

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZOOM COMMUNICATIONS, INC.,

Petitioner,

v.

RICOH COMPANY, LTD.,

Patent Owner

IPR2026-00407

U.S. Patent No.: 10,904,487 B2

DECLARATION OF DR. KEVIN C. ALMEROOTH

REGARDING U.S. PATENT NO. 10,904,487

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PETITIONER'S EXHIBIT LIST

No.	Reference	Referred To As
1001	U.S. Patent No. 10,904,487	'487 Patent
1002	Prosecution History of U.S. Patent No. 10,904,487	'487 Patent File History
1003	Declaration of Dr. Kevin Almeroth	Almeroth Decl.
1004	U.S. Patent No. 8,593,502	Saleh-502
1005	U.S. Patent Publication No. 2016/0301729	Gurevich
1006	U.S. Patent Publication No. 2015/0002435	Shimizu
1007	U.S. Patent Publication No. 2002/0085030	Ghani
1008	U.S. Patent No. 8,872,879	Saleh-879
1009	U.S. Patent No. 9,363,448	Segal
1010	U.S. Patent No. 9,716,861	Poel
1011	U.S. Patent No. 7,694,234	Fleisher
1012	U.S. Patent No. 9,648,057	Thomas
1013	Chinese Patent CN 104135484	CN-484
1014	Chinese Utility Model CN 203984563	CN-563
1015	German Patent DE102004041884	Han
1016	"SMART Board(TM) Interactive Whiteboard Reaches 20-Year Milestone." NBC News, 12 Jan. 2011, www.nbcnews.com/id/wbna41034457 .	SMART Board 20-Year
1017	SMART Technologies. "SMART Action Research." 2010,	Smart Technologies Research

	downloads.smarttech.com/media/edcompass/may2010/smartactionresearch.pdf.	
1018	Patrick, Andrew S. “The Human Factors of Mbone Videoconferences: Recommendations for Improving Sessions and Software.” June 23, 2006	Mbone Video Conferences
1019	Rollins, S., and K. Almeroth. Seminal: Additive Semantic Content for Multimedia Streams. Proceedings of Internet and Multimedia Systems and Applications (IMSA 2002), Aug. 2002	Content for Multimedia Streams
1020	Almeroth, Kevin, et al. Creating a Demarcation Point Between Content Production and Encoding in a Digital Classroom. Proceedings of ED-MEDIA 2003—World Conference on Educational Multimedia, Hypermedia & Telecommunications	Encoding in a Digital Classroom
1021	<i>Intel. 2nd Generation Intel® Core™ Processor Family Desktop, Intel® Pentium® Processor Family Desktop, and Intel® Celeron® Processor Family Desktop Datasheet</i> , Volume 1. June 2013	2nd Generation Intel Core
1022	<i>Panasonic Announces Panaboard Interactive Whiteboards with Integrated PC</i> . Tom’s Hardware,	Panaboard Interactive Whiteboards
1023	von Neumann, John. Draft of a Report on the EDVAC. Moore School of Electrical Engineering, University of Pennsylvania, 1945	Von Neuman 1945

LISTING OF CHALLENGED CLAIMS

Claim	Limitation
[1.pre]	A whiteboard device comprising:
[1.a]	a display;
[1.b]	a network interface;
[1.c]	one or more processors; and
[1.d]	one or more memories communicatively coupled to the one or more processors, the one or more memories storing instructions which, when processed by the one or more processors; cause:
[1.e]	an interactive whiteboard session window, including at least an interactive whiteboard session content area, to be displayed on the display,
[1.f]	wherein a selection menu to receive an instruction for starting a video conference session is overlaid on the interactive whiteboard session window; and
[1.g]	after receiving the instruction for starting the video conference session via the selection menu overlaid on the interactive whiteboard session window, a videoconference window to be overlaid on the interactive whiteboard session window.
2	The whiteboard device of claim 1, wherein the videoconference window displays at least content from a device of a participant of the video conference session.
3	The whiteboard device of claim 1, wherein

	processing of the instructions further causes: after the videoconference window being overlaid on the interactive whiteboard session window, display a second selection menu to receive an instruction for stopping the video conference session overlaid on the interactive whiteboard session window.
4	The whiteboard device of claim 1, wherein the videoconferencing window is maintained on top of the interactive whiteboard window during a videoconferencing session.
5	The whiteboard device of claim 1, wherein processing of the instructions further causes the interactive whiteboard session window to be moved on top of the videoconference window in response to termination of the video conference session.
6	The whiteboard device of claim 1, wherein processing of the instructions further causes an interactive whiteboard session to be shared with the one or more client devices that are external to the whiteboard device by invoking functionality provided by a collaboration library on the whiteboard device.
7	The whiteboard device of claim 1, wherein processing of the instructions further causes the selection menu to be updated in response to detecting a user selection of a particular control on the selection menu for switching between an interactive whiteboard session and the video conference session.
[8.pre]	One or more non-transitory computer-readable media storing instructions which, when processed by one or more processors, cause:
[8.a]	an interactive whiteboard session window, including at least an interactive whiteboard session content area, to be displayed on a display of a whiteboard device,

[8.b]	wherein a selection menu to receive an instruction for starting a video conference session is overlaid on the interactive whiteboard session window; and
[8.c]	after receiving the instruction for starting the video conference session via the selection menu overlaid on the interactive whiteboard session window, a videoconference window to be overlaid on the interactive whiteboard session window.
9	The one or more non-transitory computer-readable media of claim 8, wherein the videoconference window displays at least content from a device of a participant of the video conference session.
10	The one or more non-transitory computer-readable media of claim 8, further comprising additional instructions which, when processed by the one or more processors, causes: after the videoconference window being overlaid on the interactive whiteboard session window, display a second selection menu to receive an instruction for stopping the video conference session overlaid on the interactive whiteboard session window.
11	The one or more non-transitory computer-readable media of claim 8, wherein the videoconferencing window is maintained on top of the interactive whiteboard window during a videoconferencing session.
12	The one or more non-transitory computer-readable media of claim 8, further comprising additional instructions which, when processed by the one or more processors, causes the interactive whiteboard session window to be moved on top of the videoconference window in response to termination of the video conference session.
13	The one or more non-transitory computer-readable media of claim 8, further comprising additional instructions which, when processed by the one or more processors, causes an interactive whiteboard session to be shared with the one or more client devices that are external to the whiteboard device

	by invoking functionality provided by a collaboration library on the whiteboard device.
14	The one or more non-transitory computer-readable media claim 8, further comprising additional instructions which, when processed by the one or more processors, causes the selection menu to be updated in response to detecting a user selection of a particular control on the selection menu for switching between an interactive whiteboard session and the video conference session.
[15.pre]	A computer-implemented method comprising:
[15.a]	an interactive whiteboard session window, including at least an interactive whiteboard session content area, to be displayed on a display of a whiteboard device,
[15.b]	wherein a selection menu to receive an instruction for starting a video conference session is overlaid on the interactive whiteboard session window; and
[15.c]	after receiving the instruction for starting the video conference session via the selection menu overlaid on the interactive whiteboard session window, a videoconference window to be overlaid on the interactive whiteboard session window.
16	The computer-implemented method of claim 15, wherein the videoconference window displays at least content from a device of a participant of the video conference session.
17	The computer-implemented method of claim 15, further comprising: after the videoconference window being overlaid on the interactive whiteboard session window, display a second selection menu to receive an instruction for stopping the video conference session overlaid on the interactive whiteboard session window.

18	The computer-implemented method of claim 15, wherein the videoconferencing window is maintained on top of the interactive whiteboard window during a videoconferencing session.
19	The computer-implemented method of claim 15, further comprising causing the interactive whiteboard session window to be moved on top of the videoconference window in response to termination of the video conference session.
20	The computer-implemented method of claim 15, further comprising causing an interactive whiteboard session to be shared with the one or more client devices that are external to the whiteboard device by invoking functionality provided by a collaboration library on the whiteboard device.

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. 10,904,487 (“the ’487 Patent”), which is assigned to Ricoh Company, Ltd. (“Patent Owner”). I have been asked to evaluate the validity of claims 1–20 of the ’487 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 '487 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.

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. Additional details relevant to this IPR are discussed below.

10. 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.

11. 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.

12. 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.

13. 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 May 9, 2015 in networked multimedia systems, videoconferencing, 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 '487 Patent concerns the integration of videoconferencing with interactive whiteboard systems and the use of software and GUI controls to manage shared display content—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 '487 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 Petitioner's Exhibit List at the start of this declaration.

17. I may rely upon these materials and/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 '487 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 '487 Patent as set forth in this Declaration.

III. TECHNOLOGY BACKGROUND

28. It is my opinion that the alleged invention of the '487 Patent is directed to the intersection of three well-established fields: videoconferencing systems, interactive electronic whiteboard devices, and graphical user interfaces (GUIs). Each of these fields was individually mature well before the priority date of May 9, 2015. Moreover, the combination of these three fields was also well-established.

29. The integration of videoconferencing with electronic whiteboard devices was well developed, as multiple commercial products combining these technologies had been available for years before 2015. The specific techniques for using GUIs to manage overlapping application windows—including maintaining one window on top of another using operating-system-level functions—were commonplace long before the alleged invention.

30. The '487 Patent generally relates to integrating videoconferencing with interactive electronic whiteboard appliances using an application manager that coordinates window display and provides a collaboration menu. EX1001, Abstract. The patent describes managing multiple application windows on an interactive whiteboard appliance running a standard operating system, including concepts

reflected in prior art before the May 2015 priority date. As I explain below, each of these three constituent fields—and their integration—was developed in the prior art.

A. Interactive Electronic Whiteboard Devices Were Known

31. It is my opinion that interactive electronic whiteboard devices were well established before the May 9, 2015 priority date of the '487 Patent. Products such as the SMART Board, manufactured by SMART Technologies Inc., had been commercially available for well over a decade before the priority date. EX1016, EX1017. The SMART Board was first introduced commercially in 1991—more than twenty-three years before the priority date—and had been used in classrooms, corporate boardrooms, and collaborative workspaces by the time the '487 Patent's earliest application was filed. EX1016, EX1017; EX1004, 1:54-65, 4:66-5:3.

