g., only the loudest speaker is shown in full screen. The other end of the continuum is associated with another layout, e.g., all video conference streams are distributed in approximately equal size across one or more screens. There may also be other layouts associated with intermediate intervals. The movable object may be displayed on the endpoint's main display together with the composite video signal, or the object may be displayed on a separate control device (such as a touch screen remote control) together with a replica of the current video composition (layout).

Since an exemplary embodiment involves manipulating a single axis of control, the exemplary embodiment may be suitable for various user input mechanisms, such as a traditional remote control (would require a user selectable mode for controlling layout composition), mouse, and touch screens. Furthermore, other embodiment may incorporate multiple axes of control.

Figure 1 is a schematic flow chart illustrating an exemplary method for generating a composite video signal to be displayed on an endpoint display. The method starts at the initiating step 100. An object movable by a user along an axis or continuous line is provided on a display in the providing step 110.

Figure 2 is a schematic diagram for illustrating the features of the present disclosure, and shows a display area or area of a display for displaying the composite video signal 210. An exemplary object 220 is displayed, wherein the object 220 is movable along an axis 230, as indicated by the arrows shown in Figure 2. In one embodiment, the axis 230 is not visible to the user.

In one embodiment, the object 220 is provided on a main display associated with the endpoint, wherein the display is used for displaying video conference streams, such as a composite video signal, to the local user. The object 220 may be displayed together

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with the composite video signal. In one embodiment, the object 220 may be displayed as an overlay over the composite video signal. In another embodiment, the object 220 may be displayed in an area separated from the composite video signal. In another embodiment, the object 220 may be provided on a display of a control device associated with the endpoint.

The control device is a device that comprises, at least, a display, input device, a memory, and a processor. The display device may be a dedicated remote control device, a mobile unit (such as a mobile phone, tablet device, etc.) or a personal computer (PC). The display and input device may be the same device, such as a touch display. The display device is connected to the endpoint via a wired (e.g., LAN or cable to endpoint) or wireless (e.g. Wi-Fi, Bluetooth®, etc.) communication network.

A client application running on the display device is configured to communicate with the endpoint, to send control signals to the endpoint and receive control signals from the endpoint. According to one embodiment of the present disclosure, the client application receives control signals in the form of layout information from the endpoint, and, based on this layout information, the control unit renders and displays a replica of the current composite video signal displayed on the main display associated with the endpoint. Furthermore, the composite video signal and/or the replica may be updated in real time as the object 220 is moved by the user.

The layout information may e.g., be the layout currently being used, names of participants and/or endpoint, and in which frame their video conference streams are displayed, etc. The object 220 may be displayed together with the replica. In one embodiment, the object 220 may be displayed as an overlay over the replica. In another embodiment, the object 220 may be displayed in an area separated from the replica.

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The object 220 may be a solid graphical object, or the object 220 may be partly or totally transparent. The object 220 may have any shape, size, or form. In one embodiment, the object 220 may be a line or bar stretching partly or totally across the display area or the displayed composite video signal. The object 220 may appear in response to a user action, e.g., activating a layout control function via a menu system or pushing a button on a remote control, or a user touching a touch screen display.

The term "axis" is used collectively to describe a continuous or discontinuous line, having a start value, an end value, and a number of intermediate values. In one embodiment, the line is preferably linear. However, the line may have any shape or be an arc or circle. In one embodiment, the axis or continuous line is preferably positioned in alignment with vertical or horizontal parts of the display or the displayed composite video signal. However, it should be understood that the axis or continuous line may be positioned in many ways.

In one embodiment of the present disclosure, the axis 230 has a starting position Y_0 at one edge of a display or a displayed composite video signal, and an end position Y_E at an opposite edge of the display or displayed composite video signal, as shown in Figure 2. In another embodiment, the axis 230 has a starting and end position different from the edges of the display or displayed composite video signal.

In one embodiment, the object 220 and axis 230 are represented by a track bar or slider. A track bar or slider is a control used to slide a small bar or pointer (also called a thumb), along a continuous line. To use the track bar, a user can drag the thumb in one of two directions using an input device. This changes the position of the thumb. The user can also click a position along the control line to place the thumb at a desired location. Alternatively, when the track bar has focus, the user can use arrow keys to

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move the thumb. A track bar is configured with a set of values from a minimum to a maximum. Therefore, the user can make a selection included in that range.

Next, returning to Figure 1, in the associating step 120, a plurality (N) of predefined layout types is associated with (N) respective intervals Z_N along the axis or continuous line 230. For example, a "show only one participant in full screen (FOCUS)" layout may be associated with a first interval Z_1, a "show one participant in full screen and a number of other participants in small frames (FOCUS + PRESENCE)" layout may be associated with a second interval Z_2, and a "show all video conference streams in equal size (OVERVIEW)" layout type may be associated with a third interval Z_3.

In one embodiment, the axis or continuous line 230 (having a start position Y_0 and an end position Y_E, as shown in Figure 2) has a plurality (N) of intervals Z_n. A predefined layout is associated with a respective interval Z_n. In one embodiment, the intervals Z_n may be separated by a set of threshold positions Y_n on the axis or continuous line 230, wherein n=N-1 and $0<n<N$ and $Y_0<Y_n<Y_E$. The threshold positions provide N numbers of intervals $Z_0=[Y_0,Y_1]$, $Z_n=[Y_n,Y_{n+1}]$, ... $Z_N=[Y_{N-1},Y_E]$. Each interval is associated with a respective one of N numbers of predefined layouts. In one embodiment, the threshold positions Y_n are configurable by a user via a graphical user interface or setting menu.

According to one embodiment of the present disclosure, for one or more of the intervals Z_N, there is provided a relationship between the positions Y within an interval Z_N and the size of the respective frames within a layout associated with the interval Z_N. In other words, the size and/or position of one or more of the frames in a layout type is a function of the user selected position Y_u. According to this embodiment, in response to detecting a user action indicating a layout position Y_u, the size and position of each frame of the layout type is calculated based on the relationship and the layout position

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Y_u. For example, if a user selected position Y_u is within an interval associated with a FOCUS + PRESENCE layout (example of which is shown in Figures 7B-7D), the size and/or position of the frames comprising video conference streams from the sites not in FOCUS is dependent on the position Y_u.

According to another embodiment, the associating step 120 further comprises associating a plurality (M) of variations of a layout with M number of sub-intervals (X_M). The plurality of variations of a layout type may be associated within one or more of the intervals Z_N. The variations of a layout type are variations of the layout type associated with an interval Z_N. A "show all video conference streams in equal size (OVERVIEW)" layout type may e.g., be associated with an interval Z_3. A 2x2 frame variation of the OVERVIEW layout (shown in Figure 7E) may e.g., be associated with a first sub-interval X_1 of interval Z_3. A 3x3 frame variation of the OVERVIEW layout (shown in Figure 7F) may e.g., be associated with a second sub-interval X_2 of interval Z_3, and a 4x4 frame variation of the OVERVIEW layout may e.g., be associated with a third sub-interval X_3 of interval Z_3.

