

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZOOM COMMUNICATIONS, INC.,

Petitioner

v.

RICOH COMPANY, LTD.

Patent Owner

IPR2026-00424

U.S. Patent No. 10,909,059

DECLARATION OF DR. KEVIN C. ALMEROOTH

REGARDING U.S. PATENT NO. 10,909,059

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PETITIONER'S EXHIBIT LIST

No.	Reference	Referred To As
1001	U.S. Patent No. 10,909,059	'059 Patent
1002	Prosecution History of U.S. Patent No. 10,909,059	'059 Patent File History
1003	Declaration of Dr. Kevin Almeroth	Almeroth Decl.
1004	U.S. Patent No. 9,113,032	'032 Patent or Vander Mey
1005	U.S. Patent Application 2010/0302346	Huang
1006	U.S. Patent No. 6,573,926	'926 Patent or Ichimura
1007	U.S. Patent Application 2006/0248210	Kenoyer
1008	U.S. Patent No. 6,346,963	'963 Patent or Katsumi
1009	U.S. Patent Application 2007/0291108	Huber
1010	U.S. Patent Application 2008/0069011	Sekaran
1011	U.S. Patent No. 8,769,001	'001 Patent or Ohwada
1012	U.S. Patent No. 8,949,593	'593 Patent or Nakagawa
1013	U.S. Patent No. 11,546,548	'548 Patent or Kato
1014	U.S. Patent Application 2013/0169742	Wu
1015	U.S. Patent Application 2014/0114664	Khan
1016	Adobe Connect Enterprise User Guide	Adobe Connect Enterprise User Guide
1017	LifeSize Multipoint User Guide	LifeSize Multipoint User Guide
1018	GoToWebinar Quick Start Guide	GoToWebinar Quick Start Guide

LISTING OF CHALLENGED CLAIMS

1.	A transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising:
[1.a]	processor processing circuitry configured to display, on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,
[1.b]	and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,
[1.c]	wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.
2.	The transmission terminal according to claim 1, wherein the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.
3.	A transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising:
[3.a]	processing circuitry configured to display, on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,
[3.b]	and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,
[3.c]	Wherein the total number of transmission terminals participating in the video conference is greater than a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal.
4.	A method implemented by a transmission terminal performing a video conference with a plurality of transmission terminals, method comprising:

[4.a]	displaying on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,
[4.b]	and displaying, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,
[4.c]	wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.
5.	The method according to claim 4, further comprising: displaying information concerning names or identification information of transmission terminals performing the video conference.
6.	A method implemented by a transmission terminal performing a video conference with a plurality of transmission terminals, the method comprising:
[6.a]	displaying, on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,
[6.b]	and displaying, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,
[6.c]	wherein the total number of transmission terminals participating in the video conference is greater than a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal.

I. INTRODUCTION

A. Engagement

1. I, Dr. Kevin C. Almeroth, have been retained by counsel for Zoom Communications, Inc. (“Petitioner”) to provide my expert opinions regarding U.S. Patent No. 10,909,059 (“the ’059 Patent”), which is assigned to Ricoh Company, Ltd. (“Patent Owner”). I have been asked to evaluate the validity of claims 1-6 of the ’059 Patent in light of the prior art. I understand that my opinions will be submitted in support of a Petition for Inter Partes Review before the United States Patent and Trademark Office, Patent Trial and Appeal Board. This declaration sets forth my opinions and the bases for those opinions.

B. Background and Qualifications

2. My complete qualifications and professional experience are described in my curriculum vitae, a copy of which is provided as Appendix A. The following is a summary of my relevant qualifications and professional experience.

3. I am currently Professor Emeritus in the Department of Computer Science at the University of California, Santa Barbara (UCSB). I have been a faculty member at UCSB since July 1997. At UCSB, I held faculty appointments and was a founding member of the Computer Engineering Program, the Media Arts and Technology Program, and the Technology Management Program. I served as Associate Director of the Center for Information Technology and Society from 1999 to 2012. My administrative roles have included Vice Chair of Computer Science

from July 2000 through November 2005 and Associate Dean of the College of Engineering from March 2007 through August 2009.

4. I hold three degrees from the Georgia Institute of Technology. I received a B.S. degree in Information and Computer Science with high honors in June 1992, with minors in Economics, Technical Communication, and American Literature. My undergraduate work included courses typical of electrical engineering, including digital logic, signal processing, and telecommunications theory. I received an M.S. degree in Computer Science in June 1994, with a specialization in Networking and Systems. I received a Ph.D. degree in Computer Science in June 1997. My doctoral dissertation was titled “Networking and System Support for the Efficient, Scalable Delivery of Services in Interactive Multimedia Systems,” and I completed a minor in Telecommunications Public Policy.

5. For more than 30 years, my research has focused on the delivery of multimedia content and data between computing devices. This encompasses network architectures, large-scale content delivery systems, scalable delivery of content to hundreds or thousands of users simultaneously, and smaller-scale content exchange between computers and portable devices. My research has emphasized efficient content exchange across networks, scalable content delivery, mobile computing, satellite networking, delivery to mobile devices, and wireless data delivery.

6. Beginning in 1992, my research focused on interactive functions for near video-on-demand systems, including VCR-style functions such as pause, rewind, and fast-forward, and aggregation of requests for movies using one audio/video stream broadcast to multiple receivers. I have researched communicating multimedia content, including video, between computers across networks including the Internet, including streaming multimedia content and multicast protocols for efficient delivery to multiple endpoints simultaneously.

7. Starting in 1997, I worked on integrating Internet streaming media with web interactivity through a system called the Interactive Multimedia Jukebox (IMJ), where users selected content via a web page and content was scheduled and delivered through multicast channels. The IMJ combined web interactivity with Internet streaming to create a jukebox-like service supporting Video-on-Demand when capacity allowed and scalable service to many users. This work is directly relevant to the subject matter of the '059 Patent because it involved the integration of interactive user interface controls with real-time multimedia delivery across networked systems.

8. Since 1997, I have also researched wireless devices and sensors, lightweight devices, small form-factor and resource-constrained devices, wireless networking, ad hoc networks, mesh networks, and wireless protocols. My wireless networking work spans the protocol stack from applications through data link and

physical layers. My research includes application development for mobile platforms, opportunistic contact among mobile devices, wireless infrastructure support, challenged network environments, network monitoring, IEEE 802.11 networks, channel bonding, location information, handoffs, and location and movement prediction.

9. Since 2000, I have worked on network security, firewalls, intrusion detection, malware detection, and a Department of Defense/Army Research Office high-speed intrusion detection project. I have also investigated content delivery in online social networks, caching and cache placement strategies, reputation management systems, peer-to-peer communication architectures, and recommendations for downloadable applications.

10. One of my early research interests was in using technology in the classroom to aid in instruction. An initial concern was that too much technology, or technology used incorrectly could be a distraction. Therefore, starting in the late 1990s, I undertook research to first figure out what technology could be used in the classroom and then continued on with research to understand its effectiveness. This work included the design, deployment, and study of digital classroom systems, including work to build infrastructure for a next-generation digital classroom. It also led to a broader set of projects and publications involving classroom activity monitoring, network access controls, plagiarism detection, clicker-based interaction

in large lecture courses, and tools for measuring student engagement and learning in computer-equipped classrooms.

11. I have been involved in the Internet Engineering Task Force (IETF), including content-delivery and multicast-related working groups: AVT, MBONED, SSM, IDMR, RMT, and PIM. I served on the Multicast Directorate and chaired the Internet2 Multicast Working Group for seven years. I co-founded Santa Barbara Labs, which developed emulation systems for the U.S. Air Force's next-generation internetwork, including systems for IPv6, multicast, quality of service, satellite communication, security, video conferencing, and video-on-demand.

12. I have consulted with or collaborated with IBM, Hitachi Telecom, Turner Broadcasting System, Bell South, Digital Fountain, RealNetworks, Intel Research, Cisco Systems, and Lockheed Martin. I have held leadership roles in academic journals and conferences, including ACM NOSSDAV, ICNP, CHANTS, IEEE Global Internet Symposium, IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE Network, ACM Computers in Entertainment, and ACM Computer Communications Review. I am a Fellow of IEEE and a member of ACM.

13. I have taught courses covering Internet and network communication, physical and data link layers, cable systems, telephone lines, wireless communication, high-speed LANs, data communication, multimedia encoding,

mobile application design, and infrastructures including cable, ISDN, Ethernet, ATM, fiber, and DSL. I received the UCSB Academic Senate Distinguished Teaching Award in 2006-2007, multiple Computer Science Outstanding Faculty Member awards, and the UCSB Spotlight on Excellence Award. Additional details of my education and work experience, awards and honors, and publications that may be relevant to the opinions I have formed are set forth in my CV, attached hereto as Appendix A.

14. Based on my education and experience, I am familiar with the state of the art before March 31, 2014 in networked multimedia systems, video conferencing, graphical interfaces for networked collaboration, interactive multimedia systems, content sharing, client/server and peer-to-peer content delivery, and software systems for displaying and controlling multimedia content across networked devices. The '059 Patent concerns a transmission terminal for video conferencing that controls the display of a total number of participating terminals and a subset of image data from participating terminals—subjects that fall squarely within my expertise. My education, research, and professional experience provide me with a thorough understanding of the technology at issue in this proceeding, and I am well qualified to opine on the level of ordinary skill in the art and the prior art relevant to the '059 Patent.

C. Compensation and Prior Testimony

15. I am being compensated at my standard hourly rate for my study and testimony in this matter. My compensation is not contingent on the outcome of this proceeding or the specifics of my testimony. I have previously provided expert testimony in matters involving patents related to computer systems, networking, multimedia systems, and related technologies, including depositions and trial testimony in federal court. A complete list of cases in which I have testified as an expert within the past four years is set forth in my CV, attached as Appendix A.

D. Information Considered

16. My opinions are based on my years of education, research, and experience, as well as my investigation and study of relevant materials. In forming my opinions, I have considered the materials I identify in this report and those listed in the Exhibit List at the start of this declaration.

17. I may rely upon these materials or additional materials to respond to arguments raised by the Patent Owner. I may also consider additional documents and information in forming any necessary opinions—including documents that may not yet have been provided to me.

18. My analysis of the materials produced in this matter is ongoing and I will continue to review any new materials as they are provided. This declaration represents only those opinions I have formed to date.

II. LEGAL STANDARDS FOR PATENTABILITY

19. In expressing my opinions and considering the subject matter of the claims of the '059 Patent, I am relying upon certain basic legal principles that have been explained to me. I understand that in an inter partes review, the petitioner bears the burden of proving unpatentability by a preponderance of the evidence. A preponderance of the evidence means that a proposition is more likely true than not true. I have applied this standard in forming my opinions in this Declaration.

20. I understand that claims subject to inter partes review are given their ordinary and customary meaning as understood by one of ordinary skill in the art in view of the patent specification and its prosecution history.

21. I understand that a prior art reference anticipates a patent claim under 35 U.S.C. §102 if it discloses each and every element of the claim, either expressly or inherently, arranged as in the claim. Anticipation requires that the identical invention be described in a single prior art reference.

22. I understand that a claim is unpatentable as obvious under 35 U.S.C. §103 if the differences between the claimed invention and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made. The factual inquiries underlying the obviousness determination include: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary

skill in the pertinent art; and (4) objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, failure of others, and unexpected results.

23. I understand that the obviousness analysis cannot be confined by a rigid requirement of a teaching, suggestion, or motivation to combine prior art references. Any motivation known to a person of ordinary skill in the art—including common sense, the nature of the problem to be solved, or market demand—is sufficient to explain why prior art references would have been combined. The analysis must be expansive and flexible, taking into account the interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person of ordinary skill in the art. Prior art is not limited to solving the same problem addressed by the patentee; any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining prior art elements.

24. I understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. If a technique has been used to improve one device, and a person of ordinary skill would recognize that it would improve similar devices in the same way, using that technique is obvious unless its actual application is beyond that person's skill. When there is a design need or market pressure to solve a problem and there are a

finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.

25. I understand that a reference does not “teach away” from a combination simply because it suggests another embodiment is preferred. Teaching away requires a clear statement that the combination should not be attempted or will not work. I further understand that obviousness does not require bodily incorporation of features of one reference into another; the test is what the combined teachings of the prior art would have suggested to a person of ordinary skill. A person of ordinary skill is also a person of ordinary creativity, not an automaton.

26. I understand that obviousness must be assessed from the perspective of a person of ordinary skill in the art at the time of the invention, without the benefit of hindsight derived from the patent itself. Objective factors such as commercial success, long-felt but unsolved needs, failure of others, copying, licensing, and unexpected results may be considered as secondary indicia bearing on the question of obviousness.

27. I have applied these legal standards in my evaluation of the claims of the '059 Patent as set forth in this Declaration.

III. TECHNOLOGY BACKGROUND

28. The '059 Patent generally relates to a video conference system in which a transmission terminal displays information concerning the total number of participating terminals and a subset of image data from those terminals. In my opinion, every aspect of the technology described in the '059 Patent was well known years before any possible priority date of March 31, 2014.

A. Multi-Party Video Conferencing Was Well Known

29. IP network-based video conferencing systems enabling multi-party communication were commercially available and deployed by the early 2000s. As Huang explained, “the evolution of the internet and World Wide Web has made web conferencing an attractive option for people to meet online, to have video, voice, and text communications, and to view and collaborate on the same document remotely.” EX1005, ¶[0002]. In these systems, each endpoint terminal was typically equipped with a camera, a microphone, and one or more displays, connected through an IP network to a centralized server or multipoint control unit (“MCU”) that managed audio and video distribution. EX1007, ¶[0005]; EX1008, 1:21–30.

B. Displaying Participant Information During Active Conferences

30. POSITAs understood how to display participant information during an active video conference. Prior art systems offered multiple display modes to address the inherent tension between showing video of the participants and conveying information about who, and how many, participants attended conferences.

31. **Full-screen display modes** divided terminal screens into image areas—often one large primary area and multiple smaller secondary areas—to show video feeds from participating terminals. EX1007, ¶[0006], FIG. 1a; EX1008, 3:60–4:5.

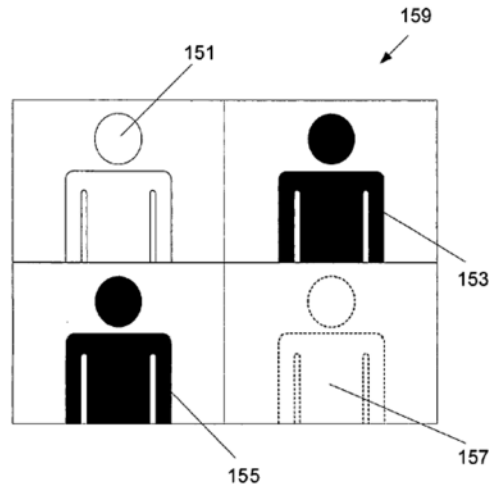


FIG. 1a
(Prior Art)

32. **In information display modes**, participant information was displayed during active conferences, such as participant names, endpoint numbers, participant counts, participant roles, and connection status. EX1016, pp. 34, 63–65; EX1017, pp. 87–93. The problem of diminishing image size as the quantity of participants increased was understood: when “the number of transmission terminals attending the conference increases,” the “display area for displaying an image transmitted from

each transmission terminal is reduced,” making it impossible for users to “grasp which transmission terminal is attending the conference.” EX1013, 1:42–572:1–10.

33. Many solutions to this problem were used. Huang disclosed dividing participants across multiple screen pages, each page showing a subset of video images, allowing users to navigate. EX1005, ¶[0009]. Vander Mey disclosed displaying a subset of participants based on participation ratings derived from conversation properties, with an overlay showing lists of participants. EX1004, 16:55–17:20, FIG. 4. Wu disclosed choosing participants to display based on participation properties and resource constraints, enabling conferences with “unlimited” participants despite only a subset appearing on the screen. EX1014, ¶¶[0013], [0045], [0055]. Khan disclosed generating and distributing lists of recently dominant speakers, in order to update each participant’s display. EX1015, ¶¶[0007]–[0010], [0058]–[0059], [0070]–[0075].

C. Conference Attendance Tracking and Session Establishment

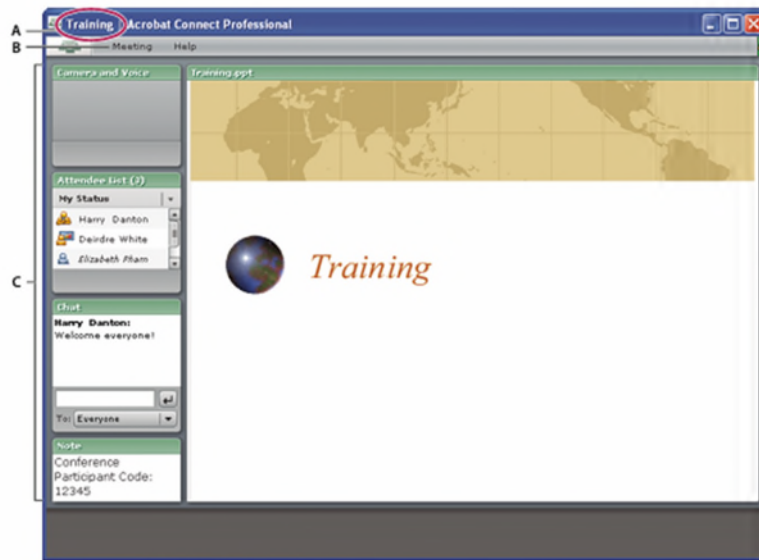
34. The process of establishing a session, tracking attendance, and responding to terminal information requests was present in numerous prior art systems, and generally followed the same high-level steps. When a terminal wished to initiate a conference, it sent attendance request information, including information identifying itself and the destination, to a management apparatus. The management apparatus updated the terminals’ state, established multimedia sessions, and

transmitted state change information to other participants. EX1012, FIGS. 20A–20B; EX1011, FIGS. 27–30B.

35. Videoconferencing management systems also used known sequences to determine participant lists: a requesting terminal requested a list, the management system determined terminal IDs and terminal names, sent the list and operation-state information, and then the terminal displayed names and status icons for candidate terminals. EX1011, 26:54–27:12, 30:55–31:20, FIG. 26

36. Dynamically updating these lists when participants joined or departed a conference was also well known. Prior art systems automatically propagated updated attendance information, thereby enabling users to be aware of conference attendance in real-time, and with no manual user intervention required. EX1009, ¶[0006] (disclosing transmitting “only the difference” when a conference state changes); EX1007, ¶[0007].

37. Commercial conferencing products were similar in design. Adobe Connect Enterprise allowed users to conduct real-time online meetings in which hosts could show presentations, share screens, and broadcast live audio and video to attendees, and Adobe’s meeting-management documentation describes an Attendees pod for managing the list of attendees, roles, permissions, and attendee information during the meeting. EX1016, p. 34.



*A participant's view of the Stage
A. Meeting name B. Participant menu bar C. Pods*

Adobe Connect documentation confirms that participant counts were tracked in meeting systems, including by reporting concurrent meeting participants and enforcing attendee limits when a meeting room was full. EX1016, pp. 43–44, 218–220.

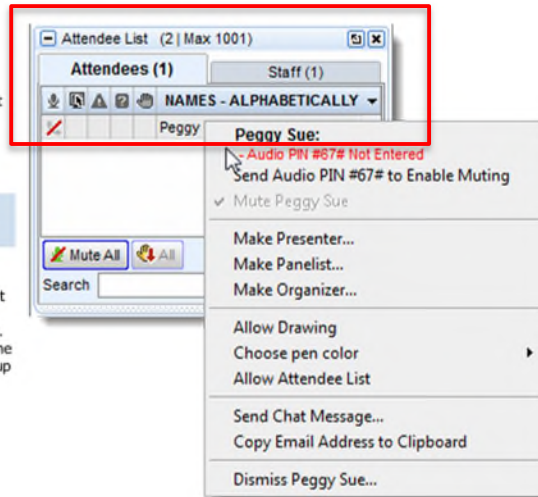
38. GoToWebinar's 2012 Organizer Quick Start Guide likewise shows support for online sessions with up to 1,000 attendees, and that webinar organizers could view statistics including the number of registrants versus the number of attendees. EX1018, p. 4.

Manage Attendee Audio

Attendees who join the audio portion of your Webinar are joined muted by default. Attendees joined via VoIP will have a Microphone icon next to their name. Attendees joined via telephone will have a Telephone icon next to their name.

Note: Up to 25 attendees can be unmuted at any one time (this is a combination of VoIP and phone attendees).