By 2015, interactive whiteboards were manufactured by numerous companies and came in a variety of form factors, screen sizes, and technology configurations. They generally allowed users to write, draw, and annotate on a large-format touch-sensitive display, with digital content being captured, stored, and shared in real time. A POSITA would have understood that interactive whiteboard technology was well known before the May 2015 priority date, and that the concept of an interactive whiteboard session window—a display region in which users collaboratively create and interact with whiteboard content—was known in the art.

32. Shimizu (EX1006), a published U.S. patent application from the early 2000s, describes a shared electronic whiteboard system where multiple attendees simultaneously perform real-time handwriting input via touch-panel terminals connected over a wireless LAN. Shimizu specifically teaches that multiple users at different locations can simultaneously write on their respective touch-panel displays, with the handwriting data being transmitted and rendered in real time on all connected terminals. The system operates under an operating system with APIs that enable the shared whiteboard functionality. EX1006, ¶¶[0040]-[0043], [0067]-[0068]. In my opinion, Shimizu demonstrates that networked collaborative whiteboard systems—where multiple remote users share a common interactive whiteboard session in real time over a network—were well-known and well-documented in the art years before the '487 Patent's priority date. The claimed concept of an interactive whiteboard session window displayed on a whiteboard device was disclosed by Shimizu and similar references.

33. Ghani (EX1007), published in 2002—thirteen years before the priority date—discloses a comprehensive online collaboration system with a whiteboard applet that supports presentations, annotations, and shared content viewing among geographically distributed participants. Ghani's collaboration platform incorporates a whiteboard applet that enables real-time shared drawing, annotation, and content manipulation. The whiteboard applet allows participants to present content, annotate

shared materials, and view content simultaneously during a collaboration session. EX1007, ¶¶[0075]-[0076], FIG. 4. In my opinion, Ghani confirms that the concept of a collaborative whiteboard session—including shared annotation, content viewing, and real-time interaction among multiple participants—was thoroughly established in the art by 2002, more than a decade before the '487 Patent's priority date. A POSITA working in this space in 2015 would have considered interactive whiteboard session functionality to be entirely conventional and unremarkable.

34. In my own work, we were interested in identifying technology that could be incorporated effectively and seamlessly into a classroom. One aspect of this work involved the creation of what we called the Collaborative Technologies Lab (CTL), a digital classroom environment designed to support presentation facilities, webcasting, remote collaboration, and lecture replay. The classroom included multiple projectors, video cameras, microphones, audio mixing, video switching, encoding systems, and support for remote participants. Importantly, the system was also designed to capture information written on classroom whiteboards or screens and synchronize that content with audio and video streams, so that classroom activity could be displayed, transmitted, archived, and later replayed (see, e.g., Exs. 1019-1020).

35. A particular aspect of this work focused on how whiteboard and classroom-session content could be made useful to local and remote students. In the

Seminal project, we considered a lecture environment containing multiple media streams, including instructor video, presentation slides, whiteboard content, classroom video, and remote-student video. (Ex. 1019) One service we described was an automated whiteboard, in which information written on a physical whiteboard could be identified, extracted, and displayed to a student as persistent session content rather than only as a transient video image. *Id.* We also considered how a student interface could combine video with related lecture content, and how classroom cues could be used to select or emphasize the most relevant media stream for display during the session. *Id.* I was also involved in work related to the Multicast Backbone (MBone). From the early 1990s, it sought to develop Internet-spanning conferencing tools to support Internet Engineering Task Force (IETF) meetings and other forms of collaboration. Relevant to the interactive whiteboard and videoconferencing requirements, MBone work included a shared whiteboard tool, WB, that displayed a large shared canvas on which users could draw or type, with drawing tools available in the same application window and the results visible to all participants. (Ex. 1018) MBone videoconferencing sessions also used separate but coordinated tools for video, audio, session selection, and shared workspace, and a typical session could display the shared workspace together with participant controls and multiple video windows selected from available video sources. *Id.*

36. Based on my more than thirty years of experience in networked multimedia systems and interactive content delivery, I can confirm that these early-2000s references describe interactive whiteboard technology, including networked collaborative whiteboard features, before May 2015. The '487 Patent's claimed "interactive whiteboard session window" reflects functionality that had been described in the interactive whiteboard art before the priority date. A POSITA would have considered this functionality familiar in the context of interactive whiteboard systems.

**B. Integration of Videoconferencing and Whiteboard Systems
Was Known**

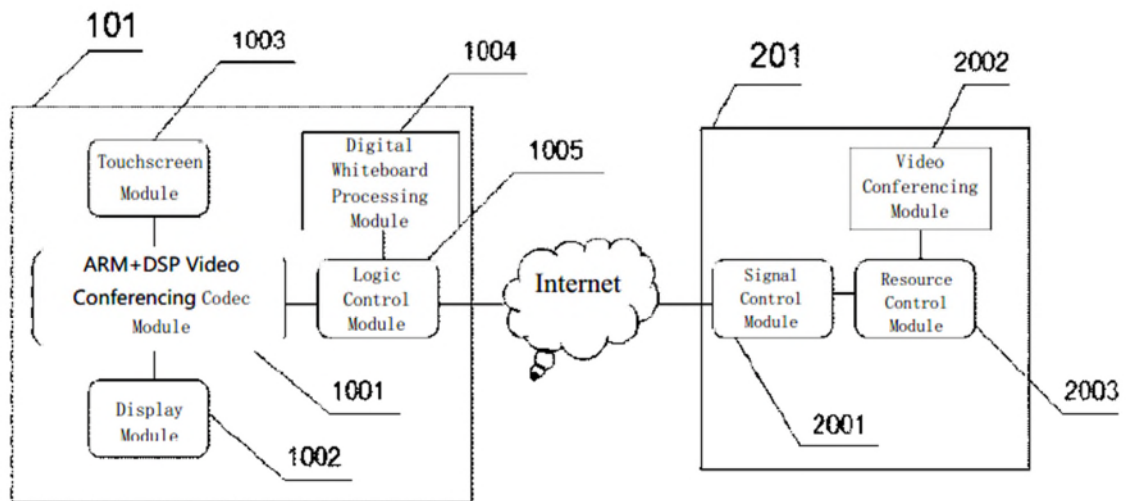
37. It is my opinion that by May 2015, integrating videoconferencing and whiteboard systems on a single appliance was well known in the art. Videoconferencing systems with graphical user interfaces were well known, and it was commonplace to integrate videoconferencing and whiteboard systems into unified products. The Polycom 3000iPower, which was commercially available by at least 2006—nine years before May 2015—combined the Polycom iPower 9800 videoconferencing unit with the Rear Projection SMART Board 3000i interactive whiteboard into a single integrated product. This product allowed computer images to be projected and viewed within a videoconference call and provided touchscreen controls that provided access to conference applications. EX1004, 1:53-65; EX1008,

1:30-41. The concept of combining videoconferencing and interactive whiteboard technologies on a single appliance was thus commercially validated nearly a decade before the priority date. A POSITA would have understood that such integration was a standard, market-driven design approach in the enterprise collaboration space.

38. The Saleh references—Saleh-502 (EX1004) and Saleh-879 (EX1008)—further demonstrate the state of the art by disclosing transparent graphical user interface menus overlaid on video content, automatic switching between annotation mode and touch-control mode based on the state of the pen tray, and overlaid controls that allow users to place calls, hang up, select camera sources, mute audio, adjust volume, and perform other videoconference functions directly from the interactive whiteboard surface. EX1004, 8:55-9:14, 10:61-11:5; EX1008, 8:17-35. In my opinion, these Saleh references are directly relevant to the '487 Patent's claim limitations because they demonstrate that the specific GUI techniques claimed—overlaid menus, transparent overlays, and switching between display modes—were known interface paradigms in the videoconferencing and collaboration space before the priority date. A POSITA would have been familiar with these techniques.

39. Chinese Utility Model CN 203984563 (EX1014), published December 3, 2014—approximately five months before the May 9, 2015 priority date—discloses an integrated digital whiteboard and video conferencing system that

achieves the simultaneous display of both the video view and the digital whiteboard view on a single display screen. The stated purpose of this integration is to achieve “the effects of conserving resources and reducing complexity” by combining multiple views of video and images from a video conference with images from a digital whiteboard, rather than requiring separate display screens or switching between views on a single screen. EX1014, Abstract, ¶¶[0003]-[0007], [0067]. CN-563 explicitly teaches multiple display modes for presenting the combined video and whiteboard content. The multi-view display “primarily includes three modes: The three modes of picture-in-picture, AVTN six-view, and AVTN seven-view,” achieving the effects of conserving resources and reducing complexity. EX1014, ¶¶[0052]-[0053]. The picture-in-picture mode is particularly significant because it directly corresponds to the overlaid window arrangement claimed in the ’487 Patent—one content source (the video conference) is displayed in a smaller window overlaid on top of another content source (the whiteboard), with both visible simultaneously. CN-563 thus represents a clear, pre-priority-date disclosure of the very concept at the heart of the ’487 Patent: integrating video conferencing and whiteboard functionality on a single appliance with overlaid display modes that allow simultaneous viewing of both content types.