Next, returning to Figure 1, in the detecting a user action step 130, a user action on the object 220 indicating a position Y_u on the axis is detected. In one embodiment, the user action is a user moving the object 220 along the axis 230. The user may move the object 220 using an input device, such as a mouse, a keyboard, buttons on a remote control, touch screen, etc.

In another embodiment, the user action is a user selecting a position along the axis 230. The user may select a position along the axis 230 using an input device, such as a mouse, a keyboard, buttons on a remote control, touch screen, etc. The object will move to the selected position.

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Next, in the composing step 140, the composite video signal is composed using the layout associated with an interval Z_U among the intervals within which Y_u is lying. At step 150, the processing ends.

In one embodiment of the present disclosure, the composing step 140 further comprises the step of identifying, in response to detecting the user action, an interval Z_U among the intervals Z_N within which Y_u is lying, and selecting a layout type associated with the interval Z_U. The composite video signal is composed using the selected layout type.

In one embodiment, the composing step 140 comprises selecting a predefined layout representing the selected layout, and sending the default layout to a video composing unit.

In another embodiment, the composing step 140 comprises generating or calculating a layout, wherein the layout parameters defining the size and position of each frame in the layout is a function of the selected position Y_u.

A layout may comprise one or more frames displaying, at any time, the loudest participant (also referred to as VOICE SWITCHED). When a frame is VOICE SWITCHED, the audio streams from all the sites are monitored and analyzed. The video conference stream originating from a site having the highest level audio is selected to be displayed in the VOICE SWITCHED frame. Other parameters may influence the selection, e.g., did the audio from a site have the highest level for more than a predetermined period of time.

In one embodiment, the method further comprises the step of determining the loudest speaker, and if the selected layout type comprises a VOICE SWITCHED frame, generating a layout each time a new site becomes the site with the loudest speaker, wherein the identified video conference stream is positioned in the VOICE SWITCHED

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frame. This step may e.g., include receiving an input from appropriate circuitry such as an audio analyzing unit included in a video conference endpoint. The input identifies the video conference stream identified as the loudest speaker. The layout is sent to the video composing unit.

In another embodiment of the present disclosure, if the selected layout comprises a VOICE SWITCHED frame, the method further comprises the step of generating a layout specifying which frame is VOICE SWITCHED. In this embodiment, the video composing unit, or appropriate circuitry such as an audio analyzing unit included in a unit hosting the video composing unit, analyzes the audio from all the sites and determines which video conference stream to display in the VOICE SWITCHED frame.

The method as described in the present disclosure may be performed by a processing device (or processing unit) included in an endpoint. More specifically, the method may be implemented as a set of processing instructions or computer program instructions, which may be tangibly stored in a memory or on a medium. The set of processing instructions is configured so as to cause an appropriate device, in particular an endpoint (or video conferencing device), to perform the described method when the instructions are executed by a processing device included in the endpoint (or video conferencing device).

Figure 3 is a schematic block diagram illustrating an endpoint 300, in particular a video conferencing endpoint, which is configured to operate in accordance with the method described above. The video conferencing endpoint (or video conferencing device) comprises a processing device (or processing unit) 320, a memory 330, and a display adapter 340, all interconnected via an internal bus 350. The video conferencing endpoint 300 (or video conferencing device) may also include a display device 360, which may include a set of display screens, such as two or three adjacent displays.

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The endpoint 300 is connected to a video composing unit 370 via a communication link 380. The video composing unit 370 receives one or more video conference streams from each of a plurality of endpoints connected in a conference, and, based on a selected layout, the image composing unit 370 composes a composite video signal.

According to one embodiment of the present disclosure, the video composing unit 370 is part of a network device, such as a centralized Multipoint Control Unit (MCU) 385, as shown in Figure 4. The video composing unit 370 may also be part of an MCU embedded in the endpoint 300 (not shown). According to this embodiment the MCU 385 receives video conference streams from three or more endpoints 300a-c connected in a conference over communication links 420a-c. The video conference streams from the endpoints 300a-c are sent to a Video Processing Unit (VPU) (not shown), where the video conference streams are decompressed, and the decompressed video conference streams are made available to the video composing unit 370, e.g., via an internal bus or a memory.

The video composing unit 370 spatially mixes one or more of the decompressed video conference streams into one composite video signal, and the composite video signal is made available to the VPU, e.g., via an internal bus or a memory. The VPU compresses the composite video conference stream, and a single composite video conference stream is sent back to one or more of the endpoints 300a-c over respective communication links 420a-c, where the composite video conference stream is decoded and displayed on display 360. A layout is used by the video composing unit 370 to compose the composite video signal.

According to another embodiment of the present disclosure, the video composing unit 370 is part of an endpoint 300a, as shown in Figure 5, wherein the endpoint 300a

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receives video conference streams from two or more remote sites 300b-c in a video conference over respective communication links 520a-c. The video conference streams may be transmitted to/from the endpoints 300a-c via one or more network device(s) or unit(s) 395, such as a video conference switch, or the endpoints 300a-c may establish separate point to point sessions between each other. According to this embodiment the endpoint 300a receives one or more video conference streams from each of the two or more endpoints 300b-c connected in a conference.

The video conference streams from the endpoints 300b-c are sent to the processing device 320 where the video conference streams are decompressed, and the decompressed video conference streams are made available to the video composing unit 370, e.g., via an internal bus or a memory. The video composing unit 370 spatially mixes one or more of the decompressed video conference streams into one composite video conference stream, and the composite video conference stream is displayed on a display associated with the endpoint. A layout is used by the video composing unit 370 to compose the composite video conference stream. In this embodiment, the processing device 320 may send the selected or calculated layout to the video composing unit 370 via the internal bus 350.

The illustrated elements of the video conferencing device 300 are shown for the purpose of explaining principles of the embodiments of the present disclosure. Thus, it will be understood that additional elements may be included in an actual implementation of a video conferencing device.

The memory 330 comprises processing instructions which enable the video conferencing device to perform appropriate, regular video conferencing functions and operations. Additionally, the memory 330 comprises a set of processing instructions as described above with reference to the method illustrated in Figure 1, resulting in that the

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processing device 320 causes the video conferencing device 300 to perform the presently disclosed method for displaying an image when the processing instructions are executed by the processing device 320.

Figure 6 illustrates examples of display area(s) according to the present disclosure. A display screen 360 included in or connected to an endpoint, or on a display control device 390 connected to the endpoint, is arranged in front of a local conference participant (or user). The local participant is conducting a video conference call (such as a multi-site call) with a plurality of remote sites. For illustrative purposes, only six conference participants have been illustrated. However, it is to be understood that there may be any number of conference participants. For simplicity, only one display 360 has been illustrated. However, it is to be understood that an endpoint may have two or more displays.