Attendees who join the webinar via Telephone must enter their Audio PIN so that the organizer has full audio controls through the Organizer Control Panel. If not entered, you can right-click the person's name and select **Send Audio PIN**. This will send a pop-up message with the Audio PIN to that person.

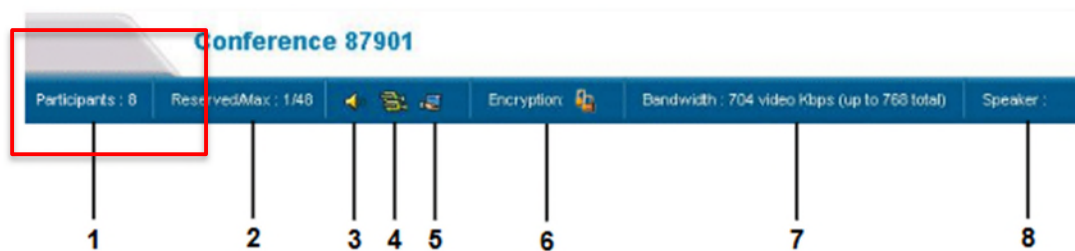


39. LifeSize's documentation also confirms that video conferencing systems managed conferences while keeping track of participant capacity, and displayed or tracked participant-related information, including participant lists. EX1017, pp. 87-93.

Figure 2-2 Conference Control Interface Elements



Figure 2-3 Conference Control Status Bar



40. These disclosures show that the display of participant information during an active conference, including displaying the total number of current participants, was not inventive. In my opinion, a POSITA designing a video conference user interface would have understood that, when a system displays fewer than all of the participant video feeds, the user benefits from separate display of information that identifies the participant population. This was particularly true for large conferences, where only a small fraction of the participants could practically be displayed on a screen at one time.

41. By the time of the alleged invention, POSITAs were familiar with the functionality relevant to the '059 Patent: tracking terminal states, storing identification data, providing participant information, and displaying that information on terminal screens during active video conferences. In my opinion, those functions were not inventive; they were ordinary features of conferencing systems.

IV. '059 Patent

A. Overview

42. The '059 Patent claims a video conference terminal that displays video from fewer than all of the conference participants, and displays information concerning the total number of participants. EX1001, claims 1, 3-4, 6.

43. The '059 Patent's own Background section describes that multi-party video conferencing using transmission terminals was already known. EX1001, 1:35-50. The patent discloses that each transmission terminal divides an image area of a display into divisions corresponding to participating transmission terminals, and displays participants in the respective divisions. EX1001, 1:47-53~~2:1-7~~. The problem identified by the patent is that when the number of conference participants grows large, the divisions become too small for a user to identify who is attending, and the user cannot know the total number of participants without switching away from the video display into a separate information mode. EX1001, 2:10-25, 23:55-67.

44. The patent suggests that rather than requiring the user to switch display modes to learn how many participants are in the conference, the terminal displays information concerning the total number of participants, e.g., the participant count, in a small auxiliary area of the display. EX1001, 24:1-10, FIG. 18. The auxiliary area is a belt-like strip at the screen edge that shows, among other things, the total

number of “bases” (i.e., participating terminals), while the video feeds are also displayed. EX1001, 24:10-28. If the number of participants is so large that not all of the participant video feeds can fit on screen, the user can still see the participant count in the auxiliary area without having to switch to a different display screen. EX1001, 25:17-26, FIGS. 19-20.

B. Prosecution History

45. U.S. Patent Application No. 16/654,752 was filed on October 16, 2019, as a continuation of U.S. Patent Application No. 15/277,069, filed on September 27, 2016, which is itself a continuation of PCT/JP2015/060144, filed on March 31, 2015. EX1001; EX1002. The application was initially filed with a single claim to a transmission terminal whose processor the number of terminals currently transmitting, and whose display shows image data from one or more transmitting terminals along with the received count. EX1002, 8.

46. In a Non-Final Office Action dated March 3, 2020, the Examiner rejected the pending claim for nonstatutory double patenting over claim 1 of U.S. Patent No. 10,503,676 (the “’676 Patent”) and also rejected claim 1 as anticipated by U.S. Patent Publication No. 2012/0182384 (“Anderson ’384”) under 35 U.S.C. §102. EX1002, 185-189. The Examiner noted U.S. 2013/0242033 (“Kato”) as pertinent prior art but did not rely on it. EX1002, 189.

47. On June 3, 2020, the Applicant amended claim 1 and added new claims 2-6. Amended claim 1 recited that the transmission terminal conducts a video conference with multiple terminals, includes processing circuitry that displays information concerning the total number of participating terminals, and shows on its screen a subset of image data from participating terminals fewer than the total number of participants. EX1002, 201. In response, the Applicant admitted Anderson '384 does not disclose or suggest the clarified display-control scheme, thereby overcoming the §102 rejection. EX1002, 207-210.

48. On June 25, 2020, the Examiner issued a Final Rejection based on nonstatutory double patenting, but otherwise indicated allowable subject matter. EX1002, 219-220. In “Allowable Subject Matter,” the Examiner stated that claims 1-6 appear allowable because the prior art of record does not teach or suggest “a transmission terminal comprising processing circuitry configured to display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other, wherein the number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminals is smaller than the total number of transmission terminals participating in the video conference.” EX1002, 227-228.

49. On September 11, 2020, the Examiner issued a Notice of Allowance, noting the terminal disclaimer over the '676 Patent and allowing claims 1-6 for the same reasons set forth in the June 25, 2020, Final Rejection. EX1002, 274-278.

V. LEVEL OF ORDINARY SKILL IN THE ART

50. A person of ordinary skill in the art ("POSITA") relevant to the '059 Patent as of March 31, 2014 would have had at least: (1) a bachelor's degree in electrical engineering, computer science, computer engineering, or equivalent coursework, with at least two years of work experience in video conferencing systems, networked multimedia communication systems, or remote conference system architectures; or (2) a master's degree in electrical engineering, computer science, computer engineering, or equivalent coursework, with coursework or research focused on video conferencing systems, networked terminal management, real-time audio/video transmission, or client-server communication architectures. An individual with additional education could have less practical experience, and vice versa. I meet or exceed this definition of a person of ordinary skill in the art at all times relevant to this proceeding.

VI. CLAIM CONSTRUCTION

51. It is my opinion that no constructions are necessary for determining whether the prior art meets the limitations of the challenged claims.

VII. OVERVIEW OF CHALLENGE

52. It is my opinion that claims 1-6 are unpatentable, as set forth below. As set forth in this declaration, I present three grounds of invalidity: (1) Ground 1, demonstrating that Vander Mey (EX1004) anticipates, or in the alternative renders obvious, claims 1-6 under 35 U.S.C. §§102/103; (2) Ground 2, demonstrating that Huang (EX1005) anticipates, or in the alternative renders obvious, claims 1-6 under 35 U.S.C. §§102/103; and (3) Ground 3, demonstrating that Vander Mey in view of Ichimura (EX1006) renders obvious claims 1-6 under 35 U.S.C. §103.

53. The application that issued as the '059 Patent was filed on October 16, 2019, and is a continuation of U.S. Application No. 15/277,069 filed September 27, 2016, which is a continuation of International Application No. PCT/JP2015/060144 filed March 31, 2015, which claims priority to Japanese Patent Application No. 2014-071406 filed March 31, 2014. EX1001.

54. The challenge is based on the references discussed below, each of which is prior art under pre-AIA 35 U.S.C. §102. None of these references were considered or cited during prosecution of the '059 Patent.

55. Vander Mey, U.S. Patent No. 9,113,032 (EX1004), was filed on August 25, 2011, and issued on August 18, 2015, making it prior art to the '059 Patent under 35 U.S.C. §§102(a) and 102(e). Vander Mey discloses a computing device that participates in a video conference with a plurality of other computing devices,

receives image data from those devices, displays only a subset of participant video feeds, and displays a participant list overlay while tracking how many total participants the video conference has. EX1004, 4:25-65, 6:10-35, 14:52-61, 17:17-25. Vander Mey was never cited or considered by the Examiner during prosecution of the '059 Patent.

56. Huang, U.S. Patent Application Publication No. 2010/0302346 (EX1005), was filed on May 27, 2009, and published on December 2, 2010, making it prior art to the '059 Patent under 35 U.S.C. §§102(a) and 102(b). Huang discloses a large-scale video conferencing system in which client computers participate in conferences with up to 100 participants, each client displays video feeds from only a subset of participants through a page-based display, and the page navigation interface, participant name lists, and search functionality convey information concerning the total number of conference participants. EX1005, ¶¶[0009], [0021], [0025]. Huang was never cited or considered by the Examiner during prosecution of the '059 Patent.

57. Ichimura, U.S. Patent No. 6,573,926 (EX1006), was filed on June 21, 1999, and issued on June 3, 2003, making it prior art to the '059 Patent under 35 U.S.C. §§102(a), 102(b), and 102(e). Ichimura discloses a conference system in which conference terminals exchange real-time data through a conference control device that maintains conference control information, including a participant number

storage section, and each terminal includes an output device and conference means that provide a user interface displaying the number and profiles of the participants currently attending the conference. EX1006, 3:55-4:30, 5:1-50, 6:20-37. Ichimura was never cited or considered by the Examiner during prosecution of the '059 Patent.

58. In my opinion, Vander Mey, Huang, and Ichimura are each relevant prior art that was not considered by the Examiner during prosecution of the '059 Patent. Had the Examiner been presented with these references, I believe the outcome of prosecution would have been different.

59. Based on my review of the prior art and my understanding of video conferencing technology as it existed before March 31, 2014, I believe the claims of the '059 Patent cover no more than the predictable combination of well-known conferencing-system features. The claimed functions—displaying a subset of participant video feeds while providing information concerning the total number of participants—were standard design choices that any POSITA would have considered when developing a video conferencing interface.

VIII. THE ASSERTED GROUNDS OF INVALIDITY

A. Ground 1: Vander Mey Anticipates and in the Alternative Renders Obvious Claims 1-6

60. It is my opinion that Vander Mey anticipates every limitation of claims 1-6 of the '059 Patent. Vander Mey discloses a computing device (transmission terminal) with processors (processing circuitry) that engages in a video conference

with a plurality of other computing devices. Vander Mey's computing device displays image data from a subset of conference participants on its display, and displays an overlay with a participant list. The displayed video feeds are fewer than the total conference population; Vander Mey provides an example where display device 4 shows image data associated with only two out of the six participants. EX1004, 6:15-~~7:220~~, 17:1~~7~~-25, FIG. 1.

61. I have also been asked to consider, if the claims are limited to display of the specific total number of participants, whether Vander Mey renders the claims obvious. It is my opinion that Vander Mey would still render claims 1-6 obvious. Vander Mey tracks “how many total participants the video conference has” and provides an overlay for conference-related information. EX1004, 14:55-61, 17:1~~7~~-~~25~~. Displaying that number in the existing overlay would have been an obvious modification requiring no more than routine software engineering skill.

62. A POSITA would have understood that Vander Mey's participant list overlay satisfies the claim requirement of displaying “information concerning a total number of transmission terminals” because a displayed participant list conveys the total number of participants—the user can simply count the entries or perceive the list's length at a glance. In my experience with video conferencing systems, participant lists were a standard mechanism for conveying attendance information,

and a POSITA would have recognized that such a list constitutes “information concerning” the total count.

1. Independent Claim Preambles [Claim 1]/[Claim 3]/[Claim 4]/[Claim 6]

a) [1.pre]/[3.pre] “A transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising:”

63. It is my opinion that Vander Mey discloses “[a] transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising.”

64. Vander Mey describes a “first computing device 2” in a “real-time video communication” with five other computing devices 20-1 through 20-5 over a network. EX1004, 4:25-40; FIG. 1. Computing device 2 and computing devices 20-1 through 20-5 “have established a real-time video communication, referred to herein as a video conference.” EX1004, 4:60-65. Computing device 2 constitutes a “transmission terminal performing a video conference with a plurality of transmission terminals.”

65. Vander Mey’s computing device is a “transmission terminal.” Vander Mey discloses that computing device 2 may be “a desktop computer,” “a mobile phone,” “a laptop,” “a tablet device,” or other computing device. EX1004, 34:30-40. The ’059 Patent also discloses that its transmission terminal may be “an information processing terminal” such as “a PC (Personal Computer), a tablet-type

terminal, a smartphone, a cell phone, a PDA.” EX1001, 4:65-5:5. These device examples confirm that Vander Mey’s computing device is a transmission terminal.

66. Therefore, in my opinion, Vander Mey discloses “[a] transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising.”

b) [4.pre]/[6.pre] “A method . . .”

67. It is my opinion that Vander Mey discloses “[a] method . . .”

68. **Vander Mey’s Own Claims Recite a Method.** Vander Mey’s claim 1 recites “[a] method, comprising: determining, at a computing device that includes one or more processors and that is associated with a user, a participation rating for each of a plurality of participants in a real-time visual communication session . . . selecting . . . two or more participants . . . and providing, for display, image data associated with the two or more selected participants on a display device of the computing device.” EX1004, 19:5-30. Vander Mey itself claims a method performed by a computing device during a video conference. A POSITA would have understood that Vander Mey necessarily discloses methods associated with its disclosure.

69. Vander Mey’s FIG. 3 is a flowchart illustrating “an example method 60 that may be performed by a computing device to determine which image data associated with two or more participants from a plurality of participants in a real-

time communication session to display on the computing device.” EX1004, 9:62-10:1-7; FIG. 3. Vander Mey’s Method 60 includes the steps of determining participation ratings (step 62), selecting participants based on those ratings (step 64), and providing image data associated with the selected participants for display (step 66). EX1004, 10:1-15; FIG. 3. These steps are performed by computing device 2—the same “transmission terminal” discussed in my analysis of [1.pre] above.

70. The Method Is Implemented by Software Executed on Processors.

Vander Mey teaches that computing device 2 includes “one or more processors 40” that execute “video conference application 8,” which in turn includes “selection module 6.” EX1004, 78:45-679, 9:50-65; FIG. 2. When processors 40 execute video conference application 8 and selection module 6, computing device 2 performs the steps of establishing a video conference, receiving image data from other participants, selecting which participants' image data to display, and displaying the selected image data on display device 4. EX1004, 6:1-20, 7:5110-6740, 10:1-15. A POSITA would have understood that any processor-based system that executes software to perform functions necessarily performs the steps of a method.

71. The Method Is Performed During a Video Conference with a Plurality of Terminals. Vander Mey discloses that computing device 2 and computing devices 20-1 through 20-5 “have established a real-time video communication, referred to herein as a video conference.” EX1004, 4:60-65. The

method described in FIG. 3 is performed during this video conference. Participation ratings are determined based on properties of the active conference (such as who is currently speaking), and the display of selected participants' image data on the screen of computing device 2 occurs during the conference. EX1004, 7:10-40, 10:1-15. Computing device 2 therefore implements the method while it is performing a video conference with the plurality of computing devices 20-1 through 20-5.

72. **Vander Mey's Specification Confirms the Method Is Continuously Performed.** Vander Mey teaches that "each participation rating for each of the plurality of participants may be updated throughout the video conference" and that "the selection process may also be performed regularly, intermittently, or continuously throughout the video conference." EX1004, 156:35-442. This confirms that Vander Mey's method 60 is an ongoing process implemented by the transmission terminal throughout the video conference, as contemplated by claims 4 and 6.

73. Therefore, in my opinion, Vander Mey discloses "[a] method."

2. **[1.a]/[3.a]/[4.a]/[6.a] "processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,"**

74. It is my opinion that Vander Mey anticipates and in the alternative renders obvious "processor processing circuitry configured to display on a screen of

the transmission terminal, information concerning a total number of transmission terminals participating in the video conference.”

75. **Processor processing circuitry.** Vander Mey’s computing device 2 includes “one or more processors 40” that execute video conference application 8 and selection module 6 to control the device’s communication and display functions. EX1004, ~~78:5045-670~~; FIG. 2. Processors 40 “may be configured to implement functionality and/or process instructions for execution in computing device 2.” EX1004, 8:~~41-543~~. A POSITA would have understood that processors 40 constitute the claimed “processor processing circuitry.”

76. **Participant List Overlay.** Vander Mey teaches that display device 84 “may further display an overlay 94” and that “[i]nformation that may be included in overlay 94 may include a list of participants.” EX1004, 17:19-25; FIG. 4. This participant list is displayed on the same screen as the selected participants’ video feeds, simultaneously with the video conference. EX1004, FIG. 4 (showing overlay 94 on display device 84 alongside four participants’ video feeds).

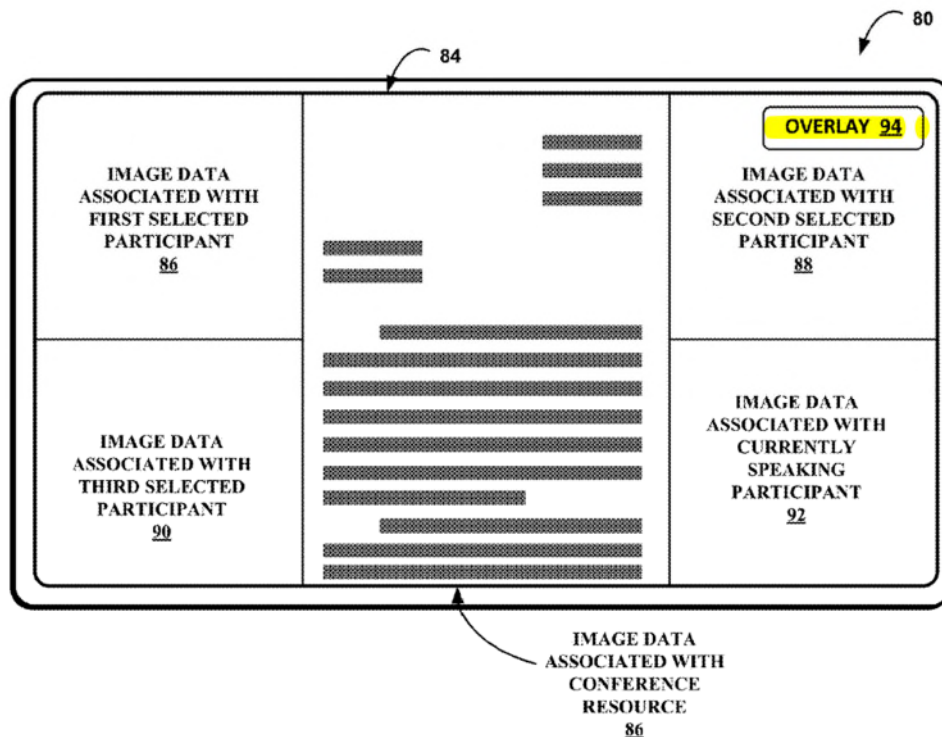


FIG. 4

77. A complete participant list conveys participant-count information because it allows the user to perceive the quantity of participants. For example, a displayed roster of Alice, Bob, Charles, Dave, Eve, and Frank conveys a six-participant conference. Vander Mey's participant list communicates the quantity of participants to a user who views it in its overlay. EX1004, 17:19-25.

78. A participant list conveys information concerning a total number of participants because the list itself discloses information concerning the quantity of conference attendees. A participant list is an informative method of convey this information as it conveys both the quantity and identity of conference participants. Therefore, Vander Mey's participant list overlay satisfies this limitation.

79. **System Knowledge and Display of Total Participant Count.** Vander Mey states that “N may be dynamically determined throughout the video conference based on properties of the video conference (for example, how many total participants the video conference has, how many active participants there are, etc.).” EX1004, 14:55-61. This shows that Vander Mey’s system maintains a count of “how many total participants the video conference has” and uses it to make display decisions.

80. A system that (1) knows the total participant count, (2) generates a list of all participants, and (3) displays that list on screen via an overlay necessarily displays “information concerning a total number of transmission terminals participating in the video conference.” The total number of transmission terminals participating in the video conference is inherent in the displayed list.

81. **Alternative Obviousness Rationale.** Displaying a participant count alongside video feeds during a conference would have been obvious to a POSITA in view of Vander Mey alone. Vander Mey’s system already tracks “how many total participants the video conference has” internally. EX1004, 14:55-61. Vander Mey already provides an overlay mechanism (overlay 94) for displaying conference-related information on screen. EX1004, 17:17-25. To display the internally tracked total-participant count in the existing overlay is a straightforward user interface modification requiring no architectural changes and no more than routine

programming skill. A POSITA would have been motivated to add a numerical participant count to the overlay because some users of Vander Mey's system—who can see only a subset of video feeds—would want to know at a glance the total size of the conference without having to count entries in a list. This is the predictable use of a known technique (displaying a count) in a known system (Vander Mey's overlay) to yield a predictable result (informing the user of conference size).