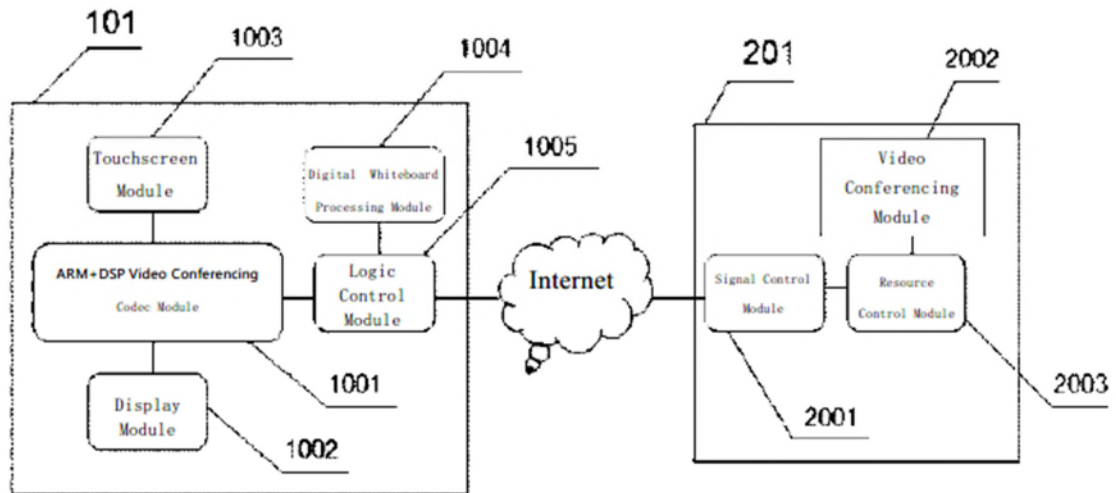


Drawing 2

EX1014, DRAWING 2

40. Chinese Patent CN 104135484 (EX1013), published November 5, 2014—approximately six months before the priority date—is particularly instructive because it not only discloses the integrated whiteboard-videoconference concept but explicitly criticizes the prior separate-device approach. CN-484 discloses an embedded system integrating an interactive whiteboard with video conferencing, in which a terminal integrates a touchscreen, microphone, and display into a single unit and incorporates an interactive whiteboard, enabling direct convening of video conferences without auxiliary devices or cables. EX1013, Abstract, ¶¶[0003]-[0008]. CN-484 specifically identifies the problems with existing solutions that require “expensive video conferencing terminal systems” along with cameras, microphones, speakers, televisions, whiteboards, projectors, computers, and

“peripherals and cables,” making the systems difficult to use and maintain. EX1013, ¶¶[0003]-[0005]. This criticism of the prior art is significant because it demonstrates that by late 2014, the concept of separate whiteboard and videoconference systems was already considered outdated and problematic, and the integrated approach was being actively pursued by multiple inventors independently. CN-484 further discloses a specific picture-in-picture display mode for the combined whiteboard and videoconference content, in which received content is displayed in picture-in-picture mode with the “digital whiteboard as the main view and the video conference as the smaller view.” EX1013, ¶¶[0040]-[0043], [0081]-[0084]. This disclosure directly maps to the ’487 Patent’s claimed arrangement where the whiteboard session window occupies the primary display area and the videoconference window is overlaid as a smaller window on top. In my opinion, CN-484’s disclosure, combined with its explicit identification of the motivation for integration, demonstrates that the claimed combination was not only known but was considered an obvious improvement over the prior separate-device approach by persons working in this field.



Drawing 2

EX1013, DRAWING 2

41. Gurevich (EX1005) directly identifies the problem of poor integration between the native user interface of a third-party video application and the user interface of an interactive board application, noting that such interfaces “often do not interface well with the user interface of the shared whiteboard application resulting in a less than desirable conferencing experience.” EX1005, ¶¶[0002]-[0004]. Gurevich provides a system that separates video from the native video application interface and presents it within an alternative presentation interface better suited for the interactive board environment. The system specifically uses Microsoft Lync 2010 as the video application component and SMART Technologies interactive board hardware including the SMART Board 4000, 6000, M600, and 800 series. EX1005, ¶¶[0037], [0041]-[0043], [0052]-[0053]. In my opinion, Gurevich’s

identification of the same integration problem that the '487 Patent purports to solve—and its independent development of a solution using the same Microsoft Lync and SMART Board components—is evidence that the '487 Patent's claimed integration was within the ordinary skill of the art. When multiple independent engineering teams converge on the same solution to the same problem using the same commercially available components, that convergence supports the conclusion that the solution was obvious.

42. In light of the foregoing references, it is my opinion that the integration of videoconferencing functionality with interactive whiteboard systems on a single appliance was a well-known, commercially-motivated design pattern by May 2015. Multiple independent references—Saleh-502, Saleh-879, CN-563, CN-484, and Gurevich—each independently disclose systems that combine videoconferencing with interactive whiteboard functionality on a single device or display. The '487 Patent's claimed integration reflects this well-established design pattern, implemented using commercially available components in their intended and documented manner. A POSITA would have understood the integration of these two technologies as a straightforward and predictable engineering task.

C. GUIs Implementing Window Layering Were Well Known

43. It is my opinion that the concept of layering visual content—displaying one window or image on top of another—was a known display paradigm in the

computing and videoconferencing arts before May 2015. This included picture-in-picture (PIP) display modes, video strips overlaid on whiteboard content, transparent window overlays, and programmatic Z-order management using operating system APIs. These techniques were employed in computing and videoconferencing applications and were documented in academic literature and commercial product documentation. EX1004, 11:5-14, 11:32-34, 20:21-37; EX1005, ¶¶[0059]-[0062], [0067]; EX1009, 9:45-52, 10:28-35; EX1011, 5:15-17, 6:28-7:14.

44. Saleh-502 discloses a PIP button on menu 310 and specifically teaches “toggling buttons for muting the audio and producing picture-in-picture on the screen 202.” EX1004, 11:5-14, 11:32-34. Saleh-502 further discloses a layout control screen 580 that allows “adjustment of video size, picture-in-picture properties, including presence and removal” and “dual monitor emulation mode, which allows for two image streams to be displayed side-by-side on a single monitor.” EX1004, 20:21-37. In my opinion, Saleh-502’s PIP functionality and layout controls demonstrate that sophisticated window layering and overlay management was already implemented in commercial videoconferencing products integrated with interactive whiteboards well before the priority date.

45. CN-484 (EX1013) discloses a picture-in-picture display mode with the “digital whiteboard as the main view and the video conference as the smaller view.” EX1013, ¶¶[0040]-[0043], [0081]-[0084]. CN-563 (EX1014) discloses multiple

view modes including picture-in-picture, AVTN six-view, and AVTN seven-view for presenting combined video and whiteboard content on a single display. EX1014, ¶¶[0052]-[0053]. These Chinese references independently confirm that PIP overlay of videoconference content on whiteboard content was a known and implemented technique before the priority date.

46. Segal (EX1009) discloses multiple display configurations for video content in a collaboration system, including floating, half-screen, full-screen, and picture-in-picture modes. EX1009, 9:45-52, 10:28-35. Segal teaches that when a user opens another content element, video continues to be displayed in a PIP interface, demonstrating dynamic window layering where video persists as an overlay while underlying content changes. In my opinion, Segal's disclosure of multiple configurable display modes—including PIP that persists across content changes—further confirms that sophisticated window layering for videoconference content was a standard feature in collaboration systems before the priority date.

47. Gurevich (EX1005) discloses video strips and video streams presented on an interactive board surface, including controls for removing streams from the video strip, changing transparency of the presentation interface, repositioning video panels, and dynamically adjusting transparency of video over whiteboard annotations in response to user interaction. EX1005, ¶¶[0059]-[0062], [0067]. Gurevich's disclosure of transparency adjustment for video overlaid on whiteboard

content is particularly significant because transparency control is only meaningful when content is layered—it confirms that Gurevich’s system displays video in a layer on top of whiteboard content, with user-adjustable opacity to balance visibility between the two layers.

48. Poel (EX1010) discloses a collaboration system with overlapping windows and session-control overlays, including sharing icons presented for a top window when windows are layered on the display. Users can drag documents between windows, and the system manages the layered window arrangement to present session controls appropriate to the top-most window. EX1010, 24:40-56, 36:41-47, 46:17-28. In my opinion, Poel demonstrates that managing multiple overlapping windows with context-sensitive controls for the top window was a known collaboration system design pattern before the priority date.

49. The ’487 Patent itself describes using FindWindow() and WS_EX_TOPMOST to manage which window remains on top of the display Z-order. EX1001, 6:25-38, 7:18-31. Fleisher (EX1011) similarly describes the use of standard Windows extended window style flags, including WS_EX_TOPMOST, WS_EX_TRANSPARENT, and WS_EX_LAYERED, to maintain and manage window presentation using operating-system API resources. EX1011, 5:15-17, 6:28-7:14. In my opinion, those extended-window-style functions were documented Windows programming tools available to developers before the ’487 Patent’s May

2015 priority date. The FindWindow() function, SetWindowLong() function, and WS_EX_TOPMOST extended style are publicly documented Windows API functions and constants that have been available to developers since at least Windows 2000. Accordingly, I do not view the '487 Patent's use of such window-management functions to control the layering of windows on a display as a technical advance over the prior art. A POSITA would have considered these API calls routine programming tools, not inventive techniques.

50. In light of the foregoing, it is my opinion that window layering and Z-order management were thoroughly conventional techniques in the computing and videoconferencing arts before May 2015. The prior art demonstrates multiple independent implementations of PIP overlays, transparent video layers over whiteboard content, configurable window arrangements, and programmatic Z-order management using standard operating system APIs. The '487 Patent's claimed overlay of a videoconference window on a whiteboard session window using FindWindow() and WS_EX_TOPMOST is simply an application of these well-known, standard techniques to a predictable use case. A POSITA would not have viewed this as a technical advance requiring inventive effort.

D. Updatable Display Selection Menus Were Well Known

51. It is my opinion that selection menus and overlaid graphical user-interface controls displayed on active application content were well known in the art

before May 2015. Overlaying context-sensitive menus on active content to control collaboration functions was a conventional and widely-implemented user interface paradigm. Multiple prior art references independently demonstrate that overlaid menus enabling mode switching, function selection, and session control were routine design patterns in both the interactive whiteboard and videoconferencing technology domains.