In Figure 6A, the local user is receiving a composite video signal. The object 220 is in a position Y_u within a first interval Z_1, which, in this example, is associated with a FOCUS layout, and hence the composite video signal is composed based on the FOCUS layout, meaning that only the participant speaking is shown on the entire display area. When a user wishes to change the layout of the composite image, the user can move the object 220 along an axis 230. As noted above, this controls the relative size between the media object that is currently in focus (e.g., active speaker or presentation) and the remaining media objects. The axis 230 itself is not visible, but the shape of the object 220 may be formed to make it clear to a user in which direction the object 220 can be moved.

For illustrative purposes, the display 360 is a touch display, so the user may move the object 220 directly with a finger, as shown in Figures 6A-6C. Other input devices may be used to move the object 220.

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As shown in Figure 6B, as the object is moved into position Y_u within a second interval Z_2, which, in this example, is associated with a FOCUS + PRESENCE layout, the composite video signal changes into a composite video signal composed based on the FOCUS + PRESENCE layout. As shown in Figure 6C, as the object is moved into position Y_u within a third interval Z_3, which, in this example, is associated with a OVERVIEW layout, the composite video signal changes into a composite video signal composed based on the OVERVIEW layout. As noted above and as shown in Figure 6C, the OVERVIEW layout shows all video conference streams in equal size.

According to another embodiment of the present disclosure shown in Figure 7A, the local user is in a conference call with a plurality of remote sites (in this example, 8) and is receiving a composite video signal. The object 220 is in a position Y_u within a first interval Z_1, which is associated with a FOCUS layout, as discussed above. As shown in Figure 7B, as the object is moved into position Y_u within a second interval Z_2, which is associated with e.g., a FOCUS + PRESENCE layout, the composite video signal changes into a composite video signal composed based on the FOCUS + PRESENCE layout.

As shown in Figure 7C, as the object is moved further along the axis within the second interval Z_2, the size of frames 730 changes accordingly. The size and position of the frames 730 is a function of the position Y_u within an interval Z_N. As the size of the frames 730 increases, less frames may be fitted at the bottom of the screen. Hence, participants 740A and 740F are no longer displayed in the composite video signal. Which of the participants 740A-740F are to be displayed in the frames 730 may be e.g., determined by voice switching (the five most recent speaking participants are displayed). As shown in Figure 7D, as the object 220 is moved further along the axis within the second interval Z_2, the size of the frames 730 changes accordingly. As the object 220 is

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moved into a position Y_u within a third interval Z_3, which is associated with a 2x2 OVERVIEW layout, the composite video signal changes into a composite video signal composed based on the 2x2 OVERVIEW layout, as shown in Figure 7E. And finally, as the object 220 is moved into a position Y_u within a forth interval Z_4, which is associated with a 3x3 OVERVIEW layout, the composite video signal changes accordingly, as shown in Figure 7F. The third and fourth intervals may also be referred to as sub-intervals X_M or an interval Z_N, since the layouts in the third and fourth intervals are variations of a layout.

In one embodiment, a threshold value P_{th} may be provided on the axis 230. When the object 220 is moved across the threshold value P_{th}, the layout changes from a picture-in-picture (PIP) mode to a picture-outside-picture (POP) mode, or vice versa. Alternatively, a user action switches the layout between PIP and POP, as is illustrated in Figure 8. The user action may be a double tap/click with an input device, or a button in the Graphical User Interface (GUI) or on a remote control being pressed. PIP is, as shown in Figures 7B-7D, when the video conference streams in the frames 730 are displayed on top of another video conference stream, while POP is when one or more video conference streams is overlaying another.

The above-discussed embodiments have been described for an endpoint with one main display 360. However, it should be noted that the above-discussed embodiments can be applied to endpoints having a plurality of displays. Figures 9 and 10 illustrate examples where endpoints have two displays 359 and 361, and where the layout on the two screens may be controlled dependently (Figure 9) or independently (Figure 10) of one another, using the method of the present disclosure.

Moreover, as can be seen on display 359 of Figure 9, participant "B" is shown in full screen as "b," and thus participant "B" is not shown on the bottom of display 359 in

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the area between participant "A" and participant "C." As a result, this area may remain empty and/or partly or totally transparent. Similarly, on display 361 of Figure 9, participant "G" is shown in full screen as "g." This concept, which allows the user to see which of the participants is shown in full screen, is also applied to, for example, the concepts discussed with respect to Figures 6 and 10 of the present disclosure.

Various components of the video conferencing endpoint or video conferencing device 300 described above can be implemented using a computer system or programmable logic. Figure 11 illustrates a computer system 1201 upon which embodiments of the present disclosure may be implemented. The computer system 1201 may include the various above-discussed components with reference to Figures 3-5, which perform the above-described process.

The computer system 1201 includes a disk controller 1206 coupled to the bus 1202 to control one or more storage devices for storing information and instructions, such as a magnetic hard disk 1207, and a removable media drive 1208 (e.g., floppy disk drive, read-only compact disc drive, read/write compact disc drive, compact disc jukebox, tape drive, and removable magneto-optical drive). The storage devices may be added to the computer system 1201 using an appropriate device interface (e.g., small computer system interface (SCSI), integrated device electronics (IDE), enhanced-IDE (E-IDE), direct memory access (DMA), or ultra-DMA).

The computer system 1201 may also include special purpose logic devices (e.g., application specific integrated circuits (ASICs)) or configurable logic devices (e.g., simple programmable logic devices (SPLDs), complex programmable logic devices (CPLDs), and field programmable gate arrays (FPGAs)).

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The computer system 1201 may also include a display controller 1209 (or display adapter 340) coupled to the bus 1202 to control a display 1210 (or display 360) such as a liquid crystal display (LCD), for displaying information to a computer user. The computer system includes input devices, such as a keyboard 1211 and a pointing device 1212, for interacting with a computer user and providing information to the processor 1203 (or processing device/unit 320). The pointing device 1212, for example, may be a mouse, a trackball, a finger for a touch screen sensor, or a pointing stick for communicating direction information and command selections to the processor 1203 and for controlling cursor movement on the display 1210.

The computer system 1201 performs a portion or all of the processing steps of the present disclosure in response to the processor 1203 executing one or more sequences of one or more instructions contained in a memory, such as the main memory 1204 (or memory 330). Such instructions may be read into the main memory 1204 from another computer readable medium, such as a hard disk 1207 or a removable media drive 1208. One or more processors in a multi-processing arrangement may also be employed to execute the sequences of instructions contained in main memory 1204. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions. Thus, embodiments are not limited to any specific combination of hardware circuitry and software.