82. In my opinion, incorporating a numerical participant count into Vander Mey's existing overlay would have been well within the skill of an ordinary software developer working on video conferencing applications. Video conferencing interfaces at the time routinely displayed participant counts alongside participant lists, as evidenced by commercial products like Adobe Connect, GoToWebinar, and LifeSize—all of which tracked and displayed participant numbers during active conferences.

83. **Routine Design Choice.** A POSITA designing a video conferencing interface would have understood that displaying the number of current participants is a routine and useful design choice, especially where the interface displays fewer than all participant videos. Vander Mey already recognizes that the total number of participants affects how many video feeds should be displayed. EX1004, 14:55-61. A POSITA would have viewed the addition of such a participant count to Vander Mey as a straightforward, predictable, and beneficial interface enhancement.

84. Therefore, in my opinion, Vander Mey anticipates, and in the alternative, renders obvious “processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference.”

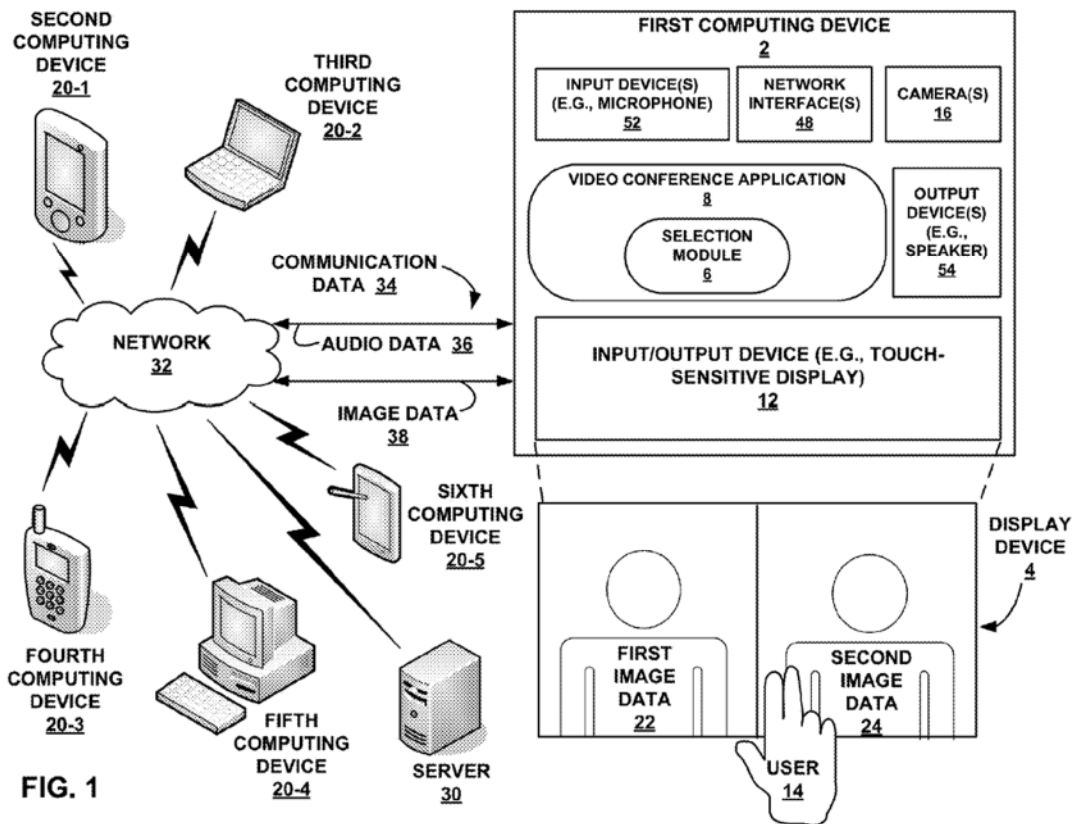
3. [1.b]/[3.b]/[4.b]/[6.b] “and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,”

85. It is my opinion that Vander Mey discloses “and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other.”

86. Vander Mey teaches that computing device 2 receives “image data 38” from the plurality of computing devices 20-1 through 20-5, and that “display device 4 of computing device 2 may display all or part of image data 38.” EX1004, 6:~~410~~-~~459~~. Image data 38 “may be one or more real-time video feeds” provided by “each computing device 20-1 through 20-5 communicatively coupled to computing device 2.” EX1004, 5:5-15. The image data displayed on display device 4 constitutes “respective sets of image data transmitted by transmission terminals participating in the video conference to each other.”

87. FIG. 1 of Vander Mey illustrates computing device 2 displaying “first image data 22 and second image data 24” on display device 4, where first image data 22 and second image data 24 are image data from two of the six conference

participants. EX1004, 6:259-357:2; FIG. 1. FIG. 4 shows display device 84 displaying image data from four participants simultaneously. EX1004, 16:41-55; FIG. 4. In both examples, image data from participating terminals is displayed on the screen of the transmission terminal.



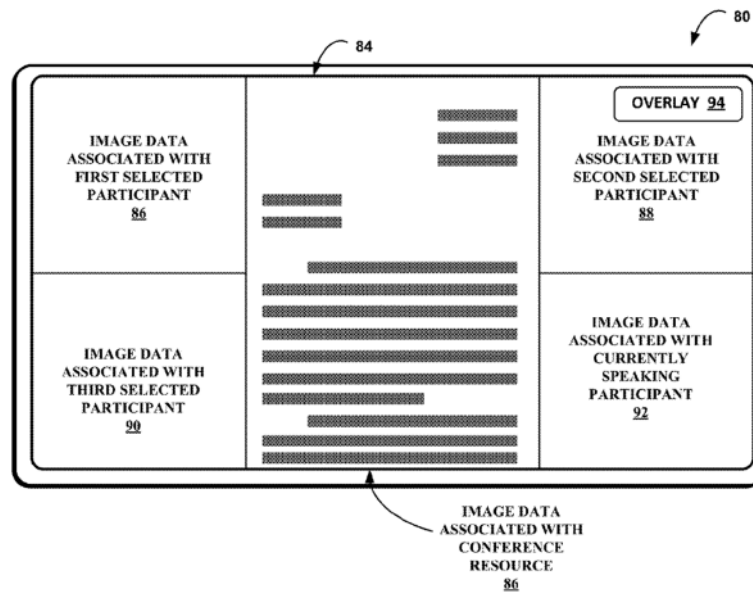


FIG. 4

88. Therefore, in my opinion, Vander Mey discloses “and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other.”

4. [1.c]/[4.c] “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

89. It is my opinion that Vander Mey discloses “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

90. Vander Mey discloses that computing device 2 participates in a six-participant video conference but “display device 4 may be configured to display image data associated with two of the six participants.” EX1004, 6:49-7:26:15-20; FIG. 1. Since two is smaller than six, this satisfies the claim requirement that “a number of the sets of image data . . . to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

91. Vander Mey’s disclosure is premised on this concept, explaining that “when the number of users or participants is relatively large, it may not be practical to display a video transmission from each participant on the computing device.” EX1004, 2:55-65. The stated purpose of selection module 6 is choosing a subset of participants for display from among all conference participants, through the use of participation ratings. EX1004, 1:25-35. Vander Mey also recites that “[a] computing device may display N number of image data signals associated with participants, where N is an integer. For example, N for a desktop computer may be larger than N for a mobile phone.” EX1004, 6:56-64, 14:52-56. That different types of devices participating in the same videoconference may display a different number of images confirms that the number of displayed video feeds (N) is a variable that is smaller than the total number of conference participants, the same scenario as claimed by the ‘059 Patent.

92. Vander Mey even teaches that “N may be dynamically determined throughout the video conference based on properties of the video conference (for example, how many total participants the video conference has, how many active participants there are, etc.).” EX1004, 14:56-61. This passage confirms that the system distinguishes between the total number of participants and the smaller number N that are displayed, dynamically managing the relationship between the two.

93. In Vander Mey Fig. 4, display device 84 shows image data from only four participants (first selected participant 86, second selected participant 88, third selected participant 90, and currently speaking participant 92) alongside a conference resource 86, while overlay 94 provides a “list of participants” which may include additional participants whose video is not displayed. EX1004, 16:~~47~~45-17:~~21~~19; FIG. 4. A POSITA viewing FIG. 4 would understand that the number of displayed video feeds (four) is smaller than the total number of conference participants (which includes participants not shown in the main display areas).

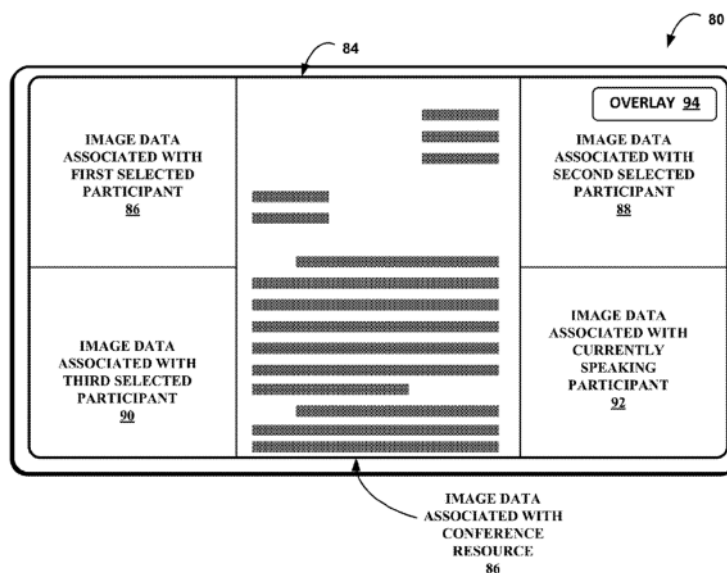


FIG. 4

94. Therefore, in my opinion, Vander Mey discloses “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

- b) [3.c]/[6.c] “wherein the total number of transmission terminals participating in the video conference is greater than a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal.”

95. It is my opinion that Vander Mey discloses “wherein the total number of transmission terminals participating in the video conference is greater than a number of the sets of image data, transmitted by transmission terminals participating

in the video conference to each other, to display on the screen of the transmission terminal.”

96. Because elements [1.c]/[4.c] and [3.c]/[6.c] recite the identical factual condition—the displayed subset is smaller than the total conference population—using different but logically equivalent phrasing, any prior art that satisfies [1.c]/[4.c] necessarily also satisfies [3.c]/[6.c], as one cannot be true without the other: If *A* is less than *B*, then *B* is greater than *A*.

97. Therefore, in my opinion, Vander Mey discloses “wherein the total number of transmission terminals participating in the video conference is greater than a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal.”

5. [2]/[5] **“the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”**

98. It is my opinion that Vander Mey discloses “the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”

99. **The Participant List Overlay Displays Names or Identification Information.** As discussed with respect to element [1.a]/[4.a], Vander Mey teaches that display device 84 “may further display an overlay 94” and that “[i]nformation

that may be included in overlay 94 may include a list of participants.” EX1004, 17:19-25; FIG. 4. A “list of participants” comprises names or identification information concerning the conference participants—a list without information that identifies participants would not be a “list of participants.” A POSITA would have understood that a displayed list of participants contains the names or other identification information that allows each participant to be distinguished from the others.

100. Participants Are Identified by Name Throughout Vander Mey.

Vander Mey teaches that display device 84 “may further display an overlay 94,” and that “[i]nformation that may be included in overlay 94 may include a list of participants.” EX1004, 17:19-25; FIG. 4. Vander Mey also discloses an identifier associated with a participant and that the identifier “may be a name, a username, a login name, a role the participant is playing in the video conference (such as mediator or presenter, etc.), or the like.” EX1004, 12:7-10. In view of these disclosures, a POSITA would have understood that Vander Mey’s participant list identifies participants by name or the other identifying information used by the system to distinguish one participant from another. This understanding is consistent with Vander Mey’s broader disclosure that participants are selected, displayed, and updated based on participant-specific information during an ongoing video conference.

101. **Vander Mey’s Participation Ratings Are Tied to Identified Participants.** Vander Mey teaches that “participation ratings may be determined individually for each participant” and that the system tracks conversation properties such as “whether user 14 is a friend of another participant,” “whether a participant has spoken the name of another participant,” and “a relationship between a participant associated with one or more of the other participants.” EX1004, 7:25-30, 11:~~4960~~-65, 12:45-55, 13:65-67. A POSITA would have understood that these properties are meaningful only if participants are identified by name or other identification information. A system that evaluates social relationships, detects spoken names, and tracks individual speaking histories necessarily maintains and can display identification information for each participant.

102. Therefore, in my opinion, Vander Mey discloses “the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”

B. Ground 2: Huang Anticipates and in the Alternative Renders Obvious Claims 1-6

103. It is my opinion that Huang anticipates every limitation of claims 1-6. Huang discloses a client computer (which is a transmission terminal), with conferencing software running on processing circuitry, that participates in a multi-party video conference with a plurality of other client computers. The computer displays video from a subset of the conference participants, using a page-based

display system. EX1005, ¶¶[0009], [0021], [0025], [0027]; FIGS. 1, 3. The number of video feeds displayed on any given page is fewer than the total number of conference participants¹, which is core to Huang's page-division technique. EX1005, ¶[0009]. Huang's claims recite a video conferencing method that includes displaying video streams on multiple screen pages, each containing video images of a subset of participants. EX1005, claims 1, 4-5, 7.

104. In the alternative, it is my opinion that Huang at least renders claims 1-6 obvious because it is common sense that a system displaying numbered pages, each displaying a maximum number of participants, inherently communicates the approximate total conference size. This is further the case because of Huang's own disclosure that its server maintains a complete participant roster and provides search functionality across the entire conference population. Adding display of a numerical participant count to Huang's existing graphical interface would have been a straightforward modification.

105. A POSITA would have been familiar with page-based navigation systems from web browsers and document viewers, and would have recognized that numbered page controls (such as "1 2 3 4 5 6 7 8 9 10 ... Next" as shown in Huang's FIG. 3) provide information about the total size of the set being navigated. In my

¹ This is true, at least when the number of participants is more than can be displayed on a single page.

experience, this design pattern was common in software applications by 2009, and a developer implementing Huang's system would have understood that the page count multiplied by participants-per-page yields the approximate total participant count.

1. Independent Claim Preambles [Claim 1]/[Claim 3]/[Claim 4]/[Claim 6]

a) [1.pre]/[3.pre] "A transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising:"

106. It is my opinion that Huang discloses "[a] transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising."

107. Huang describes "multiple client computers 110, 120, 130 and 140" that "remotely connect to a conferencing server 200 over a wide area network (WAN) 300 such as the Internet." EX1005, ¶[0021]; FIG. 1. Each client computer 110–140 participates in a multi-party video conference with the other client computers by "constantly exchange[ing] signals and media streams" including video data, audio data, and text. EX1005, ¶[0021]. Each client computer thus constitutes a "transmission terminal performing a video conference with a plurality of transmission terminals."

108. Therefore, in my opinion, Huang discloses "[a] transmission terminal performing a video conference with a plurality of transmission terminals, the transmission terminal comprising."

b) [4.pre]/[6.pre] “A method . . .”

109. It is my opinion that Huang discloses “[a] method.”

110. **Huang’s Own Claims Recite a Method.** Huang’s claim 1 recites “[a] method to provide video conferencing, comprising: a. generating at a client a high quality video stream and a low quality video stream; b. receiving at a server a plurality of high quality and low quality video streams from a plurality of clients; and c. sending from the server to each client one high quality video stream and a plurality of low quality video streams.” EX1005, claim 1. Huang’s dependent claims further recite method steps, including “selecting at the client one participant’s high quality video stream” (claim 4), “displaying at the client the low quality video for the remaining participant(s)” (claim 5), and “displaying the video streams on multiple screen pages, each page contains video images of a sub-set of participants” (claim 7). EX1005, claims 4, 5, 7. Huang thus, itself, claims, a method performed by a client computer during a video conference. A POSITA would have understood that if Huang claims a method performed at the client, it necessarily discloses performing that method.

111. **The Client Executes Conferencing Software to Perform the Method.** Huang discloses that each client computer includes “a conference application 501 which is the software that drives or controls the conferencing hardware such as webcam or headset.” EX1005, ¶[0030]; FIG. 5. The conference

application 501 controls a signal channel 505 for exchanging conferencing control signals, a media channel 510 for exchanging media with the server, and a “video and audio capturing and display module 515” for capturing and displaying video. EX1005, ¶[0030]; FIG. 5. When a general-purpose computer executes conference application 501, it performs the steps of generating video streams, transmitting them to the server, receiving video streams from other participants, selecting which participant’s high quality video to display, rendering participant video in the page-based display layout, and responding to user interactions such as page navigation and participant search. EX1005, ¶¶[0021]–[0026]; FIGS. 1–4. A POSITA would have understood that any processor-based system that performs these functional operations through software execution necessarily performs the steps of a method.

112. The Method Is Performed During a Video Conference with a Plurality of Terminals. Huang teaches that “multiple client computers 110, 120, 130 and 140 remotely connect to a conferencing server 200 over a wide area network (WAN) 300 such as the Internet,” and that “[d]uring a conference, the clients 110–140 and server 200 constantly exchange signals and media streams.” EX1005, ¶[0021]; FIG. 1. Each client thus participates in a video conference with a plurality of other client computers. The method steps described above (generating streams, selecting a participant for high-quality display, rendering pages of participant video, navigating between pages, searching for participants) each are performed during the

video conference by the client computer. EX1005, ¶¶[0021]–[0026]. Huang’s client computer therefore implements the method while it is performing a video conference with the plurality of other client computers.

113. The Method Is Continuously Performed Throughout the Conference. Huang teaches that a user can dynamically change which participant is displayed in high quality during the conference: “Each client can change the participant to view predominantly, accordingly, the server will stream the high quality video image of the selected participant, and stream low quality video images of the rest participants to the client.” EX1005, ¶[0012]. The user can also “flip through the pages one by one to display the participant or group of participants of his interest” and “search the desired participant by name of person, name of group, team ID etc., and then enter the result page that contains the video image of the desire participant.” EX1005, ¶¶[0009], [0025]. These ongoing display operations—selecting participants, changing pages, performing searches—are performed repeatedly throughout the conference by the client computer executing its conference application. This confirms that Huang’s method is not a one-time initialization step but an ongoing process implemented by the client terminal throughout the video conference.

114. Therefore, in my opinion, Huang discloses “[a] method.”

2. **[1.a]/[3.a]/[4.a]/[6.a] “processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,”**

115. It is my opinion that Huang anticipates and in the alternative renders obvious “processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference.”

116. **Processor Processing Circuitry:** Huang discloses that “[p]referably the invention is implemented in a computer program executed on a programmable computer having a processor” EX1005, ¶[0036]. Huang further teaches that each client computer “can be either a specialty conferencing device, or a general purpose computer loaded with specialty conferencing software that can exchange text, audio, and video with the server 200.” EX1005, ¶[0021]. Huang further discloses that each client includes a “conference application 501 which is the software that drives or controls the conferencing hardware such as webcam or headset” and a “video and audio capturing and display module 515” that captures and displays video. EX1005, ¶¶[0029]–[0030]; FIG. 5. A general-purpose computer loaded with conferencing software necessarily includes processing circuitry that executes the software—the conference application 501 could not operate without processing circuitry. A POSITA would have understood that Huang’s client

computer, executing conference application 501, constitutes a “transmission terminal” comprising “processor processing circuitry.”

117. **Page Count and Participant Roster.** Huang teaches a page-based display system in which the total participant population is divided across multiple pages: “if the conference has 100 participants and each page can display 9, then the system allocates them into 12 pages.” EX1005, ¶[0025]. The page navigation interface, shown in FIG. 3 as “1 2 3 4 5 6 7 8 9 10 . . . Next,” displays the total number of available pages to the user. EX1005, FIG. 3. A user presented with page number indicators, and who knows how many participants can be displayed on each page, can ascertain the approximate total number of conference participants. The page count itself is “information concerning a total number of transmission terminals participating in the video conference” because it conveys the conference scale, e.g. 12 pages, with up to 8 participants per page, communicates a conference of approximately 100 participants.