52. Saleh-879 (EX1008) and Saleh-502 (EX1004) both disclose a transparent menu element identified as menu 310 that is rendered as an overlay on top of the current display content while video is being displayed. This menu is invoked by pressing button 302 and is described as being “available from all screens including those containing video of participants and content.” EX1004, 10:61-11:5; EX1008, 8:17-35. The transparent menu 310 provides touch controls including Home, Call, Hang-Up, Volume, Mute, Cameras, and PIP controls, enabling a user to “place a videoconference call through a directory, speed dial, or manual dial menu; answer an incoming videoconference call; hang-up a videoconference call; mute or change volume of audio; select camera and content sources, swap near and far video in picture-in-picture (PIP), and other operations.” EX1004, 11:5-15. In my opinion, the Saleh references’ disclosure of a persistent, transparent overlay menu with comprehensive videoconference controls—available from all screens regardless of current content—demonstrates that the concept of an always-available

overlaid selection menu for controlling collaboration functions was a well-established design pattern in the interactive whiteboard and videoconferencing space.

53. Thomas (EX1012) discloses a “floating tool bar” that is rendered as a persistent overlay on top of the active collaboration view. The floating toolbar provides controls for activating an interactive digital surface layer, capturing participants’ desktops, sharing media, and manipulating views via swap and full-screen buttons. EX1012, 10:31-42. Thomas’s floating toolbar is particularly relevant because it demonstrates an overlaid selection menu that provides controls for multiple collaboration functions—including both whiteboard and content-sharing operations—accessible without leaving the current viewing context. This is precisely the type of overlaid menu functionality claimed in the ’487 Patent.

54. Ghani (EX1007) discloses a presenter menu where a whiteboard button makes the whiteboard appear to every participant, and a poll button causes a small window with a text box to appear over the session interface. EX1007, ¶¶[0075], [0088]. Ghani’s disclosure of menu controls that cause content windows to appear overlaid on the collaboration session interface—including both whiteboard activation and poll overlays—further confirms that overlaid, context-sensitive menu controls for managing collaboration functions were thoroughly conventional in the art.

55. Hans (EX1015), German Patent Application DE 10 2004 041 884, provides additional evidence that user-selectable graphical control elements for managing conference communication functions were well-known in the collaboration and conferencing arts before the priority date. Hans discloses conference communication systems with communication terminals equipped with switch units that enable users to request rights for different media during a conference session, such as audio transmission or text message transmission. EX1015, ¶¶[0022]-[0027], [0126]-[0127]. Significantly, Hans teaches that these switch units need not be physical keys or buttons and may instead be software-implemented graphical control elements displayed on a graphical display and selected using an input device. EX1015, ¶[0038], [0126]-[0127]. This disclosure is relevant because it demonstrates that the concept of using software-rendered graphical controls on a display—rather than dedicated hardware buttons—to manage conferencing functions was well-established in the collaboration arts before May 2015. In combination with the other prior art references discussed herein, Hans further confirms that graphical user interface elements providing access to conferencing and communication functions were entirely conventional in the interactive display and collaboration arts well before the priority date of the '487 Patent.

56. Poel (EX1010) discloses session-control overlays presented for top windows when windows are layered, including sharing icons and controls that appear contextually based on the current window arrangement. EX1010, 46:18-28. Poel's disclosure of context-sensitive session controls that appear overlaid on the top window in a layered arrangement further demonstrates that overlaid, updatable selection menus were a standard feature of collaboration systems before the priority date.

57. Each of these references demonstrates that the concept of an overlaid menu enabling mode switching and function selection—which is precisely what the '487 Patent claims as part of the collaboration menu—was a known interface design pattern in both the interactive whiteboard and videoconferencing technology domains. In my opinion, the '487 Patent's collaboration/selection menus—overlaid menus providing options to start/stop videoconferencing, show a videoconferencing session, share a whiteboard or other content, or access a keyboard—are an example of this known technique. A POSITA would have recognized the '487 Patent's menu as an application of standard UI design patterns used in collaboration and conferencing products by 2015. Overlaying a selection menu on active content to provide users with access to collaboration functions was a known approach in the relevant product space.

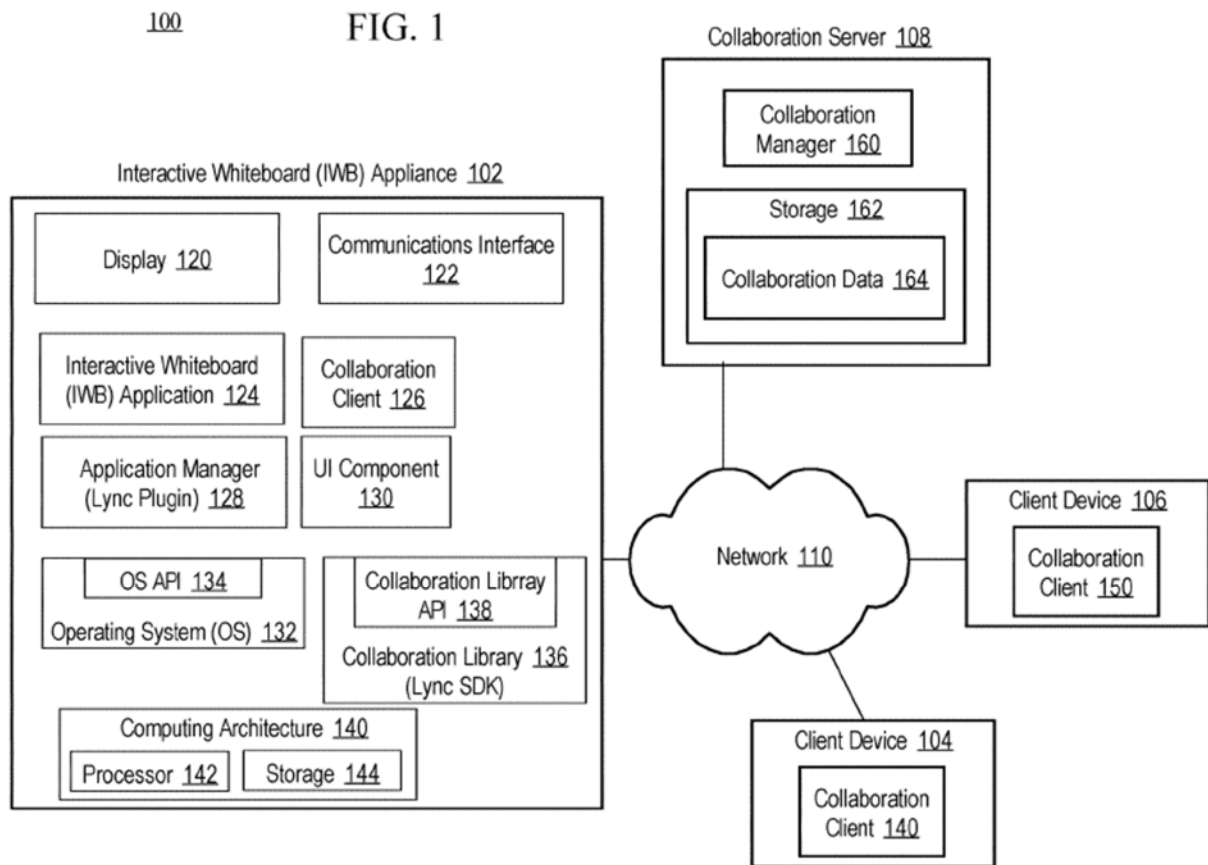
58. In light of the foregoing discussion of the technology background, the '487 Patent describes applying videoconferencing technology and interactive whiteboard technology, combined using operating-system-level window management APIs. EX1001, 6:25-38, 7:18-31; EX1011, 5:15-17, 6:28-7:14. The prior art includes disclosures of the claimed components—interactive whiteboards (EX1004, 1:53-65; EX1006, ¶¶[0040]-[0043]), videoconferencing (EX1004, 5:10-14; EX1005, ¶¶[0042], [0052]-[0053]), overlaid menus (EX1004, 10:61-11:5; EX1008, 8:17-35), picture-in-picture window arrangements (EX1004, 11:5-14; EX1009, 9:45-52), Z-order management via Windows API functions (EX1011, 5:15-17, 6:28-7:14), and touch-activated selection menus (EX1004, 7:55-8:12). In my opinion, the claimed combination of these known elements produces the predictable result of allowing a user to conduct a videoconference while simultaneously using an interactive whiteboard, with the display managed through standard window layering techniques. I do not identify any synergistic or unexpected result arising from this combination that would have been surprising to a person of ordinary skill in the art.

IV. THE '487 PATENT

A. Overview

59. The '487 Patent is directed to integrating videoconferencing capabilities with interactive electronic whiteboard appliances. EX1001, 1:19-22.

The patent discloses an interactive whiteboard appliance 102 that includes several components: a display 120 for presenting visual content to the user, a communications interface 122 for network connectivity, an interactive whiteboard (IWB) application 124 that provides the core whiteboard drawing and annotation functionality, a collaboration client 126 that handles videoconference communication, an application manager 128 that orchestrates the display layering and mode switching between applications, a user interface (UI) component 130 that renders the collaboration menu and manages user interaction, and an operating system (OS) 132 that provides a windowing API 134 used by the application manager to control window Z-order and positioning. EX1001, 3:62-4:1, FIG. 1.