As stated above, the computer system 1201 includes at least one computer readable medium or memory for holding instructions programmed according to the teachings of the present disclosure and for containing data structures, tables, records, or other data described herein. Examples of computer readable media are

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compact discs, hard disks, floppy disks, tape, magneto-optical disks, PROMs (EPROM, EEPROM, flash EPROM), DRAM, SRAM, SDRAM, or any other magnetic medium, compact discs (e.g., CD-ROM), or any other optical medium, punch cards, paper tape, or other physical medium with patterns of holes.

Stored on any one or on a combination of computer readable media, the present disclosure includes software for controlling the computer system 1201, for driving a device or devices for implementing the invention, and for enabling the computer system 1201 to interact with a human user. Such software may include, but is not limited to, device drivers, operating systems, and applications software. Such computer readable media further includes the computer program product of the present disclosure for performing all or a portion (if processing is distributed) of the processing performed in implementing the invention.

The computer code devices of the present embodiments may be any interpretable or executable code mechanism, including but not limited to scripts, interpretable programs, dynamic link libraries (DLLs), Java classes, and complete executable programs. Moreover, parts of the processing of the present embodiments may be distributed for better performance, reliability, and/or cost.

The term "computer readable medium" as used herein refers to any non-transitory medium that participates in providing instructions to the processor 1203 for execution. A computer readable medium may take many forms, including but not limited to, non-volatile media or volatile media. Non-volatile media includes, for example, optical, magnetic disks, and magneto-optical disks, such as the hard disk 1207 or the removable media drive 1208. Volatile media includes dynamic memory, such as the main memory 1204. Transmission media, on the contrary, includes coaxial cables, copper wire and fiber optics, including the wires that make

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up the bus 1202. Transmission media also may also take the form of acoustic or light waves, such as those generated during radio wave and infrared data communications.

Various forms of computer readable media may be involved in carrying out one or more sequences of one or more instructions to processor 1203 for execution. For example, the instructions may initially be carried on a magnetic disk of a remote computer. The remote computer can load the instructions for implementing all or a portion of the present disclosure remotely into a dynamic memory and send the instructions over a telephone line using a modem. A modem local to the computer system 1201 may receive the data on the telephone line and place the data on the bus 1202. The bus 1202 carries the data to the main memory 1204, from which the processor 1203 retrieves and executes the instructions. The instructions received by the main memory 1204 may optionally be stored on storage device 1207 or 1208 either before or after execution by processor 1203.

The computer system 1201 also includes a communication interface 1213 coupled to the bus 1202. The communication interface 1213 provides a two-way data communication coupling to a network link 1214 that is connected to, for example, a local area network (LAN) 1215, or to another communications network 1216 such as the Internet. For example, the communication interface 1213 may be a network interface card to attach to any packet switched LAN. As another example, the communication interface 1213 may be an integrated services digital network (ISDN) card. Wireless links may also be implemented. In any such implementation, the communication interface 1213 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

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The network link 1214 typically provides data communication through one or more networks to other data devices. For example, the network link 1214 may provide a connection to another computer through a local network 1215 (e.g., a LAN) or through equipment operated by a service provider, which provides communication services through a communications network 1216. The local network 1214 and the communications network 1216 use, for example, electrical, electromagnetic, or optical signals that carry digital data streams, and the associated physical layer (e.g., CAT 5 cable, coaxial cable, optical fiber, etc.). The signals through the various networks and the signals on the network link 1214 and through the communication interface 1213, which carry the digital data to and from the computer system 1201 may be implemented in baseband signals, or carrier wave based signals. The baseband signals convey the digital data as unmodulated electrical pulses that are descriptive of a stream of digital data bits, where the term "bits" is to be construed broadly to mean symbol, where each symbol conveys at least one or more information bits. The digital data may also be used to modulate a carrier wave, such as with amplitude, phase and/or frequency shift keyed signals that are propagated over a conductive media, or transmitted as electromagnetic waves through a propagation medium. Thus, the digital data may be sent as unmodulated baseband data through a "wired" communication channel and/or sent within a predetermined frequency band, different than baseband, by modulating a carrier wave. The computer system 1201 can transmit and receive data, including program code, through the network(s) 1215 and 1216, the network link 1214 and the communication interface 1213. Moreover, the network link 1214 may provide a connection through a LAN 1215 to a mobile device 1217 such as a personal digital assistant (PDA) laptop computer, or cellular telephone.

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While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed the novel methods and systems described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions, and changes in the form of the methods and systems described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

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CLAIMS

1. A method comprising:

providing, on a display, an object configured to be moved by a user along an axis;

associating a plurality of predefined layouts with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis; and

composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

2. The method according to claim 1, wherein the step of composing further includes

identifying an interval among the intervals within which the position is lying; and

selecting the layout associated with the interval.

3. The method according to claim 2, further comprising:

providing the selected layout to a video composing unit, which composes the composite image and which is configured to receive a plurality of video conference streams and output a composite video signal comprising one or more of the received video conference streams based on a layout.

4. The method according to claim 1, wherein

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the composite video signal includes a spatial mix of one or more video conference streams, and

the layout defines one or more frames for containing the video conference streams,

the method further comprising:

providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval, and

calculating, in response to the detecting of the user action, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.

5. The method according to claim 1, further comprising:

displaying the composite video signal on the display, the display being of a video conference terminal.

6. The method according to claim 5, further comprising:

displaying the object on a display of a control device, which is connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal.

7. The method according to claim 1, further comprising:

displaying the object on the display, which is of a video conference terminal.

8. The method according to claim 6, further comprising:

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updating one of the composite video signal and the replica in real time as the object is moved by the user.

9. The method according to claim 1, further comprising:

associating M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals;

identifying, in response to the detecting of the user action, a sub-interval among the sub-intervals within which the position is lying;

selecting a layout, of the plurality of predefined layouts, associated with the sub-interval; and

composing the composite video signal using the selected layout.

10. A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method, the method comprising:

providing, on a display, an object configured to be moved by a user along an axis;

associating a plurality of predefined layouts with respective intervals along the axis;

detecting a user action on the object indicating a position on the axis; and

composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

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11. An apparatus comprising:

a processing unit configured to

provide, on a display, an object configured to be moved by a user along an axis,

associate a plurality of predefined layouts with respective intervals along the axis, and

detect a user action on the object indicating a position on the axis; and

a video composing unit configured to compose, in response to the user action being detected by the processing unit, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

12. The apparatus according to claim 11, wherein the processing unit is further configured to

identify an interval among the intervals within which the position is lying,

select the layout associated with the interval, and

provide the selected layout to the video composing unit.

13. The apparatus according to claim 11, wherein

the composite video signal includes a spatial mix of one of more video conference streams,

the layout defines one or more frames for containing the video conference streams, and

the processing unit is further configured to

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provide, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval, and

calculate, in response to the user action being detected, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.

14. The apparatus according to claim 11, wherein

the processing unit is further configured to

associate M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals,

identify, in response to the user action being detected, a sub-interval among the sub-intervals within which the position is lying, and

select a layout, of the plurality of predefined layouts, associated with the sub-interval; and

the video composing unit is configured to compose the composite video signal using the selected layout.