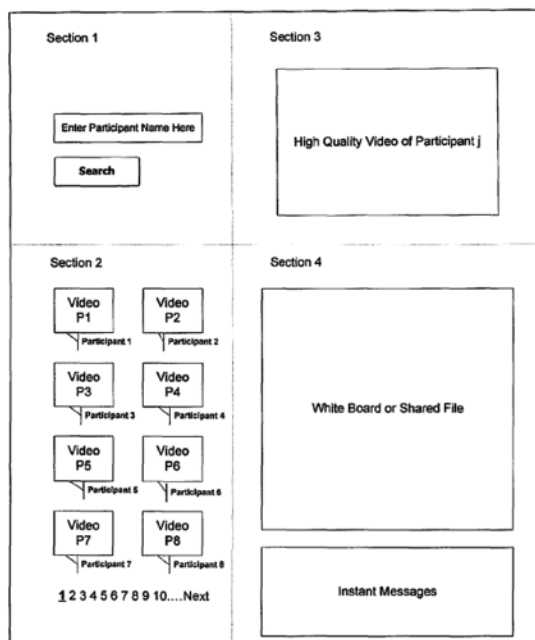


FIG. 3 Page Display & Page Division

118. **Participant Name List and Search.** Huang further teaches that “Section 2 is a list of participants and their respective video images of smaller sizes and lower quality. Below each video image is the name of the participant.” EX1005, ¶[0025]; FIG. 3. Additionally, Huang teaches a search function: “section 1 in FIG. 3 is a search box, a participant can enter the name of other participants to display the video image on section 3.” EX1005, ¶[0025]. Huang also teaches that “the client can search the desired participant by name of person, name of group, team ID etc.” EX1005, ¶[0009]. The displayed participant list on each page, combined with page navigation showing the total number of pages, conveys information concerning the total number of conference participants.

119. **Alternative Obviousness Rationale.** Displaying the total number of conference participants alongside the video feeds would have been obvious to a POSITA in view of Huang alone. Huang's server already tracks the participant roster and allocates it across numbered pages. EX1005, ¶¶[0025]–[0026]. Huang's client already displays a graphical user interface with multiple sections, including a participant list (Section 2), a search box (Section 1), and page navigation controls (FIG. 3). EX1005, ¶[0025]; FIG. 3. Adding a simple numerical indicator (e.g., “100 participants”) to any section of this existing interface would have been the straightforward design choice of displaying a number the system already knows. A POSITA would have been motivated to add such an indicator for many reasons, including to help users of large-scale conferences understand the conference size at a glance, and determining when participants join and leave, without having to continuously count pages or entries. *See also* Section III Technology Background (showing a participant count was a known feature and was desirable enough that it was included in a number of different commercial systems). This is the predictable use of a known technique (displaying a count) in a known system (Huang's conference GUI) to yield a predictable result (informing the user of conference size).

120. **Routine Design Choice.** A POSITA designing a video conferencing interface would have understood that displaying the number of current participants is a routine and useful design choice, especially where the interface displays fewer

than all participant videos. In my experience, adding a participant count indicator to an existing conference interface is a straightforward software modification that a POSITA could implement in a matter of hours. The data is already available in the system (Huang's server maintains the participant roster), and displaying a number in a graphical user interface requires only basic programming skills. A POSITA would have been confident that this modification would work as expected.

121. A POSITA would have viewed the addition of such a participant count to Huang as a straightforward, predictable, and beneficial interface enhancement.

122. Therefore, in my opinion, Huang anticipates, and in the alternative, renders obvious "processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference."

3. [1.b]/[3.b]/[4.b]/[6.b] "and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other,"

123. It is my opinion that Huang discloses "and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other."

124. Huang discloses that each client computer displays video images of conference participants on its screen. Huang's FIG. 3 shows a screen layout in which "Section 3 is a larger video image of a participant who is the host of the conference

by system default setting, or is the participant chosen to be displayed on a page” and “Section 2 is a list of participants and their respective video images of smaller sizes and lower quality.” EX1005, ¶[0025]; FIG. 3. Each page of the display contains “one large sized video image of one selected participant, and a few (in this example eight) small sized video images of corresponding participants.” EX1005, ¶[0025].

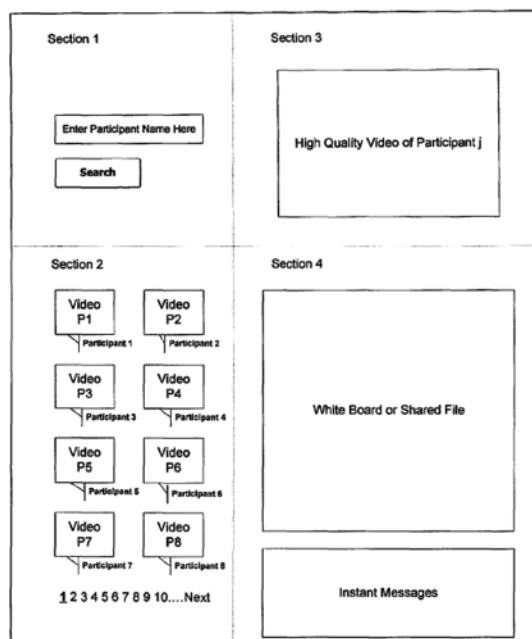


FIG. 3 Page Display & Page Division

125. The video images displayed on the client computer’s screen are received from other conference participants, each of which transmits its own video. Huang teaches that each client computer “generate[s] and send[s] its own video images to other clients directly or over a conference server, and . . . receive[s] video images from other participant clients.” EX1005, ¶[0002]. Specifically, each client sends two video streams (one high quality and one low quality) to the server, and

each client receives one high quality video stream and multiple low quality video streams from the server. EX1005, ¶¶[0004], [0024]. The displayed video images on Huang’s client screen therefore constitute “respective sets of image data transmitted by transmission terminals participating in the video conference to each other.”

126. Therefore, in my opinion, Huang discloses “and display, on the screen of the transmission terminal, respective sets of image data transmitted by transmission terminals participating in the video conference to each other.”

4. **[1.c]/[3.c]/[4.c]/[6.c] “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”**

127. It is my opinion that Huang discloses “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

128. Huang’s page-division technique is built on the premise that a client displays video from only a subset of conference participants at any given time while the total conference population is larger. Huang clearly states this principle: “in any given time, only video images of a much smaller number of participant [sic] will be streamed to a client.” EX1005, ¶[0009].

129. Huang also provides an example. In a 100-participant conference with 10 participants displayed per page, “the system divides 100 participants into 10 pages, each page with only 10 participants, thus the client only receive [sic] video streams of 10 participants at any time.” EX1005, ¶[0027]. Ten is smaller than one hundred. This anticipates the claim requirement that “a number of the sets of image data . . . to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

130. Huang further recites “[t]he video streams can be accessed through multiple screen pages, each page contains video images of a sub-set of participants.” EX1005, ¶[0007]. The system “streams only video streams for the sub-set of participants” currently displayed. EX1005, ¶[0007]. The use of the term “sub-set” confirms that the number of displayed video feeds is less than the total number of conference participants.

131. Huang explains that this architecture is necessary because the total number of participants exceeds what a single client can display or receive. In a 100-participant conference without page division, “each client will send 1 stream of his own video and receive 99 stream of videos of the rest participants,” which would require “download at 19 Mbps which is not feasible for most of the high speed internet access.” EX1005, ¶[0027]. The page-division technique solves this problem by ensuring the client receives only the streams for the displayed subset (for example

10 streams rather than 99). EX1005, ¶[0028]. A POSITA reading Huang would understand that the number of displayed image data sets is smaller than the total number of conference participants, because that is Huang's solution to the problem Huang set out to solve.

132. Therefore, in my opinion, Huang discloses “wherein a number of the sets of image data, transmitted by transmission terminals participating in the video conference to each other, to display on the screen of the transmission terminal is smaller than the total number of transmission terminals participating in the video conference.”

5. [2]/[5] **“the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”**

133. It is my opinion that Huang discloses “the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”

134. **Participant Names Are Displayed Below Each Video Image.** Huang teaches that the client's display includes “Section 2 [which] is a list of participants and their respective video images of smaller sizes and lower quality. Below each video image is the name of the participant.” EX1005, ¶[0025]; FIG. 3. This is a disclosure of displaying “information concerning names . . . of transmission terminals performing the video conference.” The participants' names are displayed

on the screen of the client computer alongside the video images during the conference.

135. Therefore, in my opinion, Huang discloses “the processing circuitry is configured to display information concerning names or identification information of transmission terminals performing the video conference.”

C. Ground 3: Vander Mey in View of Ichimura Renders Obvious Claims 1-6

136. As explained above with respect to Grounds 1 and 2, Vander Mey (which discloses a participant list overlay) and Huang (which discloses page navigation conveying information about the number of participants), anticipate or render obvious all the limitations of claims 1-6. However, to the extent Patent Owner argues that limitation [1.a]/[3.a]/[4.a]/[6.a] are limited to only displaying a specific number, it is my opinion that Ichimura discloses this. Ichimura discloses displaying the number of participants currently attending the conference. EX1006, 6:33-35. The combination of Vander Mey with Ichimura requires adding one data point (a number) from Ichimura to an existing display location (the overlay) in Vander Mey.

137. With Ichimura supplying the participant-number display of limitation [1.a]/[3.a]/[4.a]/[6.a], Vander Mey (as explained above in Ground 1) discloses the remaining limitations of claims 1/3/4/6. Vander Mey discloses a computing device with processors performing a video conference with a plurality of other computing devices. EX1004, 4:25-65, 78:451-670. Vander Mey discloses displaying respective

sets of image data transmitted by participating terminals, including first image data and second image data from selected participants. EX1004, 6:10-35. Vander Mey also discloses that the number of displayed image data sets is smaller than the total number of conference participants, because display device 4 may display image data associated with two of six participants. EX1004, ~~6:49-7:26:15-20~~.

138. Accordingly, it is my opinion that Vander Mey in view of Ichimura renders claims 1-6 obvious. Vander Mey provides the claimed video conference terminal and subset video display, while Ichimura provides the teaching of displaying the number of participants currently attending the conference. EX1004, 6:15-35, 14:55-61, 17:1~~7~~-~~25~~; EX1006, 6:29-37. The combination is the predictable use of a known conference-interface feature to improve Vander Mey's already-existing conference overlay by showing the user the total number of participants while fewer than all participant video feeds are displayed.

1. Motivation to Combine

139. A POSITA would have been motivated to incorporate Ichimura's participant-number display into Vander Mey's video conference interface for several independently sufficient reasons.

140. In my experience with networked conferencing systems, the combination of Vander Mey and Ichimura represents a straightforward integration of two complementary features: Vander Mey's subset-video-display architecture

with Ichimura's explicit participant-count display. A POSITA would have recognized that Ichimura's approach of displaying "the number and profiles of the participants currently attending the conference" directly improves user-awareness in a system like Vander Mey's that displays video from fewer participants than are actually present. The combination yields predictable results: the user sees a subset of video feeds and simultaneously sees a numerical indicator of the total conference population.

141. **Same Field of Endeavor.** Vander Mey and Ichimura are in the same field of endeavor because both are directed to networked conferencing systems in which terminals exchange conference information and present conference-related information to users through terminal displays. Vander Mey discloses a video conference system in which computing device 2 participates in a real-time video communication with multiple other computing devices and displays selected participants' image data. EX1004, 4:25-65, 6:10-35. Ichimura discloses a conference system in which conference terminals exchange real-time data such as cine image data and voice data through a conference control device and display that information on terminal monitors. EX1006, 4:10-30. Both references address the same basic problem of how to present useful conference information to users of networked conference terminals.

142. Ichimura Furthers User-Awareness in Combination With Vander Mey. Vander Mey's system displays a subset of the image data received from conference participants. EX1004, 6:15-20, 14:52-61. In Vander Mey's example, display device 4 displays image data associated with only two of six participants. EX1004, 6:15-7:20. Because the user sees fewer video feeds than the total number of participants, the user benefits from a separate indication of the total number of people currently attending the conference. Ichimura provides that feature: the terminal-side conference means controls the output device to provide a user interface that "displays the number and profiles of the participants currently attending the conference." EX1006, 6:29-37. A POSITA would have recognized that adding Ichimura's participant-number display to Vander Mey would allow the user to immediately understand the total conference size even when Vander Mey displays only a subset of participant video feeds.

143. Vander Mey Tracks the Information Ichimura Displays. Vander Mey teaches that the number N of displayed image data signals may be dynamically determined based on conference properties, including "how many total participants the video conference has" and "how many active participants there are." EX1004, 14:55-61. Thus, Vander Mey's system already maintains or obtains the total participant count internally for display-selection purposes. Ichimura teaches the straightforward user-interface step of displaying that same type of participant-count

information to the user. EX1006, 6:29-37, 5:60-65. A POSITA would have found it obvious to expose Vander Mey's already-known participant count in the user interface, just as Ichimura does.

144. **Predictable Use of a Known Interface Feature.** The combination is the predictable use of a known conference-interface feature to improve a similar video conferencing system. Vander Mey already provides an overlay 94 that may display conference-related information, including a participant list and interactive options available to a user during the video conference. EX1004, 17:17-25. Ichimura teaches displaying the number and profiles of current conference participants in a terminal user interface. EX1006, 6:29-37. Incorporating Ichimura's participant number into Vander Mey's overlay or participant-list interface would require only adding a participant count indicator to an existing conference interface which is a straightforward software modification and would yield the predictable result of informing the user of the total number of current conference participants.

145. **Reasonable Expectation of Success.** A POSITA would have had a reasonable expectation of success in combining the references. Both systems use processor-controlled terminals that display conference information to users. EX1004, 78:450-670, 17:17-25; EX1006, 6:20-37. Adding a numeric participant count to Vander Mey's existing overlay would not alter Vander Mey's video-selection process, participation-rating algorithm, or image-display functionality. It

would simply display information the system already tracks in a form that Ichimura confirms was known and useful in conference user interfaces.

146. **Routine Design Choice.** A POSITA designing a video conferencing interface would have understood that displaying the number of current participants is a routine and useful design choice, especially where the interface displays fewer than all participant videos. Vander Mey already recognizes that the total number of participants affects how many video feeds should be displayed. EX1004, 14:55-61. Ichimura confirms that conference terminals conventionally displayed the number and profiles of participants currently attending a conference. EX1006, 6:29-37. A POSITA would have viewed the addition of such a participant count to Vander Mey as a straightforward, predictable, and beneficial interface enhancement.

2. **[1.a]/[3.a]/[4.a]/[6.a] “processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference,”**

147. It is my opinion that Vander Mey in view of Ichimura renders obvious “processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference”

148. Vander Mey teaches that display device 84 “may further display an overlay 94” and that “[i]nformation that may be included in overlay 94 may include a list of participants.” EX1004, 17:19-25; FIG. 4. As explained in Ground 1 above,

this participant list conveys the total number of conference participants because a user viewing a complete list of names immediately knows the total count. Vander Mey states that its system internally tracks “how many total participants the video conference has” and uses that count to make display decisions. EX1004, 14:55-61.

149. To the extent it is argued that Vander Mey’s participant list does not satisfy this limitation, **Ichimura discloses this element.** EX1006, 6:29-37. Ichimura’s conference terminal includes an output device 23 that provides a user interface to the user. EX1006, 6:29-31, 5:60-65. That user interface “**displays the number and profiles of the participants currently attending the conference.**” EX1006, 6:335-37. This is a direct disclosure of displaying information concerning the total number of participants currently attending the conference.

150. Ichimura also discloses that the conference system tracks the participant number as participants join. EX1006, 5:15-45. The conference control information storage section includes a participant number storage section and participant information storage sections corresponding to the current participant number. EX1006, 5:15-25. When a participation request is received, Ichimura’s conference control means generates a participant identifier, stores the identifier, and adds one to the participant number storage section. EX1006, 5:15-45. A POSITA would have understood that this stored participant number is the same information

displayed to the user as the number of participants currently attending the conference.

151. In the combination, Vander Mey's computing device 2 would display Ichimura's participant count in the overlay 94 that Vander Mey already provides for presenting conference-related information. EX1004, 17:17-25. The overlay already displays "a list of participants" and "interactive options available to a user during a video conference," making it the natural location for a numerical participant count. EX1004, 17:1-5; 17:5-18:1. Adding a single numeral to this existing overlay requires no architectural changes to Vander Mey's system.

152. A POSITA would have been motivated to make this modification because Vander Mey's system already tracks the total participant count internally but does not display it as a numeral. EX1004, 14:55-61. Ichimura demonstrates that displaying this count as a dedicated numerical indicator was a known and implemented solution to the user-awareness problem inherent in any system that displays video from fewer participants than are actually in the conference. EX1006, 6:29-37.

153. Therefore, in my opinion, Vander Mey in view of Ichimura renders obvious "processor processing circuitry configured to display on a screen of the transmission terminal, information concerning a total number of transmission terminals participating in the video conference."

IX. CONCLUSION

154. It is my opinion that the Challenged Claims are anticipated and rendered obvious for the reasons I have set forth.

* * *

155. I declare under penalty of perjury that the foregoing is true and correct. I hereby declare that all statements made herein of 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.

Executed on: July 24, 2026


Dr. Kevin C. Almeroth

Kevin C. Almeroth

Professor Emeritus
Department of Computer Science
University of California
Santa Barbara, CA 93106-5110
(805)636-1123 (office)
(805)893-8553 (fax)
almeroth@cs.ucsb.edu (email)
<http://www.cs.ucsb.edu/~almeroth> (WWW URL)

Education

- Ph.D.** June 1997 *Georgia Institute of Technology* Computer Science
Dissertation Title: Networking and System Support for the Efficient,
Scalable Delivery of Services in Interactive Multimedia Systems
Minor: Telecommunications Public Policy
- M.S.** June 1994 *Georgia Institute of Technology* Computer Science
Specialization: Networking and Systems
- B.S.** June 1992 *Georgia Institute of Technology* Information and Computer Science
(high honors) *Minors:* Economics, Technical Communication, American Literature

Employment History

Professor Emeritus	Department of Computer Science University of California Santa Barbara, CA	Nov 2020 -- present
Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 2005 -- Oct 2020
Associate Dean	College of Engineering University of California Santa Barbara, CA	Mar 2007 -- Aug 2009
Vice Chair	Department of Computer Science University of California Santa Barbara, CA	Jul 2000 -- Nov 2005

Associate Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 2001 -- Jun 2005
Assistant Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 1997 -- Jun 2001
Graduate Researcher	Broadband Telecommunications Center Georgia Center for Adv Telecom Tech Atlanta, GA	Sep 1996--Jun 1997
Graduate Intern	IBM T.J. Watson Research Labs Hawthorne, NY	Jun 1995--Sep 1995
Support Specialist	Office of Information Technology Georgia Institute of Technology Atlanta, GA	Sep 1995--Jun 1997
Research Assistant	College of Computing Georgia Institute of Technology Atlanta, GA	Jan 1994--Mar 1994
Graduate Intern	Hitachi Telecommunications Norcross, GA	Jun 1992--Sep 1992
Undergraduate Intern	IBM Research Triangle Park, NC	Jun 1989--Sep 1989 Jun 1990--Sep 1990 Mar 1991--Sep 1991

Industry Technical Advising

Board of Directors	The New Media Studio Santa Barbara, CA	Nov 2006 -- present
Co-Founder & Chairman of the Board	Santa Barbara Labs, LLC Santa Barbara, CA	Sep 2007 -- Dec 2009
Board of Advisors	Techknowledge Point Santa Barbara, CA	May 2001 -- Dec 2007
Technical Advisory Board	Occam Networks, Inc. Santa Barbara, CA	May 2000 -- Dec 2010
Board of Advisors	Airplay Inc. San Francisco, CA	Jun 2005 -- Aug 2009
Consultant	Lockheed Martin Corporation San Jose, CA	Nov 1999 -- Jun 2009

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Zoom Communication, Inc. Ex 1020

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Board of Advisors	Santa Barbara Technology Group Santa Barbara, CA	Sep 2000 -- Dec 2004
Board of Directors	Virtual Bandwidth, Inc. Santa Barbara, CA	Nov 2000 -- Jun 2001
Board of Advisors & Affiliated Scientist	Digital Fountain San Francisco, CA	Jan 2000 -- Dec 2001
Senior Technologist	IP Multicast Initiative, Stardust Forums Campbell, CA	Jun 1998 -- Dec 2000

I. Teaching

A. Courses Taught

CS 176A	Intro to Computer Communication Networks	Fall 1997, Fall 1998, Fall 2002, Fall 2003, Fall 2004, Spring 2005, Spring 2006, Spring 2007, Spring 2008, Fall 2008, Fall 2009, Fall 2010, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Spring 2017, Spring 2018, Spring 2020, Fall 2020
CS 176B	Network Computing	Winter 2000, Winter 2001, Winter 2002, Winter 2012, Winter 2014, Winter 2015, Winter 2018, Winter 2019, Winter 2020
MAT 201B	Media Networks and Services	Fall 1999, Fall 2000, Fall 2001, Fall 2003
CS 276	Distributed Computing and Computer Networks	Winter 1999, Spring 2000, Fall 2002, Fall 2005, Fall 2018
CS 290I	Networking for Multimedia Systems	Winter 1998, Spring 1999, Fall 2004, Winter 2010
CS 595N	Technology and Society	Winter 2005, Fall 2005, Spring 2006, Fall 2006, Spring 2007, Fall 2007, Spring 2008, Fall 2008, Spring 2009
CS 595N	Economic Systems Seminar	Winter 2004, Spring 2004, Winter 2005, Spring 2005
CS 595N	Networking Seminar	Winter 1999, Fall 1999, Winter 2003, Winter 2019
CS 595N	Wireless Networking & Multimedia Seminar	Fall 2000
CS 595I	Systems Design and Implementation Seminar	Fall 1999, Fall 2000, Winter 2001, Spring 2001, Winter 2002, Spring 2002

B. Other Teaching Experience

- *The Evolution of Advanced Networking Services: From the ARPAnet to Internet2*, Instructor, Summer 2001. Short course taught at Escuela de Ciencias Informatica (ECI) sponsored by the Universidad de Buenos Aires.