EX1001, FIG. 1

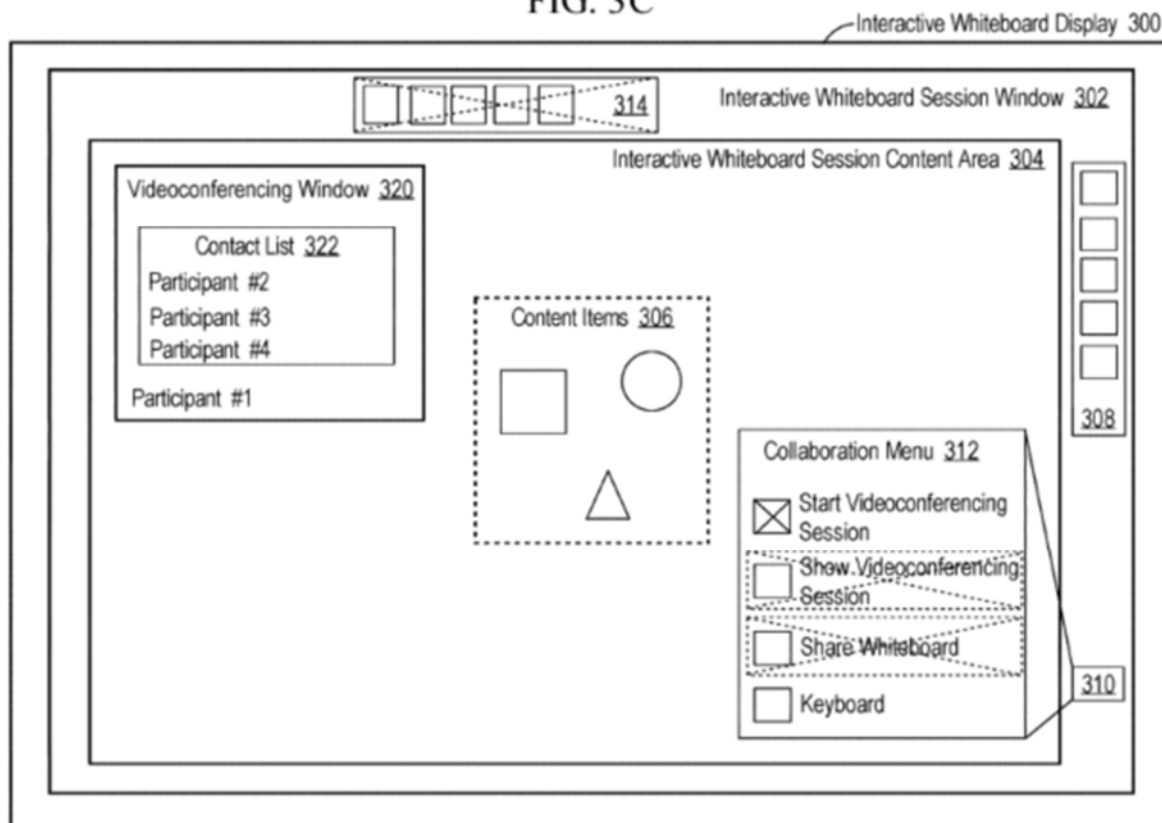
60. The patent specifically identifies the commercial off-the-shelf software products used to implement the claimed system. The collaboration client 126 is identified as “Microsoft Lync Client”—a widely deployed enterprise unified communications application. The collaboration library 136, which provides the programmatic interface for controlling the collaboration client, is identified as the “Microsoft Lync SDK”—a publicly available software development kit distributed by Microsoft for building applications that interact with the Lync platform. The collaboration server 108, which manages the communication sessions, is identified

as “Microsoft Lync Server”—Microsoft’s enterprise communications server product. EX1001, 4:40-45, 5:4-14, 5:30-37. Thus, the ’487 Patent is directed to combining a known videoconferencing application (Microsoft Lync) with a known interactive whiteboard device to manage whiteboard sessions and videoconferencing sessions in a user-friendly manner. The identification of these specific commercial products confirms that the ’487 Patent does not disclose any new communication protocol, videoconferencing technology, or server architecture—it simply uses existing, commercially available Microsoft products in their intended and documented manner.

61. The application manager 128 manages the display layering of windows using standard Microsoft Windows API functions. Specifically, to keep the whiteboard session window on top of other windows, the application manager calls FindWindow() with the class name of the whiteboard application window and then sets the WS_EX_TOPMOST extended window style in the GWL_EXSTYLE field of that window. This causes the Windows operating system to render the whiteboard window above all non-topmost windows in the Z-order. Conversely, to move the videoconference window on top of the whiteboard—for example, when the user selects the videoconference option from the collaboration menu—the application manager applies the same process to the collaboration client window (setting WS_EX_TOPMOST for it) and simultaneously unsets WS_EX_TOPMOST for the

whiteboard window, causing the videoconference to be rendered above the whiteboard in the Z-order. EX1001, 6:26-38, 7:18-31. Fleisher similarly describes the use of these same Windows extended window style flags—WS_EX_TOPMOST, WS_EX_TRANSPARENT, and WS_EX_LAYERED—to manage layered window presentation. EX1011, 5:15-17, 6:28-7:14. FindWindow(), SetWindowLong(), and the WS_EX_TOPMOST extended style are standard, publicly documented Windows API functions and constants that have been available to developers since at least Windows 2000. In my opinion, these are documented Windows GUI programming tools rather than proprietary techniques disclosed for the first time in the '487 Patent.

FIG. 3C



EX1001, FIG. 3C

62. In my opinion, the '487 Patent does not disclose a new hardware component, communication protocol, whiteboard technology, or software technique for the limitations addressed here. The patent combines a known interactive whiteboard (of the type that had been commercially available since 1991, EX1004, 1:53-65), with known videoconferencing software (Microsoft Lync, a widely deployed commercial product, EX1001, 4:40-45, 5:4-14), using known Windows API functions (FindWindow, SetWindowLong, WS_EX_TOPMOST, EX1001,

6:26-38, 7:18-31; EX1011, 5:15-17, 6:28-7:14). These individual elements were known and documented before the priority date. Combining them produces the predictable result of enabling a user to conduct a videoconference while using an interactive whiteboard, with the windows managed in a layered arrangement—the result one would expect from combining these technologies using these API functions.

63. As I explain in extensive detail in Section VIII below, this combination of known elements to achieve a predictable result was obvious to a person of ordinary skill in the art as of the May 9, 2015 priority date. The prior art not only discloses each individual element of the claimed invention, but also provides explicit motivation to combine these elements in the manner claimed. Multiple prior art references independently arrived at the same basic concept of integrating videoconferencing with interactive whiteboards on a single appliance, confirming that this combination was well within the expected skill and creativity of ordinarily skilled artisans working in this technology space.

64. The '487 Patent's UI component 130 displays a collaboration menu containing selectable items that include, among other options, a control for starting a videoconference session, a control for sharing the current whiteboard content with remote participants, and an option for accessing a virtual keyboard for text input on the whiteboard. EX1001, 5:38-6:12. This collaboration menu is rendered as an

overlay on top of the interactive whiteboard session window using the same WS_EX_TOPMOST mechanism described above—the menu window is given the topmost extended style so that it appears above the whiteboard content while the user makes a selection. EX1001, 6:26-38. In my opinion, such overlaid menus were known in the art of interactive whiteboard systems and videoconferencing systems, as demonstrated by the prior art discussed in this declaration. Saleh-502 and Saleh-879 disclose persistent transparent overlay menus available from all screens (EX1004, 10:61-11:5; EX1008, 8:17-35); Thomas discloses a floating toolbar overlaid on whiteboard content (EX1012, 8:1-25); Hans discloses software-implemented graphical control elements displayed on a graphical display for managing conferencing functions (EX1015, ¶[0038], [0126]-[0127]); and Ghani discloses collaboration interface buttons overlaid within the whiteboard environment (EX1007, ¶¶[0075]-[0076]). The '487 Patent's collaboration menu is therefore an application of known overlay menu techniques to the known context of combined whiteboard and videoconference systems.

B. Prosecution History

65. The '487 Patent issued from U.S. Application No. 16/507,952, filed July 10, 2019, which is a continuation of Application No. 15/637,006, filed June 29, 2017, which is itself a continuation of Application No. 14/708,186, filed May 9, 2015. EX1001; EX1002. The application as originally filed contained a single

independent claim directed to an interactive whiteboard appliance integrating videoconferencing. The original claim covered a device with hardware components (display, communications interface), software components (interactive whiteboard application, collaboration client), and an application manager presenting a collaboration menu with controls for switching between whiteboard and videoconference modes, sharing content with external devices, and controlling the videoconference session. EX1002.

66. On October 30, 2019, preliminary amendments were filed cancelling original claim 1 and adding new claims 2-21 across device, computer-readable media, and method categories. The new claims introduced specific user interface limitations including requirements for an overlaid selection menu, initiation of a videoconference session via the menu, and Z-order management of the whiteboard session window and videoconference window. EX1002, 50-54.

67. On April 27, 2020, the Examiner issued a Non-Final Office Action. Claims 2-14 and 16-21 were indicated as containing allowable subject matter. Claim 15 was rejected solely under 35 U.S.C. §112(b) for lack of antecedent basis in the preamble. No claim was rejected under §102 or §103. The Examiner stated that the prior art of record—Orsolini (U.S. 2006/0167996), Nelson (U.S. 2008/0098295), Back (U.S. 2008/0184115), Sriraghavan (U.S. 8,713,454), and Modai (U.S. 2015/0009278)—“failed to teach a whiteboard session window with overlaid menu

on to it to enable selection to start videoconference and then overlaying the videoconference window on the interactive whiteboard session window.” EX1002, 63-65.

68. On July 24, 2020, the applicant amended the preamble of claim 15 to address the §112(b) rejection. EX1002, 79. On September 11, 2020, the Examiner issued a Notice of Allowance for all pending claims without additional reasons for allowance. EX1002, 91-92.

69. None of the prior art references I rely upon in this declaration—Saleh-502 (EX1004), Gurevich (EX1005), Shimizu (EX1006), Ghani (EX1007), Saleh-879 (EX1008), Segal (EX1009), Poel (EX1010), Fleisher (EX1011), Thomas (EX1012), CN-484 (EX1013), CN-563 (EX1014), or Hans (EX1015) —were cited or considered during prosecution. In my opinion, had the Examiner been aware of these references, the claims would not have been allowed. The limitation the Examiner identified as the basis for allowance is expressly disclosed in multiple prior art references that were never before the Examiner.

70. As I explain in detail in Section VIII below, the prior art explicitly discloses the very limitation the Examiner found as the basis for allowance.

V. LEVEL OF ORDINARY SKILL IN THE ART

71. In my opinion, a person of ordinary skill in the art (“POSITA”) as of May 9, 2015—the earliest effective filing date of the ’487 Patent—would have had

at least one of the following combinations of education and experience: (1) a bachelor's degree in computer science, software engineering, electrical engineering, computer engineering, or a comparable technical field, together with at least two years of professional experience in software development, graphical user interface (GUI) design, videoconferencing systems, interactive display systems, or a closely related field; or (2) a master's degree or higher in one of the same technical fields, with coursework or research focused on areas such as human-computer interaction, multimedia systems, real-time communications, or collaborative computing, together with at least some practical experience in software development for graphical or interactive applications. Additional education could substitute for less professional experience, and conversely, additional professional experience could compensate for less formal education.