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ABSTRACT

In one embodiment, a method that includes providing, on a display, an object configured to be moved by a user along an axis, associating a plurality of predefined layouts with respective intervals along the axis, detecting a user action on the object indicating a position on the axis, and composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.

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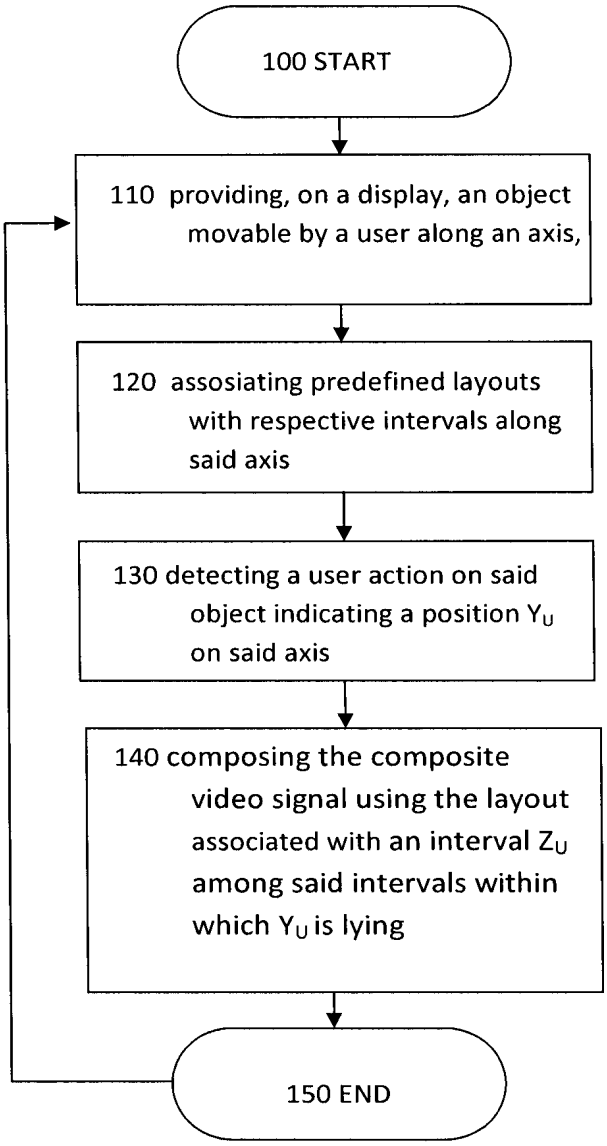

100 START
110 providing, on a display, an object movable by a user along an axis,
120 assosiating predefined layouts with respective intervals along said axis
130 detecting a user action on said object indicating a position Y_U on said axis
140 composing the composite video signal using the layout associated with an interval Z_U among said intervals within which Y_U is lying
150 END

FIG. 1

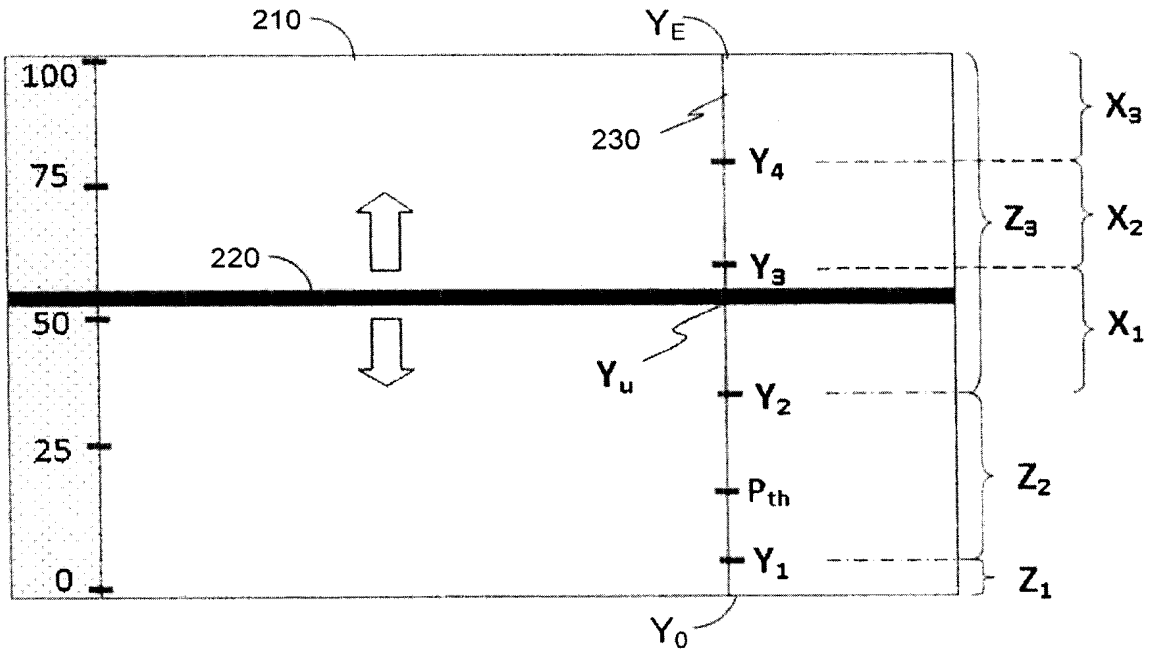

210
Y_E
100
75
50
25
0
230
220
Y_4
Y_3
Y_u
Y_2
P_{th}
Y_1
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Z_2
Z_1
X_3
X_2
X_1