- *Johns Hopkins Center for Talented Youth*, Instructor, Summer 1994. CTY is a program to teach gifted high school students the fundamentals of computer science.
- *Georgia Institute of Technology*, Graduate Teaching Assistant, Sep 1994--Sep 1996. Worked as a TA for 12 quarters teaching 7 different courses (4 undergraduate and 3 graduate).

C. Ph.D. Students Advised [14 graduated]

14. Daniel Havey
 Research Area: *Throughput and Delay on the Packet Switched Internet*
 Date Graduated: Winter 2015
 First Position: Microsoft
13. Lara Deek (co-advised with E. Belding)
 Research Area: *Resource-Efficient Wireless Systems for Emerging Wireless Networks*
 Date Graduated: Summer 2014
 First Position: Post Doc, UIUC
12. Mike Wittie
 Research Area: *Towards Sustained Scalability of Communication Networks*
 Date Graduated: Summer 2011
 First Position: Assistant Professor, Montana State University
11. Allan Knight
 Research Area: *Supporting Integration of Educational Technologies and Research of Their Effects on Learning*
 Date Graduated: Summer 2009
 First Position: Research Scientist, Citrix Online
10. Hangjin Zhang
 Research Area: *Towards Blended Learning: Educational Technology to Improve and Assess Teaching and Learning*
 Date Graduated: Spring 2009
 First Position: Microsoft
9. Gayatri Swamynathan
 Dissertation Title: *Towards Reliable Reputations for Distributed Applications*
 Date Graduated: Spring 2008
 First Position: Zynga
8. Amit Jardosh (co-advised with E. Belding)
 Dissertation Title: *Adaptive Large-Scale Wireless Networks: Measurements, Protocol Designs, and Simulation Studies*
 Date Graduated: Fall 2007
 First Position: Yahoo!
7. Khaled Harras
 Dissertation Title: *Protocol and Architectural Challenges in Delay and Disruption Tolerant Networks*
 Date Graduated: Summer 2007
 First Position: Assistant Professor, Carnegie Mellon University
6. Krishna Ramachandran (co-advised with E. Belding)
 Dissertation Title: *Design, Deployment, and Management of High-Capacity Wireless Mesh Networks*
 Date Graduated: Winter 2006
 First Position: Research Scientist, Citrix Online

5. Robert Chalmers
Dissertation Title: *Improving Device Mobility with Intelligence at the Network Edge*
Date Graduated: Summer 2004
First Position: President and CEO, Limbo.net
4. Prashant Rajvaidya
Dissertation Title: *Achieving Robust and Secure Deployment of Multicast*
Date Graduated: Spring 2004
First Position: President and CTO, Mosaic Networking
3. Sami Rollins
Dissertation Title: *Overcoming Resource Constraints to Enable Content Exchange Applications in Next-Generation Environments*
Date Graduated: Spring 2003
First Position: Assistant Professor, Mount Holyoke College
2. Srinivasan Jagannathan
Dissertation Title: *Multicast Tree-Based Congestion Control and Topology Management*
Date Graduated: Spring 2003
First Position: Consultant, Kelly & Associates
1. Kamil Sarac
Dissertation Title: *Supporting a Robust Multicast Service in the Global Infrastructure*
Date Graduated: Spring 2002
First Position: Assistant Professor, UT-Dallas

D. M.S. Students Advised (Thesis/Project Option) [19 graduated]

19. Neer Shey
Research Area: *Analyzing Content Distribution Through Opportunistic Contact for Smart Cellular Phones*
Date Graduated: Spring 2010
18. Camilla Fiorese
Research Area: *Analysis of a Pure Rate-Based Congestion Control Algorithm*
Date Graduated: Summer 2009
17. Brian Weiner
Research Area: *Multi-Socket TCP: A Simple Approach to Improve Performance of Real-Time Applications over TCP*
Date Graduated: Fall 2007
16. Avijit Sen Mazumder
Research Area: *Facilitating Robust Multicast Group Management*
Date Graduated: Fall 2005
15. Rishi Matthew
Thesis Title: *Providing Seamless Access to Multimedia Content on Heterogeneous Platforms*
Date Graduated: Summer 2004
14. Camden Ho
Research Area: *Tools and Techniques for Wireless Network Management*
Date Graduated: Spring 2004
13. Amit Jardosh (co-advised with E. Belding)
Research Area: *Realistic Environment Models for Mobile Network Evaluation*
Date Graduated: Spring 2004
12. Nitin Solanki
Research Area: *SongWand: A Wireless Barcode Scanner Using Bluetooth Technology*

- Date Graduated: Winter 2004
11. Vrishali Wagle (co-advised with E. Belding)
Research Area: *An Ontology-Based Service Discovery Mechanism*
Date Graduated: Winter 2004
 10. Uday Mohan
Thesis Title: *Scalable Service Discovery in Mobile Ad hoc Networks*
Date Graduated: Spring 2003
 9. Krishna Ramachandran
Thesis Title: *Ubiquitous Multicast*
Date Graduated: Spring 2003
 8. John Slonaker
Thesis Title: *Inductive Loop Signature Acquisition Techniques*
Date Graduated: Spring 2002
 7. Mohammad Battah
Thesis Title: *Dedicated Short-Range Communications Intelligent Transportation Systems Protocol (DSRC-ITS)*
Date Graduated: Spring 2002
 6. Kevin Vogel
Thesis Title: *Integrating E-Commerce Applications into Existing Business Infrastructures*
Date Graduated: Spring 2001
 5. Sami Rollins
Thesis Title: *Audio Xml: Aural Interaction with XML Documents*
Date Graduated: Winter 2000
 4. Andy Davis
Thesis Title: *Stream Scheduling for Data Servers in a Scalable Interactive TV System*
Date Graduated: Spring 1999
 3. David Makofske
Thesis Title: *MHealth: A Real-Time Graphical Multicast Monitoring Tool*
Date Graduated: Winter 1999
 2. Prashant Rajvaidya
Thesis Title: *MANTRA: Router-Based Monitoring and Analysis of Multicast Traffic*
Date Graduated: Winter 1999
 1. Alex DeCastro (co-advised with Yuan-Fang Wang)
Thesis Title: *Web-Based Collaborative 3D Modeling*
Date Graduated: Winter 1998

E. Teaching Awards

2006-2007 UCSB Academic Senate Distinguished Teaching Award
2004-2005 Computer Science Outstanding Faculty Member
2000-2001 UCSB Spotlight on Excellence Award
1999-2000 Computer Science Outstanding Faculty Member (co-recipient)
1998-1999 Computer Science Outstanding Faculty Member (co-recipient)
1997-1998 Computer Science Outstanding Faculty Member

II. Research

A. Journal Papers, Magazine Articles, Books, and Book Chapters

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31. A. Jardosh, E. Belding, K. Almeroth and S. Suri, "[Towards Realistic Mobility Models For Mobile Ad hoc Networks](#)," *ACM Mobicom*, San Diego, California, USA, September 2003.
30. K. Sarac, P. Namburi and K. Almeroth, "[SSM Extensions: Network Layer Support for Multiple Senders in SSM](#)," *International Conference on Computer Communication and Networks (IC3N)*, Dallas, Texas, USA, October 2003.
29. K. Ramachandran and K. Almeroth, "[MAFIA: A Multicast Management Solution for Access Control and Traffic Filtering](#)," *IEEE/IFIP Conference on Management of Multimedia Networks and Services (MMNS)*, Belfast, Northern Ireland, September 2003.
28. J. Humfrey, S. Rollins, K. Almeroth, and B. Bimber, "[Managing Complexity in a Networked Learning Environment](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, pp. 60-63, June 2003.
27. K. Almeroth, S. Rollins, Z. Shen, and B. Bimber, "[Creating a Demarcation Point Between Content Production and Encoding in a Digital Classroom](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, pp. 2-5, June 2003.
26. M. Kolsch, K. Kvilekval, and K. Almeroth, "[Improving Speaker Training with Interactive Lectures](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, June 2003.
25. P. Rajvaidya and K. Almeroth, "[Analysis of Routing Characteristics in the Multicast Infrastructure](#)," *IEEE Infocom*, San Francisco, California, USA, April 2003.
24. S. Rollins and K. Almeroth, "[Pixie: A Jukebox Architecture to Support Efficient Peer Content Exchange](#)," *ACM Multimedia*, Juan Les Pins, FRANCE, December 2002.

23. S. Rollins, R. Chalmers, J. Blanquer, and K. Almeroth, "[The Active Information System\(AIS\): A Model for Developing Scalable Web Services](#)," *IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA)*, Kauai, Hawaii, USA, August 2002.
22. S. Rollins and K. Almeroth, "[Seminal: Additive Semantic Content for Multimedia Streams](#)," *IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA)*, Kauai, Hawaii, USA, August 2002.
21. B. Stiller, K. Almeroth, J. Altmann, L. McKnight, and M. Ott, "[Content Pricing in the Internet](#)," *SPIE ITCOM Conference on Internet Performance and Control of Network Systems (IPCNS)*, Boston, Massachusetts, USA, July 2002.
20. S. Jagannathan, J. Nayek, K. Almeroth and M. Hofmann, "[A Model for Discovering Customer Value for E-Content](#)," *ACM International Conference on Knowledge Discovery and Data Mining (SIGKDD)*, Edmonton, Alberta, CANADA, July 2002.
19. S. Rollins and K. Almeroth, "[Deploying and Infrastructure for Technologically Enhanced Learning](#)," **Outstanding Paper** at the *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Denver, Colorado, USA, pp. 1651-1656, June 2002.
18. P. Rajvaidya and K. Almeroth, "[Building the Case for Distributed Global Multicast Monitoring](#)," *Multimedia Computing and Networking (MMCN)*, San Jose, California, USA, January 2002.
17. S. Jagannathan and K. Almeroth, "[An Adaptive Pricing Scheme for Content Delivery Systems](#)," *IEEE Global Internet*, San Antonio, Texas, USA, November 2001.
16. K. Sarac and K. Almeroth, "[Providing Scalable Many-to-One Feedback in Multicast Reachability Monitoring Systems](#)," *IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS)*, Chicago, Illinois, USA, October 2001.
15. S. Jagannathan and K. Almeroth, "[The Dynamics of Price, Revenue and System Utilization](#)," *IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS)*, Chicago, Illinois, USA, October 2001.
14. A. Kanwar, K. Almeroth, S. Bhattacharyya, and M. Davy, "[Enabling End-User Network Monitoring via the Multicast Consolidated Proxy Monitor](#)," *SPIE ITCOM Conference on Scalability and Traffic Control in IP Networks (STCIPN)*, Denver, Colorado, USA, August 2001.
13. S. Jagannathan and K. Almeroth, "[Using Tree Topology for Multicast Congestion Control](#)," *International Conference on Parallel Processing (ICPP)*, Valencia, SPAIN, September 2001.
12. P. Rajvaidya and K. Almeroth, "[A Router-Based Technique for Monitoring the Next-Generation of Internet Multicast Protocols](#)," *International Conference on Parallel Processing (ICPP)*, Valencia, SPAIN, September 2001.
11. R. Chalmers and K. Almeroth, "[Modeling the Branching Characteristics and Efficiency Gains of Global Multicast Trees](#)," *IEEE Infocom*, Anchorage, Alaska, USA, April 2001.
10. R. Chalmers and K. Almeroth, "[Developing a Multicast Metric](#)," *Global Internet*, San Francisco, California, USA, December 2000.
9. K. Sarac and K. Almeroth, "[Monitoring Reachability in the Global Multicast Infrastructure](#)," *IEEE International Conference on Network Protocols (ICNP)*, Osaka, JAPAN, November 2000.

8. K. Almeroth, "[A Long-Term Analysis of Growth and Usage Patterns in the Multicast Backbone \(MBone\)](#)," *IEEE INFOCOM*, Tel Aviv, ISRAEL, March 2000.
7. K. Almeroth, K. Obraczka and D. De Lucia, "[A Lightweight Protocol for Interconnecting Heterogeneous Devices in Dynamic Environments](#)," *IEEE International Conference on Multimedia Computing and Systems (ICMCS)*, Florence, ITALY, June 1999.
6. K. Almeroth and M. Ammar, "[The Interactive Multimedia Jukebox \(IMJ\): A New Paradigm for the On-Demand Delivery of Audio/Video](#)," **Best Paper** at the *Seventh International World Wide Web Conference (WWW)*, Brisbane, AUSTRALIA, April 1998.
5. K. Almeroth, M. Ammar and Z. Fei, "[Scalable Delivery of Web Pages Using Cyclic Best-Effort \(UDP\) Multicast](#)," *IEEE INFOCOM*, San Francisco, California, USA, June 1998.
4. K. Almeroth and M. Ammar, "[Delivering Popular Web Pages Using Cyclic Unreliable Multicast \(Extended Abstract\)](#)," *SPIE Conference on Voice, Video and Data Communications*, Dallas, Texas, USA, November 1997.
3. K. Almeroth, A. Dan, D. Sitaram and W. Tetzlaff, "[Long Term Resource Allocation in Video Delivery Systems](#)," *IEEE INFOCOM*, Kobe, JAPAN, April 1997.
2. K. Almeroth and M. Ammar, "[On the Performance of a Multicast Delivery Video-On-Demand Service with Discontinuous VCR Actions](#)," *International Conference on Communications (ICC)*, Seattle, Washington, USA, June 1995.
1. K. Almeroth and M. Ammar, "[A Scalable, Interactive Video-On-Demand Service Using Multicast Communication](#)," *International Conference on Computer Communication and Networks (IC3N)*, San Francisco, California, USA, September 1994.

C. Workshop Papers (refereed)

34. M. Tavakolifard, J. Gulla, K. Almeroth, F. Hopfgartner, B. Kille, T. Plumbaum, A. Lommatzsch, T. Brodt, A. Bucko, and T. Heintz, "[Workshop and Challenge on News Recommender Systems](#)," *ACM RecSys News Recommender Systems (NRS) Workshop and Challenge*, Hong Kong, CHINA, October 2013.
33. M. Tavakolifard, K. Almeroth, and J. Gulla, "[Does Social Contact Matter? Modelling the Hidden Web of Trust Underlying Twitter](#)," *ACM International Workshop on Social Recommender Systems (SRS)*, Rio de Janeiro, BRAZIL, May 2013.
32. D. Johnson, E. Belding, K. Almeroth and G. van Stam, "[Internet Usage and Performance Analysis of a Rural Wireless Network in Macha, Zambia](#)," *ACM Networked Systems for Developing Regions (NSDR) Workshop*, San Francisco, California, USA, June 2010.
31. D. Havey, R. Chertov, and K. Almeroth, "[Wired Wireless Broadcast Emulation](#)," *International Workshop on Wireless Network Measurement (WiNMee)*, Seoul, Korea, June 2009.
30. R. Raghavendra, P. Acharya, E. Belding, and K. Almeroth, "[MeshMon: A Multi-Tiered Framework for Wireless Mesh Network Monitoring](#)," *ACM Mobihoc Wireless of the Students, by the Students, for the Students Workshop (S3)*, New Orleans, Louisiana, USA, May 2009.

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29. G. Swamynathan, C. Wilson, B. Boe, B. Zhao, and K. Almeroth, "[Do Social Networks Improve e-Commerce: A Study on Social Marketplaces](#)," *ACM Sigcomm Workshop on Online Social Networks (WOSN)*, Seattle, Washington, USA, August 2008.
28. R. Raghavendra, E. Belding, and K. Almeroth, "[Antler: A Multi-Tiered Approach to Automated Wireless Network Management](#)," *IEEE Workshop on Automated Network Management (ANM)*, Phoenix, Arizona, USA, April 2008.
27. S. Karpinski, E. Belding, and K. Almeroth, "[Towards Realistic Models of Wireless Workload](#)," *International Workshop on Wireless Network Measurement (WiNMee)*, Limassol, CYPRUS, April 2007.
26. K. Harras, M. Wittie, K. Almeroth, and E. Belding, "[ParaNets: A Parallel Network Architecture for Challenged Networks](#)," *IEEE Workshop on Mobile Computing Systems and Applications (HotMobile)*, Tucson, Arizona, USA, February 2007.
25. H. Caituiro-Monge, K. Almeroth, M. del Mar Alvarez-Rohena, "[Friend Relay: A Resource Sharing Framework for Mobile Wireless Devices](#)," *ACM International Workshop on Wireless Mobile Applications and Services on WLAN Hotspots (WMASH)*, Los Angeles, California, September 2006.
24. G. Swamynathan, Ben Y. Zhao and K. Almeroth, "[Exploring the Feasibility of Proactive Reputations](#)," *International Workshop on Peer-to-Peer Systems (IPTPS)*, Santa Barbara, California, USA, February 2006.
23. G. Swamynathan, Ben Y. Zhao and K. Almeroth, "[Decoupling Service and Feedback Trust in a Peer-to-Peer Reputation System](#)," *International Workshop on Applications and Economics of Peer-to-Peer Systems (AEPP)*, Nanjing, CHINA, November 2005.
22. K. Ramachandran, M. Buddhikot, G. Chandranmenon, S. Miller, E. Belding, and K. Almeroth, "[On the Design and Implementation of Infrastructure Mesh Networks](#)," *IEEE Workshop on Wireless Mesh Networks (WiMesh)*, Santa Clara, California, USA, September 2005.
21. A. Jardosh, K. Ramachandran, K. Almeroth and E. Belding, "[Understanding Link-Layer Behavior in Highly Congested IEEE 802.11b Wireless Networks](#)," *Sigcomm Workshop on Experimental Approaches to Wireless Network Design and Analysis (EWIND)*, Philadelphia, Pennsylvania, USA, August 2005.
20. A. Sen Mazumder, K. Almeroth and K. Sarac, "[Facilitating Robust Multicast Group Management](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Skamania, Washington, USA, June 2005.
19. Y. Sun, I. Sheriff, E. Belding and K. Almeroth, "[An Experimental Study of Multimedia Traffic Performance in Mesh Networks](#)," *MobiSys International Workshop on Wireless Traffic Measurements and Modeling (WitMeMo)*, Seattle, Washington, USA, June 2005.
18. K. Ramachandran, K. Almeroth and E. Belding, "[A Framework for the Management of Large-Scale Wireless Network Testbeds](#)," *International Workshop on Wireless Network Measurement (WiNMee)*, Trentino, ITALY, April 2005.
17. A. Garyfalos, K. Almeroth and K. Sanzgiri, "[Deployment Complexity Versus Performance Efficiency in Mobile Multicast](#)," *International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWiM)*, San Jose, California, USA, October 2004.