72. I meet or exceed this definition of a person of ordinary skill in the art at all times relevant to this proceeding. As set forth in my curriculum vitae (Appendix A) and in Section I of this declaration, I hold a Ph.D. in Computer Science from the Georgia Institute of Technology, have more than 30 years of professional experience in networked multimedia systems, content delivery, videoconferencing, interactive multimedia, and distributed collaboration systems, and have extensive experience with the types of software technologies at issue in this proceeding. My qualifications substantially exceed those of an ordinarily skilled artisan in this field.

My research and industry work have involved the integration of multimedia content delivery with interactive user interfaces, the design and implementation of systems for real-time video communication across networks, and the development of architectures for scalable content sharing between networked devices. I have worked with videoconferencing and multimedia systems, network communication protocols, graphical user interface design for multimedia applications, and software systems that manage the display and control of shared multimedia content across networked devices. My experience includes collaboration with companies developing multimedia and networking products, founding a technology lab that built video conferencing and video-on-demand emulation systems, and decades of teaching and research in networked multimedia delivery. I bring to this analysis not only theoretical knowledge of the relevant technologies, but also practical experience designing and evaluating the same types of systems and solutions discussed in the prior art and claimed in the '487 Patent.

VI. CLAIM CONSTRUCTION

73. No claim construction is necessary for purposes of this inter partes review proceeding. I have reviewed the claims of the '487 Patent and the prior art references discussed in this declaration, and I have concluded that there is no need for any special claim construction in order to determine that the cited prior art renders all Challenged Claims unpatentable as obvious under 35 U.S.C. §103.

Accordingly, I do not present any claim constructions in this declaration. All claim terms should be given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the specification of the '487 Patent and the prosecution history. To the extent any party contends that a particular term requires construction, I reserve the right to supplement my opinions in light of any such construction.

VII. OVERVIEW OF CHALLENGE

74. It is my opinion that claims 1-20 of the '487 Patent are unpatentable under 35 U.S.C. §103 as obvious in view of the prior art discussed in this declaration. As set forth below, I present two independent grounds of invalidity: (1) Ground 1A/1B, demonstrating that Saleh-502 (EX1004) anticipates and/or renders obvious all twenty claims; and (2) Ground 2, demonstrating that Gurevich (EX1005) in view of Saleh-502 (EX1004) renders obvious all twenty claims.

75. Saleh-502, U.S. Patent No. 8,593,502, is entitled “Videoconferencing System with Integrated Interactive Whiteboard” and was filed on January 18, 2011. It issued on November 26, 2013, making it prior art to the '487 Patent under 35 U.S.C. §102(a)(1). Saleh-502 discloses a combined SMART Board interactive whiteboard and Polycom videoconferencing system with a transparent overlaid GUI menu (menu 310) that enables initiation and control of videoconference sessions directly from the whiteboard display, including picture-in-picture (PIP) layout

modes. EX1004, 1:53-65, 7:55-8:12, 10:61-11:14, 20:21-37. Saleh-502 was never cited or considered by the Examiner during prosecution of the '487 Patent.

76. Gurevich, U.S. Patent Application Publication No. 2016/0301729, was filed on April 9, 2015—one month before the '487 Patent's claimed priority date of May 9, 2015. Gurevich is prior art under 35 U.S.C. §102(a)(2). Gurevich discloses a system integrating Microsoft Lync videoconferencing with SMART Board interactive whiteboard hardware through an alternative presentation interface that suppresses the native Lync UI and presents processed video streams overlaid on the interactive whiteboard surface, with toolbar controls for managing video display. EX1005, ¶¶[0041]-[0042], [0050]-[0053], [0057], [0059]-[0061]. Gurevich was never cited or considered by the Examiner during prosecution of the '487 Patent.

77. In my opinion, both Saleh-502 and Gurevich are relevant prior art that was overlooked during prosecution. Each reference independently discloses systems that integrate videoconferencing functionality with SMART Board interactive whiteboard hardware.. The limitation the Examiner identified as the basis for allowance—a whiteboard session window with overlaid menu enabling selection to start a videoconference and then overlaying the videoconference window on the interactive whiteboard session window—is expressly taught by Saleh-502's transparent menu 310 that provides call-initiation controls overlaid on the display, followed by display of the video content on the same screen. Had the Examiner been

presented with these references, I believe the outcome of prosecution would have been different. The combination of these known elements—interactive whiteboards, overlaid selection menus, videoconference initiation, and overlaid videoconference windows—achieves the predictable result of allowing a user to initiate and view a videoconference from within a whiteboard application, which is what the prior art demonstrated.

VIII. THE ASSERTED GROUNDS OF INVALIDITY

A. Ground 1A/1B: Saleh-502 Anticipates And/Or Renders Obvious Claims 1-20

1. Summary of Prior Art: Saleh-502—EX1004

78. Saleh-502, U.S. Patent No. 8,593,502 (EX1004), is entitled “Videoconferencing System with Integrated Interactive Whiteboard” and was assigned to Polycom, Inc., a manufacturer of videoconferencing equipment and solutions at the time of its filing. Saleh-502 was filed on January 18, 2011, and issued on November 26, 2013, making it prior art to the ’487 Patent under 35 U.S.C. §102(a)(1). This reference is relevant to the present proceeding because it discloses an integrated system that combines videoconferencing capabilities with an interactive whiteboard in a single unified device, which is the same general concept claimed in the ’487 Patent. The system described in Saleh-502 addresses similar technical problems, including integration of whiteboard functionality with

videoconferencing in a manner that allows users to transition between modes of operation. As I will explain in detail below, Saleh-502 discloses every element recited in claims 1–20 of the '487 Patent, either expressly or as would have been obvious to a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention.

79. Saleh-502 acknowledges the prior art 3000iPower system, which combined the Polycom iPower 9800 videoconferencing system with the SMART Board 3000i interactive display to create an integrated solution for conferencing and collaboration. Specifically, Saleh-502 explains that this prior combined system “allows computer images to be projected and viewed within a videoconference call,” “offers touchscreen controls that provide access to conference applications,” and further allows a user to “use a pen from a pen tray . . . and make notes on a whiteboard.” EX1004, 1:54-65. This prior art acknowledgment is significant because it demonstrates that the concept of combining videoconferencing with interactive whiteboard technology was already known and commercially available well before the filing date of the '487 Patent. The 3000iPower system provided users with the ability to project computer images during a videoconference, use touch-based controls to navigate conference applications, and employ a physical pen to annotate on the whiteboard surface—all capabilities that are central to the claims of the '487 Patent. This prior art disclosure establishes that the field of integrated

videoconferencing and interactive whiteboard systems was well-developed at the time Saleh-502 was filed in January 2011, and had been commercially deployed by major industry participants including Polycom and SMART Technologies.

80. Saleh-502 improves upon the prior 3000iPower system by coupling the Polycom VSX 8000 videoconferencing unit to the 3000i SMART Board interactive display, with a stated goal of simplifying user interaction and providing a more seamless experience for users conducting videoconferences while simultaneously utilizing the interactive whiteboard. EX1004, 4:55-5:14. The improvement described in Saleh-502 focuses on creating a tighter integration between the videoconferencing unit and the interactive display so that users can more easily navigate between videoconferencing functions and whiteboard functions without having to interact with multiple separate control interfaces or physical devices. Saleh-502 describes the need for a unified system in which the interactive display serves as both the output device for video content and the input device for touch-based commands, thereby eliminating the need for separate remote controls or keyboards that were required by prior systems. This design philosophy of simplifying user interaction through a unified touch-based interface on the same display that shows video content is precisely the approach claimed in the '487 Patent. The goal of simplifying user interaction by using the SMART Board's touch capabilities to control both videoconferencing and whiteboard functions

demonstrates that the inventors of Saleh-502 recognized and solved the same technical challenge that the '487 Patent claims to address.

81. The combined system disclosed in Saleh-502 enables the SMART Board to simultaneously display video content received from a remote endpoint and receive touch inputs from a local user, thereby “incorporat[ing] features of input and display for the videoconferencing system.” EX1004, 5:10-14. The system architecture centers on a controller 120 that includes a video codec 122 for encoding and decoding video streams, and a data processor 124 for handling data processing tasks. The controller 120 is coupled to a memory 130 that stores multiple operational functions including a GUI function 131 for rendering graphical user interface elements, a camera function 132 for controlling camera operations, an annotation function 133 for managing user annotations, a whiteboard function 134 for operating the whiteboard mode, and an auxiliary device function 135 for interfacing with peripheral devices. EX1004, 7:4-67. Additionally, the controller 120 is coupled to a network interface 140 that is connected to a videoconference network 142, enabling the system to communicate with remote endpoints for the purpose of conducting videoconference calls and sharing content. EX1004, 7:47-50. This architecture—a processor-based controller coupled to memory storing executable functions and connected to a network interface—corresponds to the structural elements recited in the claims of the '487 Patent.