FIG. 2

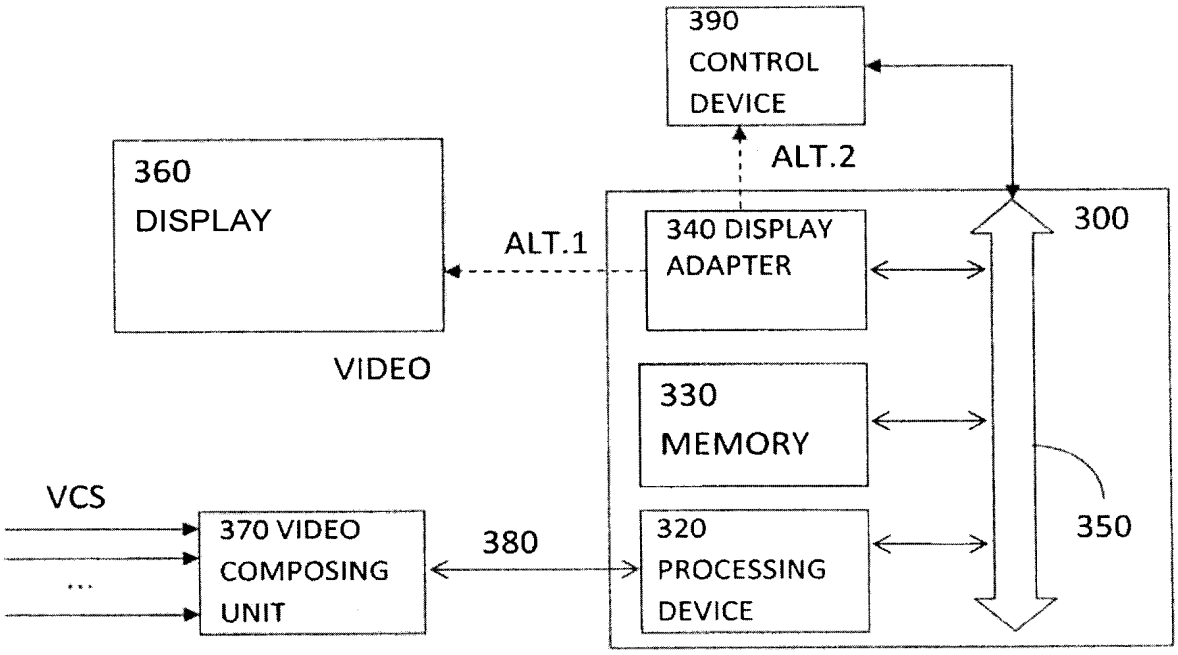

390
CONTROL
DEVICE
ALT.2
360
DISPLAY
ALT.1
340 DISPLAY
ADAPTER
300
VIDEO
330
MEMORY
VCS
370 VIDEO
COMPOSING
UNIT
380
320
PROCESSING
DEVICE
350

FIG. 3

350
390 CONTROL DEVICE
ALT.2
360 DISPLAY
ALT.1
340 DISPLAY ADAPTER
330 MEMORY
320 PROCESSING DEVICE
300a
420a
CONT. SIGN.
300b
420b
300c
420c
MCU 385
370 VIDEO COMPOSING UNIT

FIG. 4

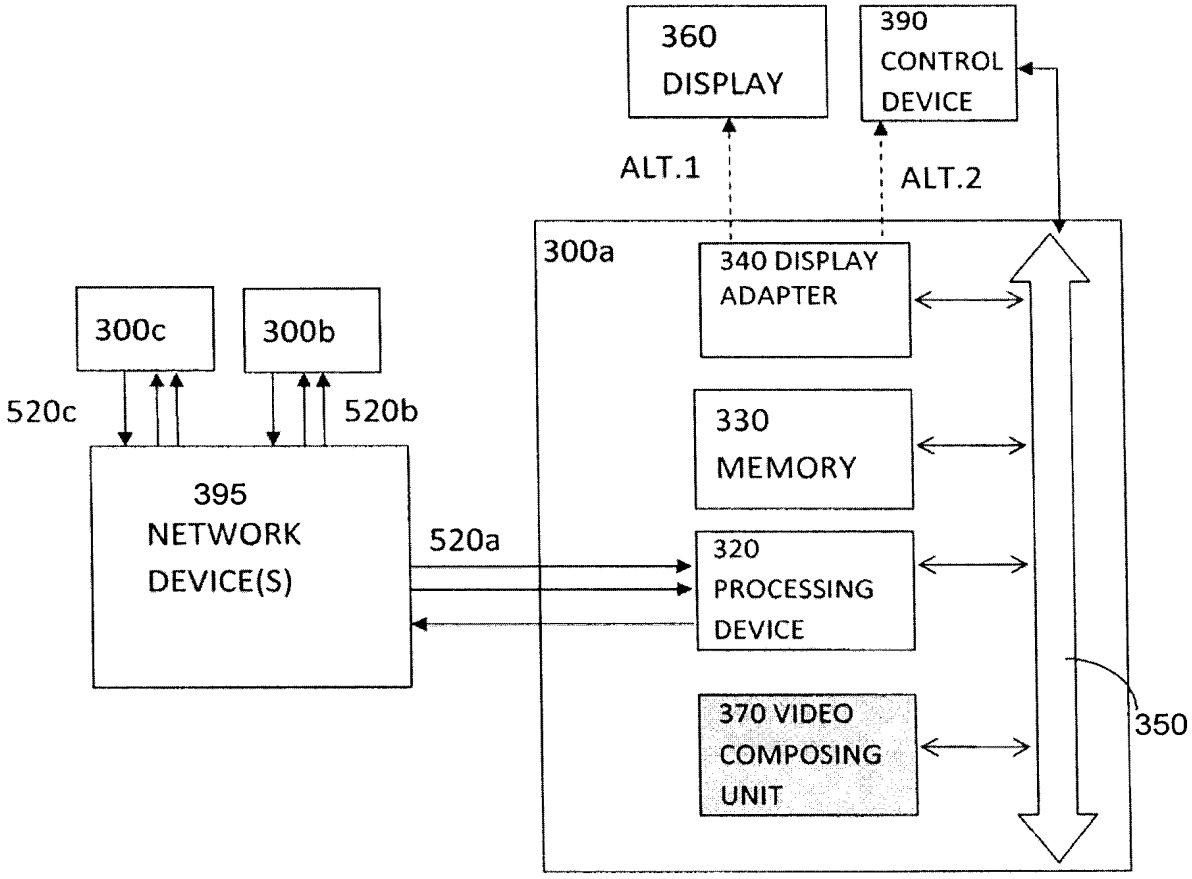

360
DISPLAY
390
CONTROL
DEVICE
ALT.1
ALT.2
300a
340 DISPLAY
ADAPTER
300c
300b
520c
520b
330
MEMORY
395
NETWORK
DEVICE(S)
520a
320
PROCESSING
DEVICE
370 VIDEO
COMPOSING
UNIT
350