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16. C. Ho, K. Ramachandran, K. Almeroth and E. Belding, "[A Scalable Framework for Wireless Network Monitoring](#)," *ACM International Workshop on Wireless Mobile Applications and Services on WLAN Hotspots (WMASH)*, Philadelphia, Pennsylvania, USA, October 2004.
15. A. Garyfalos, K. Almeroth and J. Finney, "[A Hybrid of Network and Application Layer Multicast for Mobile IPv6 Networks](#)," *International Workshop on Large-Scale Group Communication (LSGC)*, Florence, ITALY, October 2003.
14. A. Garyfalos, K. Almeroth and J. Finney, "[A Comparison of Network and Application Layer Multicast for Mobile IPv6 Networks](#)," *ACM Workshop on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM)*, San Diego, California, USA, September 2003.
13. S. Jagannathan, and K. Almeroth, "[Pricing and Resource Provisioning for Delivering E-Content On-Demand with Multiple Levels-of-Service](#)," *International Workshop on Internet Charging and QoS Technologies (ICQT)*, Zurich, SWITZERLAND, October 2002.
12. S. Rollins, K. Almeroth, D. Milojevic, and K. Nagaraja, "[Power-Aware Data Management for Small Devices](#)," *Workshop on Wireless Mobile Multimedia (WoWMoM)*, Atlanta, GA, USA, September 2002.
11. K. Almeroth, S. Bhattacharyya, and C. Diot, "[Challenges of Integrating ASM and SSM IP Multicast Protocol Architectures](#)," *International Workshop on Digital Communications: Evolutionary Trends of the Internet (IWDC)*, Taormina, ITALY, September 2001.
10. K. Sarac and K. Almeroth, "[Scalable Techniques for Discovering Multicast Tree Topology](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Port Jefferson, New York, USA, June 2001.
9. P. Rajvaidya, K. Almeroth and K. Claffy, "[A Scalable Architecture for Monitoring and Visualizing Multicast Statistics](#)," *IFIP/IEEE International Workshop on Distributed Systems: Operations & Management (DSOM)*, Austin, Texas, USA, December 2000.
8. S. Jagannathan, K. Almeroth and A. Acharya, "[Topology Sensitive Congestion Control for Real-Time Multicast](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, North Carolina, USA, June 2000.
7. K. Sarac and K. Almeroth, "[Supporting the Need for Inter-Domain Multicast Reachability](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, North Carolina, USA, June 2000.
6. D. Makofske and K. Almeroth, "[MHealth: A Real-Time Multicast Tree Visualization and Monitoring Tool](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Basking Ridge New Jersey, USA, June 1999.
5. K. Almeroth and Y. Zhang, "[Using Satellite Links as Delivery Paths in the Multicast Backbone \(MBone\)](#)," *ACM/IEEE International Workshop on Satellite-Based Information Services (WOSBIS)*, Dallas, Texas, USA, October 1998.
4. M. Ammar, K. Almeroth, R. Clark and Z. Fei, "[Multicast Delivery of Web Pages OR How to Make Web Servers Pushy](#)," *Workshop on Internet Server Performance (WISP)*, Madison, Wisconsin, USA, June 1998.
3. K. Almeroth and M. Ammar, "[Prototyping the Interactive Multimedia Jukebox](#)," *Mini-conference on Multimedia Appliances, Interfaces, and Trials--International Conference on Communications (ICC)*, Zoom Communication, Inc. Ex 1020

Montreal, Quebec, CANADA, June 1997.

2. K. Almeroth and M. Ammar, "[Collection and Modeling of the Join/Leave Behavior of Multicast Group Members in the Mbone](#)," *High Performance Distributed Computing Focus Workshop (HPDC)*, Syracuse, New York, USA, August 1996.
1. K. Almeroth and M. Ammar, "[The Role of Multicast Communication in the Provision of Scalable and Interactive Video-On-Demand Service](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Durham, New Hampshire, USA, April 1995.

D. Non-Refereed Publications

8. K. Almeroth, E. Belding, M. Buddhikot, G. Chandranmenon, S. Miller, and K. Ramachandran, "[Infrastructure Mesh Networks](#)," *U.S. Patent Application US20070070959 A1*, September 2005.
7. K. Almeroth, R. Caceres, A. Clark, R. Cole, N. Duffield, T. Friedman, K. Hedayat, K. Sarac, M. Westerlund, "[RTP Control Protocol Extended Reports \(RTCP XR\)](#)," *Internet Engineering Task Force (IETF) Request for Comments (RFC) 3611*, November 2003.
6. Z. Albanna, K. Almeroth, D. Meyer, and M. Schipper, "[IANA Guidelines for IPv4 Multicast Address Allocation](#)," *Internet Engineering Task Force (IETF) Request for Comments (RFC) 3171*, August 2001.
5. B. Quinn and K. Almeroth, "[IP Multicast Applications: Challenges and Solutions](#)," *Internet Engineering Task Force (IETF), Request for Comments (RFC) 3170*, September 2001.
4. K. Almeroth, L. Wei and D. Farinacci, "[Multicast Reachability Monitor \(MRM\) Protocol](#)," *Internet Engineering Task Force Internet Draft*, July 2000.
3. K. Almeroth and L. Wei, "[Justification for and use of the Multicast Reachability Monitor \(MRM\) Protocol](#)," *Internet Engineering Task Force Internet Draft*, March 1999.
2. K. Almeroth, "[Managing IP Multicast Traffic: A First Look at the Issues, Tools, and Challenges](#)," IP Multicast Initiative White Paper, San Jose, California, USA, February 1999.
1. K. Almeroth, K. Obraczka and D. De Lucia, "[Pseudo-IP: Providing a Thin Network Protocol for Semi-Intelligent Wireless Devices](#)," *DARPA/NIST Smart Spaces Workshop*, Gaithersburg, Maryland, USA, July 1998.

E. Released Software Systems

19. ***A Multi-radio Wireless Mesh Network Architecture*** -- <http://moment.cs.ucsb.edu/tic/>. Released December 1, 2006 (with K. Ramachandran, I. Sheriff, and E. Belding). The software as part of a multi-radio wireless mesh network that includes a Split Wireless Router that alleviates the interference that can occur between commodity radios within a single piece of hardware. The second is server software to perform channel assignment and communicate the assignments throughout the mesh network.
18. ***AODV-Spanning Tree (AODV-ST)*** -- <http://www.cs.ucsb.edu/~krishna/aodv-st/>. Released September 1, 2006 (with K. Ramachandran and E. Belding). AODV-ST is an extension of [IPR2026-00424](#) AODV

protocol specifically designed for wireless mesh networks. The advantages of AODV-ST over AODV include support for high throughput routing metrics, automatic route maintenance for common-case traffic, and low route discovery latency.

17. ***The Multicast Detective*** -- http://www.nmsl.cs.ucsb.edu/mcast_detective/. Released September 1, 2005 (with A. Sen Mazumder). The multicast detective is a robust solution to determine the existence and nature of multicast service for a particular user. By performing a series of tests, a user can determine whether there is network support for multicast, and consequently, whether a multicast group join is likely to succeed.
16. ***AutoCap: Automatic and Accurate Captioning*** -- <http://www.nmsl.cs.ucsb.edu/autocap/>. Released August 1, 2005 (with A. Knight). AutoCap is a software system that takes as input an audio/video file and a text transcript. AutoCap creates captions by aligning the utterances in the audio/video file to the transcript. For those words that are not recognized, AutoCap estimates when the words were spoken along with an error bound that gives the content creator an idea of caption accuracy. The result is a collection of accurately time-stamped captions that can be displayed with the video.
15. ***PAIRwise Plagiarism Detection System*** -- <http://cits.ucsb.edu/pair/>. Released July 1, 2005 (with A. Knight). PAIRwise is a plagiarism detection system with: (1) an easy-to-use interface for submitting papers, (2) a flexible comparison engine that allows intra-class, inter-class, and Internet-based comparisons, and (3) an intuitive graphical presentation of results.
14. ***DAMON Multi-Hop Wireless Network Monitoring*** -- <http://moment.cs.ucsb.edu/damon/>. Released October 1, 2004 (with K. Ramachandran and E. Belding). DAMON is a distributed system for monitoring multi-hop mobile networks. DAMON uses agents within the network to monitor network behavior and send collected measurements to data repositories. DAMON's generic architecture supports the monitoring of a wide range of protocol, device, or network parameters.
13. ***Multicast Firewall*** -- <http://www.nmsl.cs.ucsb.edu/mafia/>. Released June 1, 2004 (with K. Ramachandran). MAFIA, a multicast firewall and traffic management solution, has the specific aim of strengthening multicast security through multicast access control, multicast traffic filtering, and DoS attack prevention.
12. ***AODV@IETF Peer Routing Software*** -- <http://moment.cs.ucsb.edu/aodv-ietf/>. Released November 1, 2003 (with K. Ramachandran and E. Belding). One of the first large-scale efforts to run the Ad hoc On demand Distance Vector (AODV) routing protocol in a public space (at the Internet Engineering Task Force (IETF)). The implementation includes a daemon that runs on both the Linux and Windows operating systems.
11. ***Mobility Obstacles*** -- <http://moment.cs.ucsb.edu/mobility/>. Released September 1, 2003 (with A. Jardosh, E. Belding, and S. Suri). The topology and movement of nodes in ad hoc protocol simulation are key factors in protocol performance. In this project, we have developed ns-2 simulation plug-ins that create more realistic movement models through the incorporation of obstacles. These obstacles are utilized to restrict both node movement and wireless transmissions.
10. ***mwalk*** -- <http://www.nmsl.cs.ucsb.edu/mwalk/>. Released December 1, 2000 (with R. Chalmers). Mwalk is a collection of Java applications and Perl scripts which re-create a global view of a multicast session from mtrace and RTCP logs. Users to the site can download mwalk, examine the results of our analysis, or download data sets for use in simulations dependent on multicast tree characteristics.
9. ***MANTRA2*** -- <http://www.nmsl.cs.ucsb.edu/mantra/>. Released December 1, 1999 (with P. Rajvaidya). This new version of MANTRA focuses on the visualization of inter-domain routing statistics.

in conjunction with the Cooperative Association for Internet Data Analysis (CAIDA) we have developed advanced collection and visualization techniques.

8. **MRM** -- <http://www.nmsl.cs.ucsb.edu/mrm/>. Released October 1, 1999 (with K. Sarac). MRM is the Multicast Reachability Protocol. We have implemented an end-host agent that responds to MRM Manager commands. Our end-host agent works in conjunction with Cisco routers to detect and isolate multicast faults.
7. **MANTRA** -- <http://www.nmsl.cs.ucsb.edu/mantra/>. Released January 1, 1999 (with P. Rajvaidya). MANTRA is the Monitoring and Analysis of Traffic in Multicast Routers. It uses scripts to collect and display data from backbone multicast routers.
6. **SDR Monitor** -- <http://www.nmsl.cs.ucsb.edu/sdr-monitor/>. Released January 1, 1999 (with K. Sarac). The SDR Monitor receives e-mail updates from participants containing information about observed sessions in the MBone. A global view of multicast reachability is then constructed.
5. **The MHealth tool** -- <http://www.nmsl.cs.ucsb.edu/mhealth/>. Released September 1, 1998 (with D. Makofske). The mhealth tool graphically visualizes MBone multicast group trees and provides 'health' information including end-to-end losses per receiver and losses on a per hop basis. The implementation required expertise in Java, the MBone tools, and Unix.
4. **The MControl tool** -- <http://www.nmsl.cs.ucsb.edu/mcontrol/>. Released August 1, 1998 (with D. Makofske). Mcontrol is a tool to provide VCR-based interactivity for live MBone sessions. The implementation required expertise in Java, the MBone tools, and Unix.
3. **Interactive Multimedia Jukebox (IMJ)** -- <http://imj.ucsb.edu/>. Released October 1, 1996. The IMJ combines the WWW and the MBone conferencing tools to provide a multi-channel video jukebox offering both instructional and entertainment programming on a wide scale. The implementation required expertise in HTML, Perl, C, the MBone tools, and Unix.
2. **Mlisten** -- <http://www.cc.gatech.edu/computing/Telecomm/mbone/>. Released September 1, 1995. A tool to continuously collect MBone multicast group membership information including number and location of members, membership duration, and inter-arrival time for all audio and video sessions. The implementation required expertise in C, Tcl/Tk, the MBone tools, and UNIX socket programming.
1. **Audio-on-Demand (AoD)**. March 1, 1995. A server/client prototype to demonstrate interactivity in near VoD systems. The AoD server provides songs-on-demand and VCR-like functions via multicast IP over Ethernet. The implementation required expertise in C, OpenWindows programming, UNIX socket programming, and network programming.

F. Tutorials, Panels and Invited Talks

- "25th Anniversary Panel," Network and Operating System Support for Digital Audio and Video (NOSSDAV), Portland, Oregon, USA, March 2015.
- "Sensing and Opportunistic Delivery of Ubiquitous Video in Health Monitoring, On-Campus and Social Network Applications," Workshop on Mobile Video Delivery (MoViD), Chapel Hill North Carolina, USA, February 2012.
- "Medium Access in New Contexts: Reinventing the Wheel?," USC Invited Workshop on Theory and

Practice in Wireless Networks, Los Angeles, California, USA, May 2008.

- "The Wild, Wild West: Wireless Networks Need a New Sheriff," University of Florida CISE Department Lecture Series, Gainesville, Florida, USA, February 2008.
- "Distinguishing Between Connectivity, Intermittent Connectivity, and Intermittent Disconnectivity," Keynote at the ACM MobiCom Workshop on Challenged Networks (CHANTS), Montreal, CANADA, September 2007.
- "The Three Ghosts of Multicast: Past, Present, and Future," Keynote at the Trans-European Research and Education Networking Association (TERENA) Networking Conference, Lynby, DENMARK, May 2007.
- "Multicast Help Wanted: From Where and How Much?," Keynote at the Workshop on Peer-to-Peer Multicasting (P2PM), Las Vegas, Nevada, USA, January 2007.
- "The Confluence of Wi-Fi and Apps: What to Expect Next," Engineering Insights, UC-Santa Barbara, Santa Barbara, California, USA, October 2006.
- "Challenges, Opportunities, and Implications for the Future Internet," University of Minnesota Digital Technology Center, Minneapolis, Minnesota, USA, September 2006.
- "Wireless Technology as a Catalyst: Possibilities for Next-Generation Interaction," Santa Barbara Forum on Digital Transitions, Santa Barbara, California, USA, April 2006.
- "Challenges and Opportunities in an Internet with Pervasive Wireless Access," University of Texas--Dallas Computer Science Colloquium, Dallas, Texas, USA, March 2006.
- "Challenges and Opportunities with Pervasive Wireless in the Internet," Duke University Computer Science Colloquium, Durham, North Carolina, USA, February 2006.
- "The Span From Wireless Protocols to Social Applications," Intel Research Labs, Cambridge, United Kingdom, December 2005.
- "The Internet Dot.Com Bomb and Beyond the Dot.Com Calm," CSE IGERT and Cal Poly Lecture Series, San Luis Obispo, California, USA, October 2005.
- "Panel: Directions in Networking Research," IEEE Computer Communications Workshop (CCW), Irvine, California, USA, October 2005.
- "Economic Incentives for Ad Hoc Networks," KAIST New Applications Seminar, Seoul, South Korea, March 2004.
- "New Applications for the Next Generation Internet," Citrix Systems, Santa Barbara, California, USA, March 2004.
- "PI: The Imperfect Pursuit of Pure Pattern," CITS Visions in Technology Series, Santa Barbara, California, USA, January 2004.
- "Panel: Core Networking Issues and Protocols for the Internet," National Science Foundation (NSF) Division of Advanced Networking Infrastructure and Research (ANIR) Principal Investigators Workshop, Washington DC, USA, March 2003.

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- "Panel: Pricing for Content in the Internet," SPIE ITCOM Internet Performance and Control of Network Systems, Boston, Massachusetts, USA, July 2002.
- "The Technology Behind Wireless LANs," Central Coast MIT Enterprise Forum, Santa Barbara, California, USA, March 2002.
- "Lessons Learned in the Digital Classroom," Center for Information and Technology Brown Bag Symposium, Santa Barbara, California, USA, March 2002.
- "The Evolution of Advanced Networking Services: From the ARPANet to Internet2," California State University--San Luis Obispo CS Centennial Colloquium Series, San Luis Obispo, California, USA, February 2002.
- "Deployment of IP Multicast in Campus Infrastructures," Internet2 Campus Deployment Workshop, Atlanta, Georgia, USA, May 2001.
- "Multicast: Is There Anything Else to Do?," Sprint Research Retreat, Miami, Florida, USA, May 2001.
- "The Evolution of Next-Generation Internet Services and Applications," Government Technology Conference 2001 (GTC) for the Western Region, Sacramento, California, USA, May 2001.
- "I2 Multicast: Not WIDE-scale Deployment, FULL-scale Deployment," Closing Plenary, Internet2 Member Meetings, Washington, D.C., USA, March 2001.
- "Panel: Beyond IP Multicast," Content Delivery Networks (CDN), New York, New York, USA, February 2001.
- "Viable Multicast Pricing & Business Models for Wider-Scale Deployment," Content Delivery Networks (CDN), New York, New York, USA, February 2001.
- "IP Multicast: Modern Protocols, Deployment, and Management," Content Delivery Networks (CDN), New York, New York, USA, February 2001 & San Jose, California, USA, December 2001.
- "Under the Hood of the Internet," Technology 101: Technology for Investors, Center for Entrepreneurship & Engineering Management, November 2000.
- "Understanding Multicast Traffic in the Internet," (1) University of Virginia, (2) University of Maryland, and (3) Columbia University, September 2000.
- "The Bad, The Ugly, and The Good: The Past, Present, and Future of Multicast," Digital Fountain, San Francisco, California, USA, August 2000.
- "Implications of Source-Specific Multicast (SSM) on the Future of Internet Content Delivery," Occam Networks, Santa Barbara, California, USA, August 2000.
- "Introduction to Multicast Routing Protocols," UC-Berkeley Open Mash Multicast Workshop, Berkeley, California, USA, July 2000.
- "Efforts to Understand Traffic and Tree Characteristics," University of Massachusetts--Amherst Colloquia, Amherst, Massachusetts, USA, May 2000.
- "Monitoring Multicast Traffic," Sprint Research Retreat, Half Moon Bay, California, USA, April 2000.

- "What is the Next Generation of Multicast in the Internet?," HRL Laboratories, Malibu, California, USA, January 2000.
- "Mission and Status of the Center for Information Technology and Society (CITS)," Intel Research Council, Portland, Oregon, USA, September 1999.
- "Multicast at a Crossroads," IP Multicast Initiative Summits and Bandwidth Management Workshops, San Francisco, CA, USA, (1) October 1999; (2) February 2000; and (3) June 2000.
- "IP Multicast: Modern Protocols, Deployment, and Management," Network+Interop: (1) Las Vegas, Nevada, USA--May 2000; (2) Tokyo, JAPAN--June 2000; (3) Atlanta, Georgia, USA--September 2000; (4) Las Vegas, Nevada, USA--May 2001; (5) Las Vegas, Nevada, USA--May 2002.
- "IP Multicast: Practice and Theory" (w/ Steve Deering), Network+Interop: (1) Las Vegas, Nevada, USA--May 1999; (2) Tokyo, JAPAN--June 1999; and (3) Atlanta, Georgia, USA--September 1999.
- "Internet2 Multicast Testbeds and Applications," Workshop on Protocols for High Speed Networks (PfHSN), Salem, Massachusetts, USA, August 1999.
- "IP Multicast: Protocols for the Intra- and Inter-Domain," Lucent Technologies, Westford, Massachusetts, USA, August 1999.
- "Internet2 Multicast Testbeds and Applications," NASA Workshop: Bridging the Gap, Moffett Field, California, USA, August 1999.
- "The Evolution of Next-Generation Services and Applications in the Internet," Tektronix Distinguished Lecture Series, Portland, Oregon, USA, May 1999.
- "Multicast Applications and Infrastructure in the Next Generation Internet," CENIC 99 Workshop on Achieving Critical Mass for Advanced Applications, Monterey, California, USA, May 1999.
- "Multicast Traffic Monitoring and Analysis Work at UCSB" (w/ P. Rajvaidya), Workshop on Internet Statistics and Metrics Analysis (ISMA), San Diego, California, USA, April 1999.
- "How the Internet Works: Following Bits Around the World," Science Lite, Santa Barbara General Affiliates and Office of Community Relations, California, USA, February 1999.
- "Managing Multicast: Challenges, Tools, and the Future," IP Multicast Initiative Summit, San Jose, California, USA, February 1999.
- "The Future of Multicast Communication and Protocols," Internet Bandwidth Management Summit (iBAND), San Jose, California, USA, November 1998.
- "An Overview of IP Multicast: Applications and Deployment," (1) Workshop on Evaluating IP Multicast as the Solution for Webcasting Real-Time Networked Multimedia Applications, New York, New York, USA, July 1998; and (2) Satellites and the Internet Conference, Washington, D.C., USA, July 1998.
- "IETF Developments in IP Multicast," IP Multicast Initiative Summit, San Jose, California, USA, February 1998.
- "An Introduction to IP Multicast and the Multicast Backbone (MBone)" vBNS IP2026-00424

sponsored by the National Center for Network Engineering (NLNRE), San Diego, California, USA, February 1998.