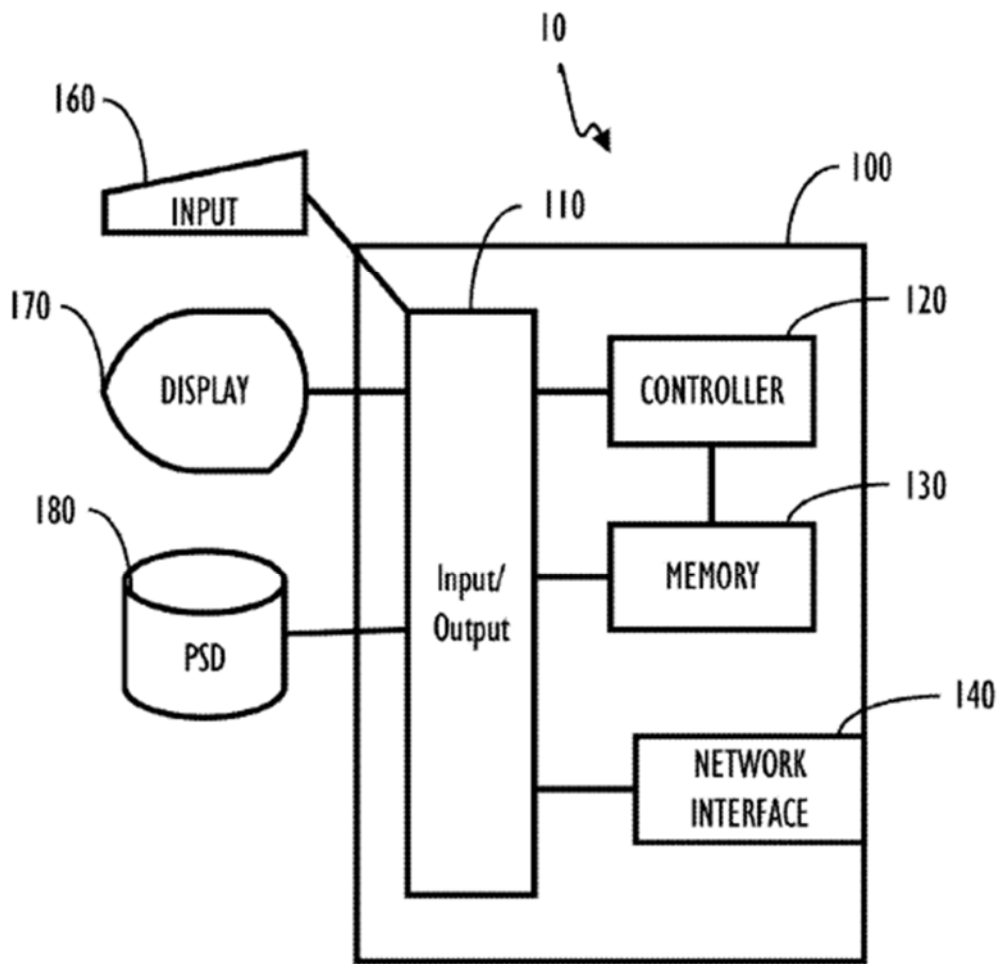
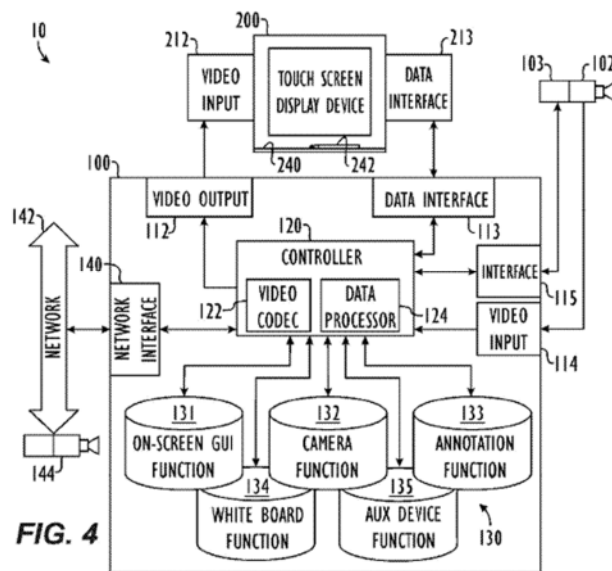


FIG. 1

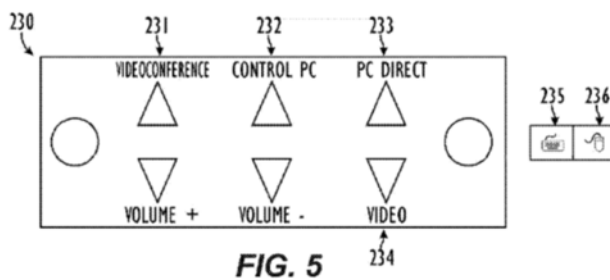
EX1004, FIG. 1

82. The on-screen GUI function 131 stored in memory 130 displays “touch controls, menus, and dialogs” on the SMART Board display, thereby allowing a user to “place a videoconference call through a directory, speed dial, or manual dial menu; answer an incoming videoconference call; hang-up a videoconference call; mute or change volume of audio; select camera and content sources, swap near and

far video in picture-in-picture (PIP), and other operations.” EX1004, 7:55-8:12. This extensive list of videoconferencing functions that are accessible through the on-screen GUI demonstrates that Saleh-502 discloses a comprehensive graphical user interface that provides touch-based access to the full range of videoconferencing operations directly on the interactive display surface. The ability to place calls through a directory, speed dial, or manual dial menu means that the system provides multiple mechanisms for initiating a videoconference session, each accessible through the on-screen touch interface without requiring any separate physical remote control or keyboard. Furthermore, the ability to control audio settings, camera sources, and picture-in-picture layout all through the same on-screen GUI demonstrates that the system provides a unified touch-based control surface for all aspects of the videoconferencing experience. This is precisely the type of integrated on-screen control that the ’487 Patent claims as its invention—a menu system displayed on the same screen as the whiteboard content that allows users to initiate and control videoconference sessions.



EX1004, FIG. 4



EX1004, FIG. 5

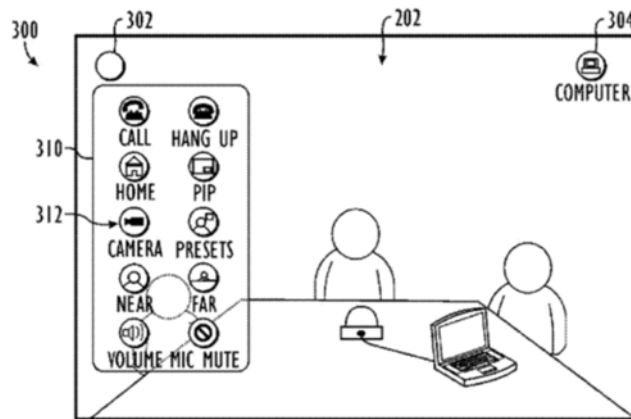


FIG. 6

EX1004, FIG. 6

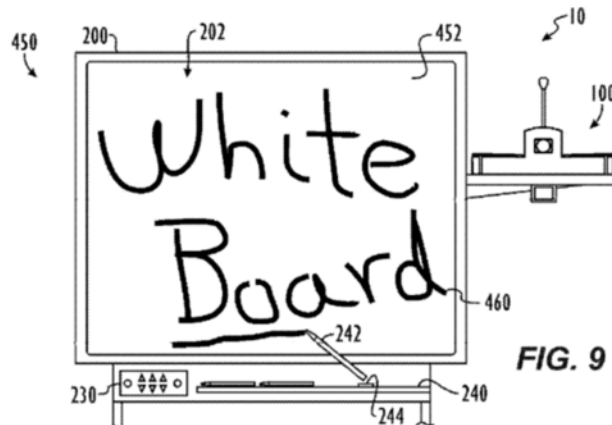


FIG. 9

EX1004, FIG. 9

83. Saleh-502 further discloses a transparent menu 310 that is overlaid on the touch screen display while video or other content is being displayed, which can be invoked by pressing button 302. This transparent menu is described as being “transparent or hidden and is available from all screens including those containing

video of participants and content.” EX1004, 10:61-11:5. This disclosure establishes that Saleh-502 teaches an overlay menu that can be invoked regardless of what content is currently being displayed on the screen—whether that content is a live video feed from a remote participant, shared presentation content, or whiteboard content. The fact that the menu is described as “transparent” means that when the menu is invoked, it does not completely obscure or replace the underlying content; rather, it is overlaid on top of that content so the user can simultaneously see the underlying display while interacting with the menu options. This design choice of making the menu available from “all screens” allows users to access system controls regardless of the current operational mode, which is relevant to the overlay limitation recited in the claims of the ’487 Patent.

84. Saleh-502 discloses that users can switch between different operational modes—including videoconference mode, whiteboard mode, and PC mode—by pressing corresponding buttons 231-234 on the touch screen interface. EX1004, 9:33-10:5. Additionally, the system supports automatic mode switching based on physical interactions with the pen tray: when a user picks up a pen from the pen tray, the system automatically transitions to annotation or whiteboard mode, and when the pen is replaced in the pen tray, the system automatically returns to touch-control mode. EX1004, 8:55-9:14. This multi-modal operation scheme demonstrates that Saleh-502 contemplates a system in which the same display surface serves multiple

distinct purposes—displaying video content during a videoconference, functioning as an interactive whiteboard for drawing and annotation, and operating as a PC display for showing computer-generated content. The seamless transitions between these modes, triggered either by on-screen button presses or by the physical act of picking up or replacing a pen, illustrate a sophisticated system design that prioritizes ease of use and natural user interaction. The ability to switch between videoconferencing and whiteboard modes on the same display is precisely the type of multi-functional operation that is central to the claims of the '487 Patent.

85. The whiteboard function 134 stored in memory 130 enables the display to be used as an interactive whiteboard, wherein the user can draw, write, and annotate on the display surface using a pen or touch input. Critically, Saleh-502 discloses that “whiteboard’s content 452 with the annotations 460 can be sent to remote endpoints by the videoconferencing unit 100” as H.239 content. EX1004, 13:30-60. The H.239 protocol is a standard videoconferencing protocol for sharing auxiliary content—such as presentations, documents, or in this case, whiteboard content—alongside the primary video stream during a videoconference call. This disclosure demonstrates that Saleh-502 not only provides an interactive whiteboard that can be used locally, but also integrates the whiteboard functionality directly with the videoconferencing system so that whiteboard content can be shared with remote participants in real time during an active videoconference session. The ability to

transmit whiteboard content as H.239 content to remote endpoints means that the whiteboard session is inherently linked to the videoconference session, enabling collaborative annotation and drawing that can be viewed by all conference participants. This tight integration between the whiteboard function and the videoconferencing function is precisely the type of combined operation that the '487 Patent claims to provide.