FIG. 5

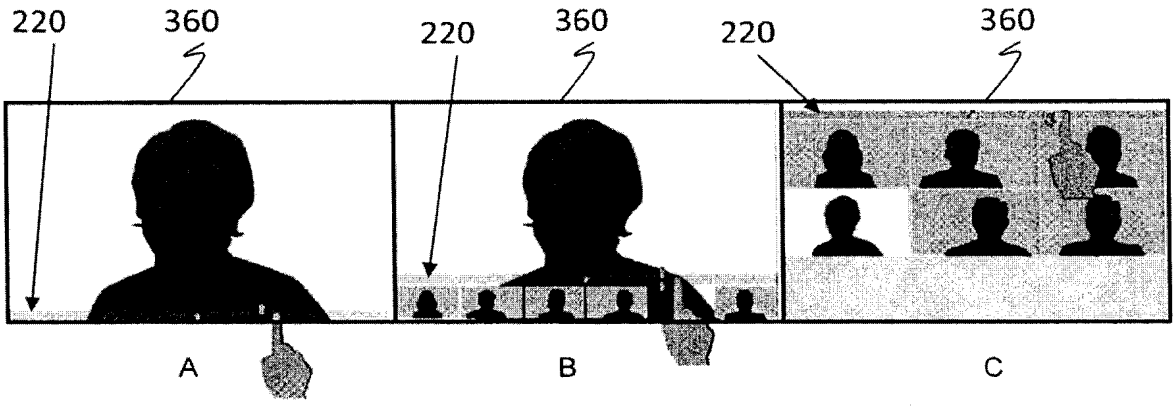

220
360
220
360
220
360
A
B
C

FIG. 6

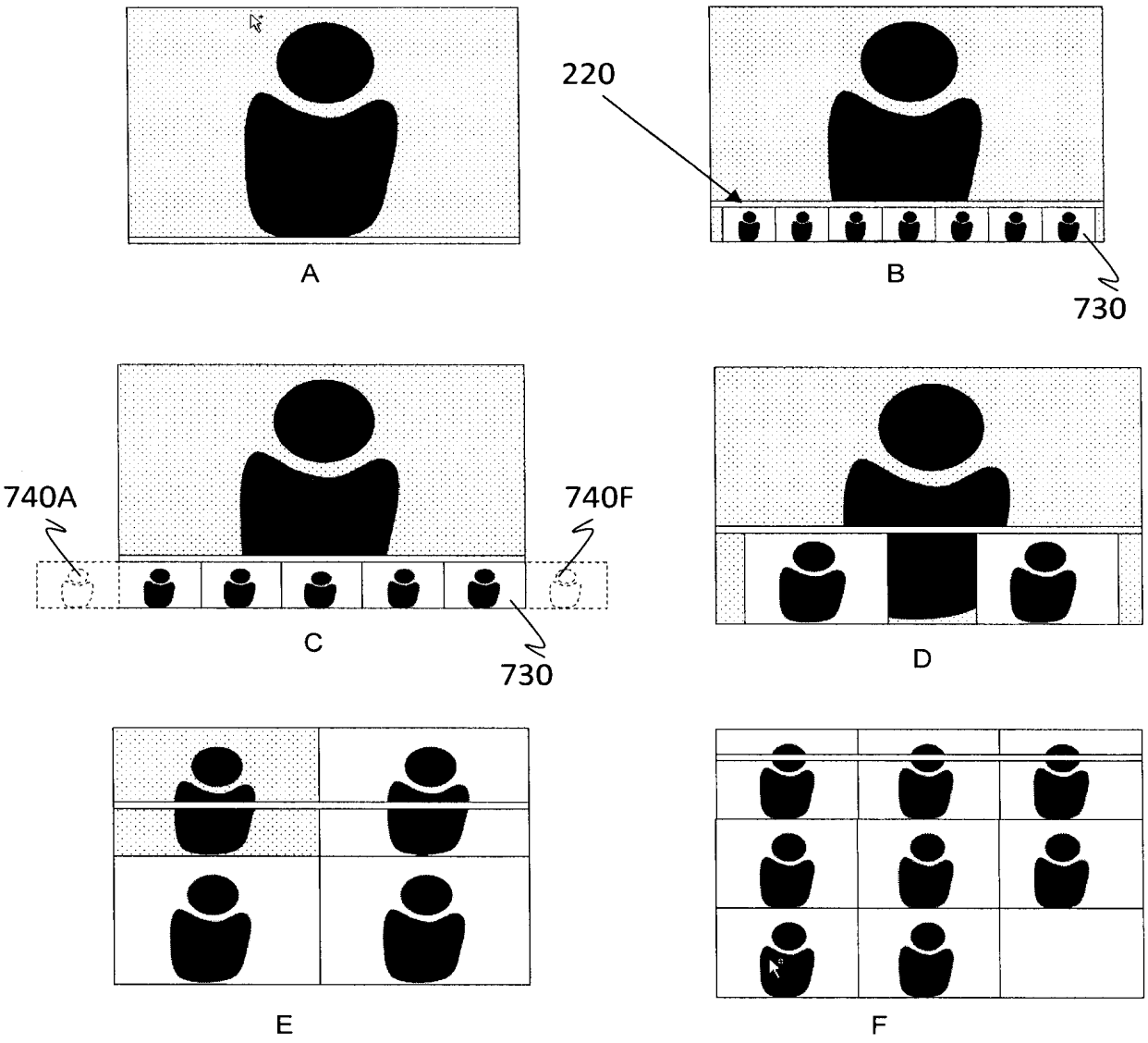


FIG. 7

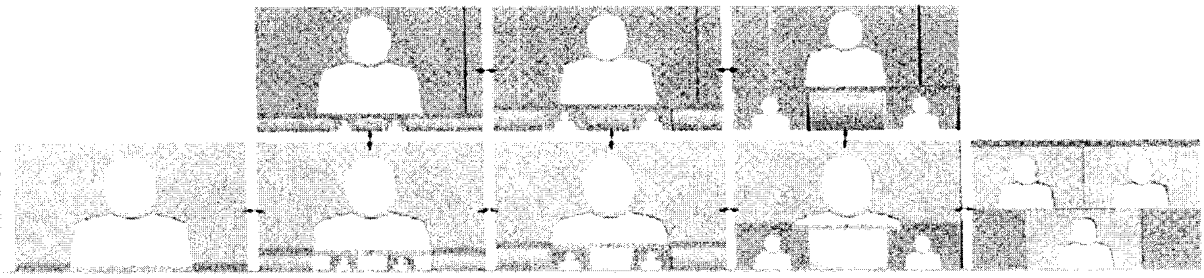
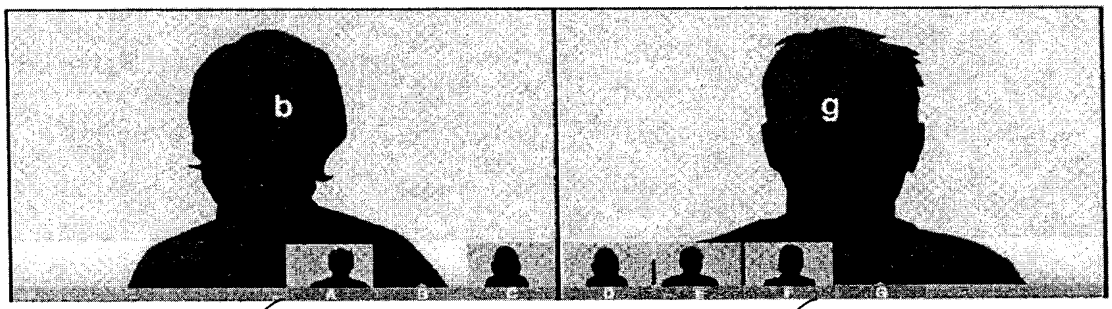