- "Using Multicast Communication to Deliver WWW Pages" Computer Communications Workshop (CCW '97), Phoenix, Arizona, USA, September 1997.

G. Research Funding

- K. Almeroth, "Packet Scheduling Using IP Embedded Transport Instrumentation," Cisco Systems Inc., \$100,000, 3/1/13-8/31/14.
- K. Almeroth, E. Belding and S.J. Lee, "GOALI: Maximizing Available Bandwidth in Next Generation WLANs", National Science Foundation (NSF), \$101,088, 10/1/13-9/30/14.
- K. Almeroth and E. Belding, "GOALI: Intelligent Channel Management in 802.11n Networks," National Science Foundation (NSF), \$51,000, 10/1/10-9/30/11.
- B. Zhao, K. Almeroth, H. Zheng, and E. Belding, "NeTS: Medium: Airlab: Distributed Infrastructure for Wireless Measurements," National Science Foundation (NSF), \$700,000, 9/1/09-8/13/13.
- K. Almeroth, E. Belding and T. Hollerer, "NeTS-WN: Wireless Network Health: Real-Time Diagnosis, Adaptation, and Management," National Science Foundation (NSF), \$600,000, 10/1/07-9/30/10.
- K. Almeroth, "Next-Generation Service Engineering in Internet2," University Consortium for Advanced Internet Development (UCAID), \$1,254,000, 7/1/04-6/30/09 (reviewed and renewed each year).
- B. Manjunath, K. Almeroth, F. Bullo, J. Hespanha, T. Hollerer, C. Krintz, U. Madhow, K. Rose, A. Singh, and M. Turk, "Large-Scale Multimodal Wireless Sensor Network," Office of Naval Research Defense University Research Instrumentation Program (DURIP), \$655,174, 4/14/08-4/14/09.
- K. Almeroth and E. Belding, "Improving Robustness in Evolving Wireless Infrastructures," Intel Corporation, \$135,000, 7/1/06-6/30/09 (reviewed and renewed for second and third year).
- K. Almeroth and K. Sarac, "Bridging Support in Mixed Deployment Multicast Environments," Cisco Systems Inc., \$100,000, 9/1/07-8/31/08.
- K. Sarac and K. Almeroth, "Building the Final Piece in One-to-Many Content Distribution," Cisco Systems Inc., \$95,000, 9/1/06-8/31/07.
- E. Belding, K. Almeroth and J. Gibson, "Real-Time Communication Support in a Ubiquitous Next-Generation Internet," National Science Foundation (NSF), \$900,000, 10/1/04-9/30/07.
- K. Almeroth and K. Sarac, "Improving the Robustness of Multicast in the Internet," Cisco Systems Inc., \$80,000, 9/1/04-8/31/05.
- R. Mayer, B. Bimber, K. Almeroth and D. Chun, "Assessing the Pedagogical Implications of Technology in College Courses," Mellon Foundation, \$350,000, 7/1/04-6/30/07.
- B. Bimber, A. Flanagan and C. Stol, "Technological Change and Collective Association: Changing

Relationships Among Technology, Organizations, Society and the Citizenry," National Science Foundation (NSF), \$329,175, 7/1/04-6/30/07.

- K. Almeroth and B. Bimber, "Plagiarism Detection Techniques and Software," UCSB Instructional Development, \$22,000, 7/1/04-6/30/05.
- K. Almeroth, "Student Travel Support for the 14th International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV)," National Science Foundation (NSF), \$10,000, 5/1/04-8/31/04.
- K. Almeroth, "An Automated Indexing System for Remote, Archived Presentations," QAD Inc., \$25,000, 5/1/04-6/30/05.
- K. Almeroth and M. Turk, "A Remote Teaching Assistant Support System," Microsoft, \$40,000, 1/1/04-6/30/05.
- K. Almeroth, "Supporting Multicast Service Functionality in Helix," Real Networks, \$30,000, 9/1/03-6/30/04.
- K. Almeroth and E. Belding, "Service Discovery in Mobile Networks," Nokia Summer Research Grant (U. Mohan), \$10,240, 7/1/03-9/30/03.
- K. Almeroth, D. Zappala, "Building a Global Multicast Service," Cisco Systems Inc., \$100,000, 1/1/03-6/30/04.
- K. Almeroth, "Developing A Dynamic Protocol for Candidate Access Router Discovery," Nokia Graduate Student Fellowship (R. Chalmers), \$26,110, 9/01/02-6/30/03.
- B. Bimber and K. Almeroth, "The Role of Collaborative Groupware in Organizations," Toole Family Foundation, \$182,500 (\$20,000 cash plus \$162,500 in software), 9/1/02-8/30/07.
- B. Manjunath, et al., "Digital Multimedia: Graduate Training Program in Interactive Digital Multimedia," National Science Foundation (NSF), \$2,629,373, 4/1/02-3/31/07.
- J. Green, K. Almeroth, et al., "Inquiry in the Online Context: Learning from the Past, Informing the Future," UCSB Research Across Disciplines, \$10,000, 9/1/01-8/31/02.
- K. Almeroth, "Monitoring and Maintaining the Global Multicast Infrastructure," Cisco Systems Inc., \$54,600, 7/1/01-6/30/02.
- R. Kemmerer, K. Almeroth, et al., "Hi-DRA High-speed, Wide-area Network Detection, Response, and Analysis," Department of Defense (DoD), \$4,283,500, 5/1/01-4/30/06.
- A. Singh, K. Almeroth, et al., "Digital Campus: Scalable Information Services on a Campus-wide Wireless Network," National Science Foundation (NSF), 1,450,000, 9/15/00-12/31/04.
- K. Almeroth, "Visualizing the Global Multicast Infrastructure," UC MICRO w/ Cisco Systems Inc., \$85,438, 7/1/00-6/30/02.
- H. Lee, K. Almeroth, et al., "Dynamic Sensing Systems," International Telemetering Foundation, \$260,000, 07/01/00-06/30/04.
- B. Bimber and K. Almeroth, "Funding for the Center on Information Technology and Society,"

\$250,000 from Dialogic (an Intel Company) and \$250,000 from Canadian Pacific.

- K. Almeroth, "CAREER: From Protocol Support to Applications: Elevating Multicast to a Ubiquitous Network Service," National Science Foundation (NSF), \$200,000, 9/1/00-8/31/04.
- K. Almeroth, "Characterizing Multicast Use and Efficiency in the Inter-Domain," Sprint Advanced Technology Laboratories, \$62,500, 3/1/00-6/30/01.
- K. Almeroth, "Producing the Next Generation of Multicast Monitoring and Management Protocols and Tools," UC MICRO w/ Cisco Systems Inc., \$124,500, 7/1/99 - 6/30/01.
- K. Almeroth, "Utilizing Satellite Links in the Provision of an Inter-Wide Multicast Service," HRL Laboratories, \$20,000, 7/1/99 - 6/30/00.
- T. Smith, K. Almeroth, et al., "Alexandria Digital Earth Prototype," National Science Foundation, \$5,400,000, 4/1/99-3/31/04.
- V. Vesna, K. Almeroth, et al., "Online Public Spaces: Multidisciplinary Explorations in Multi-User Environments (OPS:MEME), Phase II," UCSB Research Across Disciplines, \$50,000, 9/1/98-8/31/99.
- K. Almeroth, "Techniques and Analysis for the Provision of Multicast Route Management," UC MICRO w/ Cisco Systems Inc., \$97,610, 7/1/98 - 6/30/00.
- K. Almeroth, "Capturing and Modeling Multicast Group Membership in the Multicast Backbone (MBone)," UC MICRO w/ Hughes Research Labs, \$19,146, 7/1/98 - 12/31/99.
- K. Almeroth, "Building a Content Server for the Next Generation Digital Classroom," UCSB Faculty Research Grant, \$5,000, 7/1/98-6/31/99.

H. Research Honors and Awards

- IEEE Fellow Status, 2014
- Finalist for Best Paper Award, IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON), June 2008
- Best Paper Award, Passive and Active Measurement (PAM) Conference, April 2007
- Outstanding Paper Award, World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA), June 2006
- IEEE Senior Member Status, 2003
- Finalist for Best Student Paper Award, ACM Multimedia, December 2002
- Outstanding Paper Award, World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA), June 2002
- Computing Research Association (CRA) Digital Government Fellowship, 2001
- National Science Foundation CAREER Award, 2000
- Best Paper Award, 7th International World Wide Web Conference, April 1998

III. Service

A. Professional Activities

1. Society Memberships

Member, Association for Computing Machinery (ACM): 1993-present
Member, ACM Special Interest Group on Communications (SIGComm): 1993-present
Fellow, Institute of Electrical and Electronics Engineers (IEEE): 1993-present
Member, IEEE Communications Society (IEEE ComSoc): 1993-present
Member, American Society for Engineering Education (ASEE): 2003-2006

2. Review Work for Technical Journals and Publishers

NSF CISE research proposals, IEEE/ACM Transactions on Networking, IEEE/ACM Transactions on Computers, IEEE/ACM Transactions on Communications, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Multimedia, IEEE Communications, IEEE Communications Letters, IEEE Network, IEEE Internet Computing, IEEE Multimedia, IEEE Aerospace & Electronics Systems Magazine, ACM Transactions on Internet Technology, ACM Transactions on Multimedia Computing, Communications and Applications, ACM Computing Surveys, ACM Computer Communications Review, ACM Computeres in Entertainment, ACM/Springer Multimedia Systems Journal, AACE Journal of Interactive Learning (JILR), International Journal of Computer Mathematics, Journal of Communications and Networks, Journal of Parallel and Distributed Computing, Journal of Network and Systems Management, Journal of High Speed Networking, Journal of Communications and Networks, Journal on Selected Areas in Communications, Journal of Wireless Personal Communications, Personal Mobile Communications, Annals of Telecommunications, International Journal of Wireless and Mobile Computing, Pervasive and Mobile Computing (PMC), Wireless Networks Journal, Computer Networks Journal, Cluster Computing, Computer Communications, Mobile Computing and Communications Review, Performance Evaluation, Software--Practice & Experience, Information Processing Letters, ACM Sigcomm, ACM Multimedia, ACM Network and System Support for Digital Audio and Video Workshop (NOSSDAV), ACM Sigcomm Workshop on the Economics of Peer-to-Peer Systems (P2PEcon), ACM Sigcomm Workshop on Challenged Networks (CHANTS), IEEE Infocom, IEEE Globecom, IEEE Global Internet (GI) Symposium, IEEE Globecom Automatic Internet Symposium, IEEE Globecom Internet Services and Enabling Technologies (IS&ET) Symposium, IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), IEEE International Conference on Network Protocols (ICNP), IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON), IEEE International Conference on Multimedia and Exposition (ICME), IEEE International Conference on Communications (ICC), IEEE International Conference on Parallel and Distributed Systems (ICPADS) IEEE International Symposium on High-Performance Distributed Computing (HPDC), IEEE International Conference on Distributed Computing Systems (ICDCS), IEEE International Workshop on Quality of Service (IWQoS), IEEE/IFIP Network Operations and Management Symposium (NOMS), IFIP/IEEE International Symposium on Integrated Network Management (IM), IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS), IEEE Aerospace & Electronics Systems Magazine, SPIE Conference on Multimedia Computing and Networking (MMCN), IFIP

Networking, IASTED International Conference on Information Systems and Databases (ISD), IASTED International Conference on Communications, Internet, and Information Technology, IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA), IASTED International Conference on European Internet and Multimedia Systems and Applications (EuroIMSA), IASTED International Conference on Communications and Computer Networks (CCN), IASTED International Conference on Software Engineering and Applications (SEA), International Conference on Computer and Information Science (ICIS), International Association for Development of the Information Society (IADIS) International Conference on the WWW/Internet, Workshop on Network Group Communication (NGC), International Conference on Next Generation Communication (CoNEXT), International Conference on Parallel Processing (ICPP), International Conference on Computer Communications and Networks (IC3N), International Workshop on Hot Topics in Peer-to-Peer Systems (Hot-P2P), International Workshop on Wireless Network Measurements (WiNMee), International Workshop on Incentive-Based Computing (IBC), International Workshop on Multi-hop Ad Hoc Networks (REALMAN), International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWIM), International Packet Video (PV) Workshop, High Performance Networking Conference (HPN), International Parallel Processing Symposium (IPPS), International Symposium on Innovation in Information & Communication Technology (ISIICT), Workshop on Coordinated Quality of Service in Distributed Systems (COQODS), Pearson Education (Cisco Press) Publishers, Macmillan Technical Publishing, and Prentice Hall Publishers.

3. Conference Committee Activities

Journal/Magazine Editorial Board

IEEE Transactions on Mobile Computing (TMC): 2006-2011, 2017-2020 (Associate Editor-in-Chief)
 IEEE Networking Letters: 2018-2021
 IEEE Transactions on Network and Service Management (TNSM): 2015-2021
 Journal of Network and Systems Management (JNSM): 2011-present
 IEEE/ACM Transactions on Networking (ToN): 2003-2009, 2013-2017
 ACM Computers in Entertainment: 2002-2015
 IEEE Network: 1999-2012
 AACE Journal of Interactive Learning Research (JILR): 2003-2012
 IEEE Transactions on Mobile Computing (TMC): 2006-2011
 ACM Computer Communications Review (CCR): 2006-2010

Journal/Magazine Guest Editorship

IEEE Journal on Selected Areas in Communications (JSAC) Special Issue on "Delay and Disruption Tolerant Wireless Communication", June 2008
 Computer Communications Special Issue on "Monitoring and Measuring IP Networks", Summer 2005
 Computer Communications Special Issue on "Integrating Multicast into the Internet", March 2001

Conference/Workshop Steering Committee

IEEE International Conference on Network Protocols (ICNP): 2007-present
 ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006-present

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IEEE Global Internet (GI) Symposium: 2005-2013, 2018-present
International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV): 2001-2020, 2005-2011 (chair), 2012-2020 (co-chair)
IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2005-2009

Conference/Workshop Chair

International Conference on Communication Systems and Networks (COMSNETS): 2014 (co-chair)
ACM International Conference on Next Generation Communication (CoNext): 2013 (co-chair)
ACM RecSys News Recommender Systems (NRS) Workshop and Challenge: 2013 (co-chair)
ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006 (co-chair)
IEEE International Conference on Network Protocols (ICNP): 2003 (co-chair), 2006
International Workshop on Wireless Network Measurements (WiNMee): 2006 (co-chair)
IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2002 (co-chair)
International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV): 2002 (co-chair), 2003 (co-chair)
IEEE Global Internet (GI) Symposium: 2001 (co-chair), 2018 (co-chair)
International Workshop on Networked Group Communication (NGC): 2000 (co-chair)

Program Chair

International Conference on Computer Communication and Networks (ICCCN): 2015 (Track co-chair)
International Conference on Communication Systems and Networks (COMSNETS): 2010
IEEE International Conference on Network Protocols (ICNP): 2008 (co-chair)
IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON): 2007 (co-chair)
IFIP Networking: 2005 (co-chair)

Posters/Demonstrations Chair

ACM Sigcomm: 2012 (co-chair)

Student Travel Grants Chair

ACM Sigcomm: 2010 (co-chair)

Publicity Chair

IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2004 (co-chair)

Keynote Chair

IEEE Infocom: 2005 (co-chair)

Local Arrangements Chair

Internet2 "Field of Dreams" Workshop: 2000

Tutorial Chair

ACM Multimedia: 2000

IEEE International Conference on Network Protocols (ICNP): 1999

Panel/Session Organizer

NSF ANIR PI 2003 Panel on "Core Networking Issues and Protocols for the Internet"

CCW 2001 Session on "Multicast/Peer-to-Peer Networking"

NOSSDAV 2001 Panel on "Multimedia After a Decade of Research"

NGC 2000 Panel on "Multicast Pricing"

Technical Program Committee

IEEE International Conference on Network Protocols (ICNP): 1999, 2000, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009 (Area Chair), 2010 (Area Chair), 2011 (Area Chair), 2012 (Area Chair), 2013, 2014 (Area Chair), 2015 (Area Chair), 2016 (Area Chair), 2017 (Area Chair), 2018 (Area Chair), 2019 (Area Chair), 2020 (Area Chair), 2021 (Area Chair)

International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV): 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019

ACM Multimedia (MM): 2001, 2003, 2004, 2005 (short paper), 2006, 2007, 2008, 2008 (short paper), 2010, 2011, 2012, 2013, 2015, 2016, 2017, 2018, 2019, 2023, 2024, 2026

IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON): 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 (Area Chair), 2012 (Area Chair), 2013, 2014 (Area Chair), 2015, 2016 (Area Chair), 2017, 2018, 2019

IEEE/IFIP Network Operations and Management Symposium (NOMS): 2004, 2006, 2010
IEEE Infocom: 2004, 2005, 2006, 2008, 2009, 2010 (Area Chair), 2011 (Area Chair), 2012 (Area Chair)

IFIP Networking: 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022

IEEE International Conference on Communications (ICC) Next Generation Networking and Internet Symposium (NGNI): 2018, 2019

ACM Workshop on Mobile Video (MoVid): 2014, 2015, 2016, 2017

ACM Student Research Competition (SRC) Grand Finals: 2014

Mobile and Social Computing for Collaborative Interactions (MSC): 2014

IEEE Conference on Communications and Network Security (CNS): 2013

IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM): 2005, 2006, 2007, 2008, 2009, 2010

ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006, 2008, 2009, 2010, 2011, 2012, 2016, 2017, 2018, 2019

IEEE International Conference on Distributed Computing Systems (ICDCS): 2006, 2010, 2011, 2012, 2013

International Workshop on Wireless Network Measurements (WiNMee): 2006, 2008, 2010

ACM Sigcomm: 2004 (poster), 2008 (poster), 2010

IEEE International Conference on Computer Communication and Networks (IC3N): 2008, 2009, 2010, 2011, 2012

International Conference on Communication Systems and Networks (COMSNETS): 2009, 2010, 2011, 2012, 2013

International Conference on Sensor Networks (SENSORNETS): 2012

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International Workshop on Social and Mobile Computing for Collaborative Environments (SOMOCO): 2012

Workshop on Scenarios for Network Evaluation Studies (SCENES): 2009, 2010, 2011

ACM Multimedia Systems (MMSys): 2010, 2011, 2012, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022

IEEE International Symposium on Multimedia (ISM): 2016

IEEE International Conference on Pervasive Computing and Communications (PerCom): 2010

IEEE Wireless Communications and Networking Conference (WCNC): 2010, 2011

ACM International Symposium on Mobility Management and Wireless Access (MobiWac): 2010, 2011

International Conference on Computing, Networking and Communications, Internet Services and Applications Symposium (ICNC-ISA): 2012, 2013

IEEE WoWMoM Workshop on Hot Topics in Mesh Networking (HotMesh): 2010, 2011, 2012, 2013

IEEE Workshop on Pervasive Group Communication (PerGroup): 2010

ACM International Conference on Next Generation Communication (CoNEXT): 2005, 2006, 2007, 2009, 2012

IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets) Wireless Communications, Networks and Systems Symposium: 2007, 2008, 2009

IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets) Internet Technologies Symposium: 2007, 2008, 2009

International Workshop on Mobile and Networking Technologies for Social Applications (MONET): 2008, 2009

Extreme Workshop on Communication-The Midnight Sun Expedition (ExtremeCom): 2009

IEEE International Workshop on Cooperation in Pervasive Environments (CoPE): 2009

International Workshop on the Network of the Future (FutureNet): 2009, 2010, 2011, 2012

IEEE International Conference on Multimedia and Exposition (ICME): 2010

SPIE Conference on Multimedia Computing and Networking (MMCN): 2004, 2008

ACM Sigcomm Workshop on the Economics of Networks, Systems, and Computation (NetEcon): 2008

IEEE International Conference on Communications (ICC): 2008

IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS): 2008

IFIP/IEEE International Symposium on Integrated Network Management (IM): 2005, 2007

Global Internet (GI) Symposium: 2001, 2002, 2004, 2006, 2007, 2022, 2023

IEEE/ACM International Conference on High Performance Computing (HiPC): 2007

ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc): 2007

IEEE Workshop on Embedded Systems for Real-Time Multimedia (ESTIMedia): 2007

IEEE/IFIP Wireless On Demand Network Systems and Services (WONS): 2007

IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2001, 2002, 2003, 2004, 2005, 2006