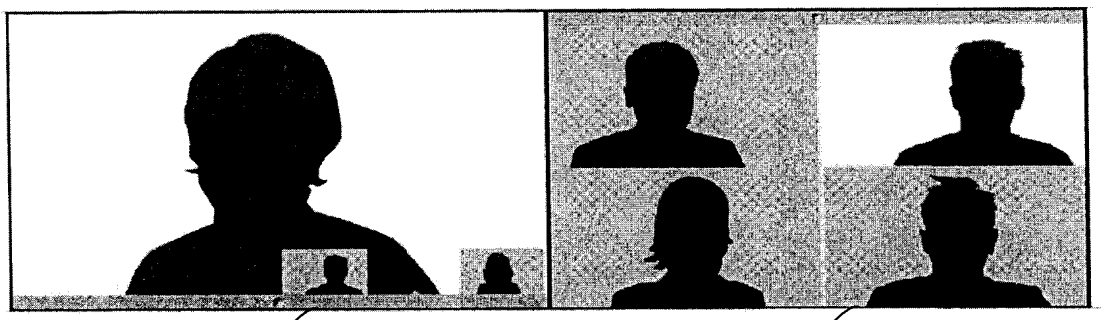
FIG. 8



359

FIG. 9

361

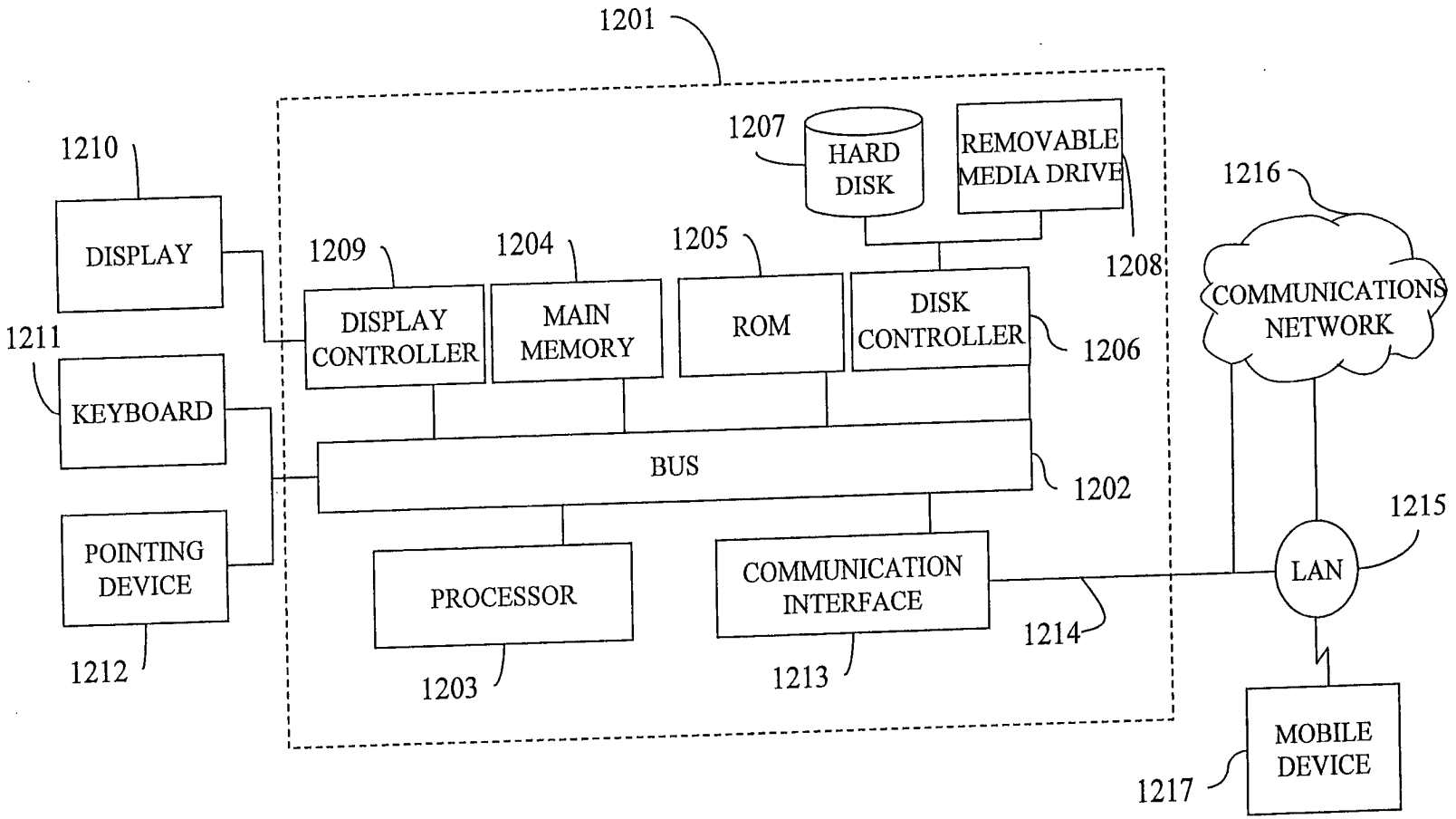


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FIG. 10

361

FIG. 11



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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Filer:	Marvin Jay Spivak/Maritza Ulloa
Attorney Docket Number:	401318US8

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	380	380
Utility Search Fee	1111	1	620	620
Utility Examination Fee	1311	1	250	250
Pages:				
Claims:				
Miscellaneous-Filing:				
Late filing fee for oath or declaration	1051	1	130	130
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1380**

Electronic Acknowledgement Receipt

EFS ID:	13363830
Application Number:	13560767
International Application Number:	
Confirmation Number:	3368
Title of Invention:	METHOD, COMPUTER-READABLE STORAGE MEDIUM, AND APPARATUS FOR MODIFYING THE LAYOUT USED BY A VIDEO COMPOSING UNIT TO GENERATE A COMPOSITE VIDEO SIGNAL
First Named Inventor/Applicant Name:	Hakon SKRAMSTAD
Customer Number:	22850
Filer:	Marvin Jay Spivak/Maritza Ulloa
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	401318US8
Receipt Date:	27-JUL-2012
Filing Date:	
Time Stamp:	18:19:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1380
RAM confirmation Number	7684
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Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

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Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal of New Application	1	1
Application Data Sheet	2	3
Specification	4	27
Claims	28	32
Abstract	33	33
Drawings-other than black and white line drawings	34	40

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	36905 640b64c7d8473ec8518dce48116fc82afaa5b0ce	no	2

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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.

SCORE Placeholder Sheet for IFW Content

Application Number: 13560767 Document Date: 7/27/2012

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions developed by SIRA.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface using the Supplemental Content tab.
- Other USPTO employees can bookmark the current SCORE URL (http://es/ScoreAccessWeb/).
- External customers may access SCORE content via the Public and Private PAIR interfaces using the Supplemental Content tab.

Form Revision Date: May 1, 2009