IASTED International Conference on European Internet and Multimedia Systems and Applications (EuroIMSA): 2004, 2006

IEEE International Conference on Parallel and Distributed Systems (ICPADS): 2005, 2006

IEEE Globecom Internet Services and Enabling Technologies (IS&ET) Symposium: 2006

International Workshop on Incentive-Based Computing (IBC): 2006

IEEE International Workshop on Quality of Service (IWQoS): 2006, 2014, 2015

International Workshop on Multi-hop Ad Hoc Networks (REALMAN): 2006
 IEEE Globecom Automatic Internet Symposium: 2005
 ACM Sigcomm Workshop on the Economics of Peer-to-Peer Systems (P2PEcon): 2005
 International Conference on Parallel Processing (ICPP): 2001, 2003, 2004
 International Packet Video (PV) Workshop: 2002, 2003, 2004
 IEEE International Symposium on High-Performance Distributed Computing (HPDC): 2004
 International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWIM): 2004
 International Symposium on Innovation in Information & Communication Technology (ISIICT): 2004
 Workshop on Coordinated Quality of Service in Distributed Systems (COQODS): 2004
 IASTED International Conference on Networks and Communication Systems (NCS): 2004
 IASTED International Conference on Communications, Internet, and Information Technology (CIIT): 2004
 IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA): 2003, 2004
 International Workshop on Networked Group Communication (NGC): 1999, 2000, 2001, 2002, 2003
 International Association for Development of the Information Society (IADIS)
 International Conference on the WWW/Internet: 2003
 International Conference on Computer and Information Science (ICIS): 2003
 Human.Society@Internet: 2003
 IASTED International Conference on Communications and Computer Networks (CCN): 2002
 The Content Delivery Networks (CDN) Event: 2001
 IP Multicast Initiative Summit: 1998, 1999, 2000
 Corporation for Education Network Initiatives in California (CENIC): 1999
 Internet Bandwidth Management Summit (iBAND): 1998, 1999

B. Technical Activities

1. Working Groups

Internet2 Working Group on Multicast, Chair: 1998-2005
 IEEE Communications Society Internet Technical Committee (ITC), Conference Coordinator: 2000-2004
 IETF Multicast Directorate (MADDOGS), Member: 1999-2001
 IASTED Technical Committee on the Web, Internet and Multimedia, Member: 2002-2005
 Internet Engineering Task Force (IETF), various working groups: 1995-present

2. Meeting Support Work

Internet Engineering Task Force MBone broadcasts: 1995-2005
 Conference MBone broadcasts: Sigcomm '99, and '00
 Interop+Networld Network Operations Center (NOC) Team Member: 1998-2006
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C. University of California Committees

1. Department of Computer Science Committees

Public Relations: 2005-2006 (chair 2005-2006), 2009-2011 (chair 2009-2011)
Strategic Planning: 2000-2002, 2003-2006, 2009-2011
Undergraduate Advising and Affairs: 2006-2007, 2014-2015
Vice Chair: 2000-2005
Graduate Admissions: 2000-2005 (chair 2000-2005), 2011-2012
Graduate Affairs: 2000-2005 (co-chair 2000-2005)
Teaching Administration: 2000-2005
Facilities: 1997-2001 (chair 1999-2000), 2006-2007
External Relations: 1999-2002
Computer Engineering Public Relations: 2011-2012
Computer Engineering Awards: 2011-2012
Computer Engineering Administration/Recruiting: 1998-2001
Computer Engineering Lab and Computer Support: 1998-2001
Faculty Recruiting: 1999-2002
Graduate Advising: 1998-1999, 2000-2005

2. University Committees

Member, Campus Budget and Planning: 2013-2015
Faculty, Cognitive Science Program: 2006-2020
Faculty, Technology Management Program (TMP): 2003-2014
Faculty, Media Arts and Technology (MAT) Program: 1998-2014
Faculty, Computer Engineering Degree Program: 1998-2020
Steering Committee, Center for Information Technology and Society (CITS): 2012-2020
Associate Director, Center for Information Technology and Society (CITS): 1999-2012
Member, Campus Committee on Committees: 2010-2013
Member, Campus Income and Recharge Committee: 2010-2013
Member, College of Engineering Executive Committee: 2010-2012 (chair 2011-2012), 2014-2015 (chair 2014-2015)
Member, Distinguished Teaching Award Committee: 2009, 2010, 2011
Member, Campus Classroom Design and Renovation Committee: 2003-2010
Member, ISBER Advisory Committee: 2008-2011
Member, Fulbright Campus Review Committee: 2007
Member, Faculty Outreach Grant Program Review Committee: 2007
Executive Vice Chancellor's Information Technology Fee Committee: 2005-2006
Council on Research and Instructional Resources: 2003-2006
Executive Vice Chancellor's Working Group on Graduate Diversity: 2004-2005
Member, Engineering Pavillion Planning Committee: 2003-2005
Information Technology Board: 2001-2004
Executive Committee, Center for Entrepreneurship & Engineering Management (CEEM): 2001-2004

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3. System Wide Committees

UCSB Representative to the Committee on Information Technology and Telecommunications Policy (ITTP): 2003-2005

UCSB Representative to the Executive Committee, Digital Media Innovation (DiMI): 1998-2003

D. Georgia Tech Committees and Service (while a graduate student)

Graduate Student Body President: 1994-1995

Georgia Tech Executive Board: 1994-1995

Georgia Tech Alumni Association Executive Committee: 1994-1995

Dean of Students National Search Committee: 1995

Institute Strategic Planning Committee: 1994-1996

Cases in last 4 years I have been deposed or testified at hearing/trial:

- A deposition in Inter Partes Review of U.S. Patent Nos. 9,860,198 (IPR2021-00882) and 10,728,192 (IPR2021-00883) [Meta Platforms, Inc. v. Wrinkl, Inc.]. 12/2021-06/2022.
- Depositions in TQ Delta, LLC v. AdTran, Inc. (14-cv-954-RGA, 15-cv-121-RGA, D. Del). 03/2017-06/2022.
- Depositions in Inter Partes Review of U.S. Patent Nos. 8,166,081 (IPR2021-01267), 8,688,028 (IPR2021-01303), 8,903,307 (IPR2021-01305), and 8,200,203 (IPR2021-01371) [Hyundai Motor America v. StratosAudio, Inc.]. 06/2021-08/2022.
- A deposition and trial testimony in Shopify, Inc. v. Express Mobile, Inc. (1:19-cv-00439-RGA, D. Del.). 05/2020-08/2022.
- A deposition in FirstFace Co, LTD v. Apple, Inc (3:18-cv-02245-JD, N. D. Cal.). 05/2022-11/2022.
- Depositions in Inter Partes Review of U.S. Patent Nos. 9,291,475 (IPR2022-00708 and IPR2023-00031); 9,602,608 (IPR2022-00709); 7,484,008 (IPR2022-00857); and 6,832,283 (IPR2022-0970) [Toyota Motor Corp. and American Honda Motor Co, Inc. v. Intellectual Ventures II LLC]. 01/2022-02/2023.
- A deposition in Inter Partes Review of U.S. Patent No. 9,182,231 (IPR2022-00586) [Qualcomm Inc. v. FedEx Corporate Services, Inc.]. 09/2021-04/2023.
- A deposition in WebRoot, Inc. and Open Text, Inc. v. Trend Micro, Inc. (22-cv-00239-ADA-DTG, W. D. Tex.). 06/2022-04/2023.
- Depositions and trial testimony in Sonos, Inc. v. Google, LLC (6:20-cv-881-ADA, W. D. Tex.; 3:20-cv-06754-WHA, N. D. Cal.; and 3:21-cv-07559-WHA, N. D. Cal.). 11/2019-05/2023.
- A deposition in Inter Partes Review of U.S. Patent No. 8,072,968 (IPR2022-00890) [IBM Corp. v. Ebates Performance Marketing, Inc.]. 06/2022-05/2023.
- Depositions and trial testimony in Personal Audio, LLC v. Google, Inc. (1:17-cv-01751-VAC-CJB, D. Del). 03/2018-06/2023.
- A deposition and trial testimony in Centripetal Networks, Inc. v. Cisco Systems, Inc. (2:18-cv-00094, E. D. Va.). 01/2019-06/2023.
- A deposition in Orckit Corp v. Cisco Systems, Inc. (2:22-cv-276, E. D. Tex.). 05/2023-06/2023.
- A deposition and trial testimony in Touchstream Technologies, Inc. v. Google, LLC (6:21-cv-00569-ADA, W. D. Tex.). 08/2022-07/2023.
- A deposition in Inter Partes Review of U.S. Patent No. 8,784,113 (IPR2022-01439) [Go1 Pty, Ltd. v. OpenSesame, Inc.]. 01/2022-09/2023.
- A deposition and trial testimony in SB IP Holdings, LLC v. Vivint Smart Home, Inc. (4:20-cv-00886-ALM, E. D. Tex.). 12/2021-10/2023.

- Depositions and trial testimony in Alacritech, Inc. v. Centurylink Communications LLC; Winstron Corporation, Dell, Inc. (2:16-cv-693-RWS, 2:16-cv-692-RWS, 2:16-cv-695-RWS, E. D. Tex.). 04/2016-10/2023.
- A deposition in Inter Partes Review of U.S. Patent Nos. 9,503,498 (IPR2023-00185); 9,516,091 (IPR2023-00186); and 8,924,457 (IPR2023-00187) [Bright Data LTD v. Oxylabs, UAB]. 06/2020-11/2023.
- Trial testimony in GoodRx, Inc. v. Famulus Health LLC (AAA Ref. No. 01-23-000-5919). 06/2023-11/2023.
- A deposition in Entropic Communications LLC v. Charter Communications, Inc. (2:22-cv-00125-JRG, E. D. Tex.). 03/2023-12/2023.
- Depositions in Post-Grant Review of U.S. Patent No. 10,782,951 (PGR2021-00096) and 11,157,256 (PGR2022-00053) [IronSource Ltd. v. Digital Turbine, Inc.]. 05/2021-12/2023.
- Trial testimony in Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices, and Hardware and Software Components Thereof (US ITC Inv. No. 337-TA-1361) [Netgear v. TP-Link]. 05/2023-01/2024.
- A deposition in Antonio McKinney et al. v. Corsair Gaming, Inc. (3:22-cv-00312-CRB, N. D. Cal.). 07/2023-01/2024.
- A deposition in Certain Fitness Devices, Streaming Components Thereof, and Systems Containing Same (US ITC Inv. No. 337-TA-1265E) [iFit Inc., FreeMotion Fitness, Inc. and NordicTrack, Inc. v. DISH DBS Corporation, DISH Technologies LLC, and Sling TV LLC]. 10/2023-02/2024.
- A deposition in Marble VOIP Partners LLC v. Zoom Video Communications, Inc. 4:23-cv-03619-JSW, N. D. Cal.). 12/2023-04/2024.
- Depositions in IBM Corp. v. Rakuten, Inc. and Ebates Performance Marketing, Inc. (21-461-VAC, D. Del.). 06/2022-06/2024.
- A deposition and trial testimony in Omnitracs, LLC v. Platform Science, Inc. (3:20-cv-0958-CAB-DDL, S. D. Cal.). 05/2023-07/2024.
- A deposition in NetSocket, Inc. v. Cisco Systems, Inc. (2:22-cv-00172-JRG, E. D. Tex.). 09/2022-08/2024.
- Depositions in Partes Review of U.S. Patent Nos. 7,230,931 (IPR2023-00098) and 9,426,794 (IPR2023-01147) [Verizon Wireless v. General Access Solutions, Ltd.]. 03/2023-08/2024.
- A deposition and trial testimony in International Business Machines Corp v. Zynga, Inc. (22-590-GBW, D. Del.). 08/2023-09/2024.
- A deposition in Lionra Technologies Limited v. Fortinet, Inc. (2:22-cv-00322-JRG-RSP, E. D. Tex.). 02/2023-09/2024.
- Depositions in STA Group LLC v. Motorola Solutions, Inc. (2:23-cv-00030-JRG-RSP, E. D. Tex.). 04/2024-01/2025.
- A deposition and trial testimony in WSOU Investments, LLC v. Cisco Systems, Inc. (6:20-cv-00128-ADA, W. D. Tex.). 03/2021-02/2025.

- A deposition and trial testimony in Touchstream Technologies, Inc. v. Comcast Cable Communications, LLC (2:23-cv-00062-JRG, E. D. Tex.). 01/2024-03/2025.
- A deposition and trial testimony in VidStream, LLC v. X, formerly Twitter, Inc. (3:16-cv-0764-N, N. D. Tex.). 07/2016-04/2025.
- Depositions in Western Digital Technologies, Inc. v. Viasat, Inc. (4:22-cv-4376-HSG, N. D. Cal.). 08/2022-05/2025.
- Depositions in Video Solutions PTE. LTD. v. Cisco Systems, Inc. (2:23-cv-222-JRG, E. D. Tex.). 08/2023-05/2025.
- Trial testimony in Adeia Guides, Inc. v. Bell Canada, Inc. (T-1184-21, Canada Federal Court). 01/2022-05/2025.
- A deposition in Certain Smart Televisions (ITC Inv. No. 337-TA-1420). [Maxell, Ltd. v. TCL Multimedia Technology Holdings, Ltd.]. 12/2024-06/2025.
- Trial testimony in The Nielsen Company (US), LLC v. Hyphametrics, Inc. (23-126-GBW-CJB, D. Del.). 10/2023-07/2025.
- A deposition in Plus One, LCC v. Capital Relocation Services, LLC (23-cv-2016-KMM-JFD, D. Minn.). 06/2024-07/2025.
- A deposition in Inter Partes Review of U.S. Patent No. 7,924,802 (IPR2024-01336) [Qualcomm, Inc. v. Cobblestone Wireless LLC]. 08/2024-09/2025.
- A deposition in Beijing Meishe Network Technology Co. LTD. v. TikTok, Inc. (5:23-cv-6012-SI, N. D. Cal.). 05/2023-08/2025.
- Trial testimony in Contour IP Holding, LLC v. GoPro, Inc. (17-cv-04738-WHO, N. D. Cal.). 10/2019-10/2025.
- Depositions in Inter Partes Review of U.S. Patent Nos. 8,875,185 (IPR2024-01338), 9,317,597 (IPR2024-01339), 8,145,704 (IPR2024-01340), 9,215,261 (IPR2024-01341), 8,886,753 (IPR2024-01342), and 9,923,947 (IPR2024-01343) [TikTok, Inc. v. NTECH Properties, Inc.]. 04/2024-10/2025.
- A deposition and trial testimony in Express Mobile, Inc. v. GoDaddy.com, LLC (1:19-cv-01937-RGA, D. Del.). 05/2020-11/2025.
- A deposition in Inter Partes Review of U.S. Patent No. 11,973,731 (IPR2024-01489 and IPR2024-01490) [Slack Technologies, LLC and Salesforce, Inc. v. Wrinkl, Inc.]. 01/2025-11/2025.
- A deposition and trial testimony in BARCO, Inc. v. YeaLink Network Technology Co., LTD (2:23-cv-00521-JRG-RSP, E. D. Tex.). 06/2024-11/2025.
- A deposition and trial testimony in SmartSky Networks, LLC v. Gogo Business Aviation, LLC (22-266-VAC, D. Del.). 12/2023-11/2025.
- Trial testimony in MyChoice, LLC and BarBoards, LLC v. Taiv, Inc. (2:23-cv-00507-JRG-RSP, E. D. Tex.). 04/2025-12/2025.

- A deposition in Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices and Components Thereof (US ITC Inv. No. 337-TA-1454) [Estelgia, LLC v. Plume Design Inc.]. 07/2025-03/2026.
- A deposition in Motorola Solutions, Inc. v. Hytera Communications Corp. LTD (1:17-cv-01972, N. D. Ill.). 04/2017-present.
- Depositions and trial testimony in Luminati Networks Ltd. v. UAB Tesonet and UAB Metacluster LT (2:18-cv-00299-JRG, E. D. Tex.); Luminati Networks Ltd. v. Teso LT, UAB; Oxysales, UAB; and Metacluster LT, UAB, (2:19-cv-00395-JRG, E. D. Tex.); Luminati Networks Ltd. v. Code 200, UAB; Oxysales, UAB; and Metacluster LT, UAB (2:19-cv-00396-JRG, E. D. Tex.); Bright Data Networks Ltd. v. Tefincom S.A. (2:19-cv-00414-JRG, E. D. Tex.); Metacluster LT, UAB v. Bright Data Ltd. (2:23-cv-00011-JRG-RSP, E. D. Tex.); Bright Data Ltd. v. Oxylabs, UAB (2:23-cv-00171-JRG-RSP, E. D. Tex.). 06/2020-present.
- A deposition in Zilkr Cloud Technologies, LLC v. Cisco Systems, Inc. (2:22-cv-00166-JRG-RSP, E. D. Tex.). 02/2023-present.
- A deposition in STA Group, LLC v. Motorola Solutions, Inc. (2:22-cv-00381-JRG-RSP, E. D. Tex.). 05/2023-present.
- A deposition in NEC Corporation v. Peloton Interactive, Inc. (1-22-cv-00987-CJB, D. Del.). 08/2023-present.
- A deposition in Robocast, Inc. v. Netflix, Inc. (1:22-cv-00305-RGA, D. Del.). 07/2022-present.
- Depositions in Time Warner Cable Enterprises, LLC v. Nokia of America Corp. (650748/2022, IAS Part 43, N. Y. and 654900/2022, IAS Part 43, N. Y.). 01/2024-present.
- A deposition in Charter Communications, LLC v. Sonus Networks, Inc. and Ribbon Communications Operating Company, Inc. (N22C-09-529-EMD-CCLD, DE and 653435/2022, Part 49, N. Y.). 01/2024-present.
- A deposition in Stellar LLC v. Motorola Solutions, Inc. and Watchguard Video, Inc. (4:23-cv-750-SDJ, E. D. Tex.). 01/2024-present.
- A deposition in Inter Partes Review of U.S. Patent Nos. 10,407,026 (IPR2024-00785), 9,171,268 (IPR2024-00786), 11,396,244 (IPR2024-00814), 9,365,188 (IPR2024-00981), 11,738,659 (IPR2024-001167), 11,104,245 (IPR2026-00059), 12,337,716 (IPR2026-00070), and 12,337,715 (PGR2026-00008) [Toyota Motor Corp and Kia Corp v. Emerging Automotive LLC]. 11/2023-present.
- A deposition in Warner Records, Inc. et al. v. Altice USA, Inc. (2:23-cv-00576-JRG-RSP, E. D. Tex.). 09/2024-present.
- A deposition in Cal Bridge, Inc. v. OneCal (1:24-cv-22361, S. D. Fla.). 03/2025-present.
- Depositions in Inter Partes Review of U.S. Patent Nos. 10,762,002 (IPR2024-01436), 11,403,237 (IPR2024-01437), 11,258,676 (IPR2024-01438), 11,422,951 (IPR2024-01439), 10,684,972 (IPR2025-00491), 11,966,346 (IPR2025-00597) and 11,966,347 (IPR2025-00598) [YeaLink Network Technology Co., LTD v. BARCO N. V.]. 06/2024-present.

- A deposition in Audio Pod IP, LLC v. Amazon.com, Inc. (3:24-cv-00406-RCY, E. D. Va.). 05/2025-present.
- A deposition in Voxtur Analytics Corp v. AutomationRE, Inc. (1:25-cv-742-GBW, D. Del.). 07/2025-present.
- A deposition in Sonos, Inc. v. Google, LLC (2:20-cv-00169-JAK, C. D. Cal.). 03/2025-present.
- A deposition in SoftEx, LLC v. Absolute Software Corp (1:22-cv-1308-DAE, W. D. Tex.). 10/2022-present.
- A deposition in Adaptive Spectrum and Signal Alignment, Inc. v. Charter Communications, Inc. et al. (2:24-cv-00124-JRG-RSP, E. D. Tex.). 04/2024-present.
- A deposition in AutoConnect Holdings, LLC v. Toyota Motor Corp and General Motors, LLC (2:24-cv-00802-JRG-RSP and 2:24-cv-00877-JRG-RSP, E. D. Tex.). 04/2025-present.
- A deposition in Oracle America, Inc. and Oracle International Corporation v. Procore Technologies, Inc. (4:24-cv-07457-JST, N. D. Cal.). 04/2025-present.
- A deposition in Audio Pod IP, LLC v. Audible, Inc. (2:25-cv-02198-MEF-AME, D. N. J.).3:24-cv-00406-RCY, E. D. Va.). 05/2025-present.