86. In my experience researching and developing networked multimedia systems and interactive content delivery platforms over the past three decades, the architecture disclosed in Saleh-502 represents a straightforward approach to combining videoconferencing with interactive whiteboard technology. The use of a controller with stored operational functions, a network interface, and an on-screen GUI with overlaid menus was known in the videoconferencing industry before 2013. By the time Saleh-502 was filed in January 2011, integrated videoconferencing and whiteboard systems had been commercially available, and the specific architectural choices made in Saleh-502—including the use of stored program functions executed by a controller, a network interface for connecting to videoconference networks, and a touch-sensitive display that serves as both output and input device—were conventional design choices. The concept of overlaying a transparent menu on top of displayed content, including whiteboard content, was a known user interface design pattern. In summary, Saleh-502 discloses a whiteboard device (SMART

Board) with a display (screen 202), a network interface (network interface 140 coupled to videoconference network 142), processors (controller 120 including video codec 122 and data processor 124), and memory (memory 130) storing instructions that cause interactive whiteboard content to be displayed and videoconferencing to be initiated on the same screen. EX1004, 5:22-34, 7:22-8:14. The overlaid transparent menu 310 with touch controls for placing calls, hanging up, muting, adjusting volume, selecting cameras, and toggling PIP corresponds directly to the '487 Patent's claimed selection menu overlaid on the whiteboard session window. EX1004, 11:6-14.

87. Like the '487 Patent, Saleh-502 recognizes that users would benefit from a more user-friendly experience combining both technologies into a single, cohesive interface. EX1004, 1:54-2:16. It is my opinion that every structural and functional element of the Challenged Claims of the '487 Patent is expressly disclosed by Saleh-502 and/or rendered obvious by Saleh-502, as explained below. A POSITA would have been motivated to combine these elements in the manner claimed because Saleh-502 expressly sought to improve the user experience of combined whiteboard and videoconferencing systems, through providing intuitive, on-screen controls for managing these functions. EX1004, 2:8-12, 7:55-8:12.

2. [Claims 1.pre] “A whiteboard device comprising:”

88. It is my opinion that Saleh-502 discloses a “whiteboard device” as recited in the preamble of claim 1 of the ’487 Patent. Saleh-502 describes a touch screen display device 200, specifically identified as the 3000i model SMART Board manufactured by SMART Technologies of Canada, which functions as an interactive whiteboard capable of receiving user input through touch and pen interactions. EX1004, 4:62-65. Saleh-502 discloses that this device is known to couple with and integrate a videoconferencing unit to form a combined system that provides both interactive whiteboard functionality and videoconferencing capabilities in a unified platform. EX1004, 4:55-67, 5:1-14. The SMART Board 3000i is one of the most well-known and commercially successful interactive whiteboard products in the industry, and it was specifically designed to serve as a large-format interactive display that could be used in conference rooms and classrooms for collaborative writing, drawing, and annotation activities. The SMART Board’s fundamental purpose is to function as an electronic whiteboard that replaces traditional dry-erase whiteboards with a digital surface that can capture, store, and share user-created content, making it the quintessential example of a “whiteboard device” as that term is used in the claims of the ’487 Patent.

89. In my opinion, the SMART Board 3000i constitutes a “whiteboard device” within the meaning of the ’487 Patent claims. The SMART Board 3000i

meets the meeting of the Claims because it incorporates a rear-projection display surface coupled with resistive or DViT (Digital Vision Touch) sensor technology that detects the position of touches on the display surface, enabling the system to track user input and render corresponding ink strokes or other graphical elements on the display. The SMART Board product line had been commercially available since the early 1990s and was recognized in the industry as an interactive whiteboard platform. The integration of this SMART Board with the Polycom videoconferencing unit creates a combined system that maintains the whiteboard capabilities of the SMART Board while adding videoconferencing functionality, meaning the combined system continues to function as a whiteboard device with added communication capabilities. A system built around the SMART Board 3000i interactive whiteboard constitutes a “whiteboard device.”

90. Thus, a POSITA would have understood that Saleh-502’s combined system—which integrates a Polycom videoconferencing unit with the SMART Board 3000i interactive whiteboard to form a unified device capable of whiteboard operations, videoconferencing, and combined whiteboard-and-videoconference operations—constitutes a “whiteboard device” within the meaning of claim 1 of the ’487 Patent. The SMART Board’s identity and purpose as an interactive whiteboard is not altered by its integration with a videoconferencing unit; rather, the addition of videoconferencing capabilities enhances the whiteboard device by enabling remote

collaboration without changing its character as a whiteboard. A POSITA reading Saleh-502 would recognize the described system as a whiteboard device because Saleh-502 identifies the SMART Board 3000i as an interactive whiteboard product, and because the system retains whiteboard functionality including pen-based annotation, touch-based drawing, and content sharing.

- a. **[Claim 8.pre] “One or more non-transitory computer-readable media storing instructions which, when processed by one or more processors, cause:”**

91. It is my opinion that Saleh-502 expressly discloses non-transitory computer-readable media as recited in the preamble of claim 8. Specifically, Saleh-502 describes memory 130 as including “RAM, ROM, PROM, programmable read-write memory, and solid-state memory.” EX1004, 4:19-23. Additionally, Saleh-502 describes a program storage unit 180 that “represents any form of non-volatile storage” suitable for retaining programmed instructions and data even when power is removed from the system. EX1004, 3:67-4:3. Furthermore, Saleh-502 expressly states that the machine-readable medium “may include read-only memory (ROM), random-access memory (RAM), magnetic disc storage media, optical storage media, flash-memory devices.” EX1004, 22:15-20. Each of these identified storage technologies—ROM, PROM, solid-state memory, magnetic disc storage, optical storage, and flash-memory devices—constitutes a non-transitory computer-readable

medium. The express identification of these specific storage technologies in Saleh-502, combined with the disclosure that they store operational functions and programmed instructions, directly satisfies the preamble requirement of claim 8 for “non-transitory computer-readable media” storing instructions.

b. [Claim 15.pre] “A computer-implemented method comprising:”

92. It is my opinion that Saleh-502 also discloses a “computer-implemented method” as recited in the preamble of claim 15. Saleh-502 expressly states that “[a]spects of the invention are described as a method of control or manipulation of data, and may be implemented in one or a combination of hardware, firmware, and software.” EX1004, 22:6-21. Saleh-502 further states that “[e]mbodiments of the invention may also be implemented as instructions stored on a machine-readable medium” that when executed by a processor cause the processor to perform the described methods. EX1004, 22:6-21. These statements confirm that Saleh-502 expressly contemplates its disclosed functionality being implemented as a computer-implemented method—that is, a method performed by a computer executing software instructions stored on a machine-readable medium. The operational functions 131-135 stored in memory 130 and executed by controller 120 constitute the software implementation of the methods described throughout Saleh-502, including the methods of displaying GUI elements, managing whiteboard content, controlling camera operations, and managing videoconference calls. A

POSITA would have readily understood that the step-by-step operations described in Saleh-502 for displaying menus, initiating calls, managing whiteboard sessions, and overlaying menus constitute a computer-implemented method as recited in claim 15.

93. Thus, a POSITA would have understood that Saleh-502 satisfies the preambles of claims 1, 8, and 15 of the '487 Patent. The combined system built around the SMART Board 3000i constitutes a “whiteboard device” as recited in claim 1; the expressly disclosed memory technologies including ROM, PROM, solid-state memory, and flash memory constitute “non-transitory computer-readable media” as recited in claim 8; and the expressly disclosed software-implemented methods of control constitute a “computer-implemented method” as recited in claim 15. Each preamble is directly and expressly met by the disclosures of Saleh-502 without any need for inference or modification, confirming that Saleh-502 operates in the same technical space and addresses the same subject matter as the '487 Patent.

3. [Claims 1.a/8.a] “a display”

94. It is my opinion that Saleh-502 discloses a “display” as recited in claim element 1[a] of the '487 Patent. Saleh-502 describes a projection screen 202 that serves as the visual output surface of the SMART Board system, along with an integrated XGA projector 220 that projects images onto the projection screen from behind the screen surface. EX1004, 5:23-26. The projection screen 202 is the surface

upon which all visual content is rendered for the user, including videoconference video feeds from remote participants, graphical user interface elements such as menus and buttons, whiteboard content including user-drawn annotations, and shared presentation content from connected computers. The combination of the projection screen 202 and the integrated XGA projector 220 constitutes a complete display system that is capable of rendering full-color graphical content at XGA resolution for viewing by users standing in front of the SMART Board. This display system is an integral component of the whiteboard device and serves as both the output surface for visual content and the input surface for touch-based user interactions, fulfilling the fundamental requirement of a “display” as recited in the claims.

95. The XGA resolution refers to a display resolution of 1024×768 pixels, which was a standard and widely-used display resolution for projection systems and computer monitors during the 2011-2013 timeframe when Saleh-502 was filed and issued. Rear-projection display technology, as employed in the SMART Board 3000i, allowed for a flat, touch-sensitive front surface while housing the projection optics behind the screen, thereby avoiding the shadow-casting problems associated with front-projection systems. The XGA projector 220 integrated into the SMART Board generates images by projecting light through an LCD or DLP imaging element onto the rear surface of the projection screen, where the images are then visible from

the front side of the screen to users. A POSITA would have recognized the projection screen 202 with XGA projector 220 as a large-format display suitable for rendering graphical content, video, and user interface elements. The use of a rear-projection display in an interactive whiteboard was a known commercial product category before the filing of the '487 Patent.

96. Thus, a POSITA would have understood that the projection screen 202 with integrated XGA projector 220 disclosed in Saleh-502 constitutes a “display” within the meaning of the claims of the '487 Patent. The projection screen serves as the visual output device upon which all graphical content is rendered for viewing by the user, including GUI elements, video streams, whiteboard content, and shared presentations. This element of Saleh-502 satisfies the “display” limitation of claim 1 because the projection screen 202 is expressly disclosed as a display device that renders visual content for user viewing.

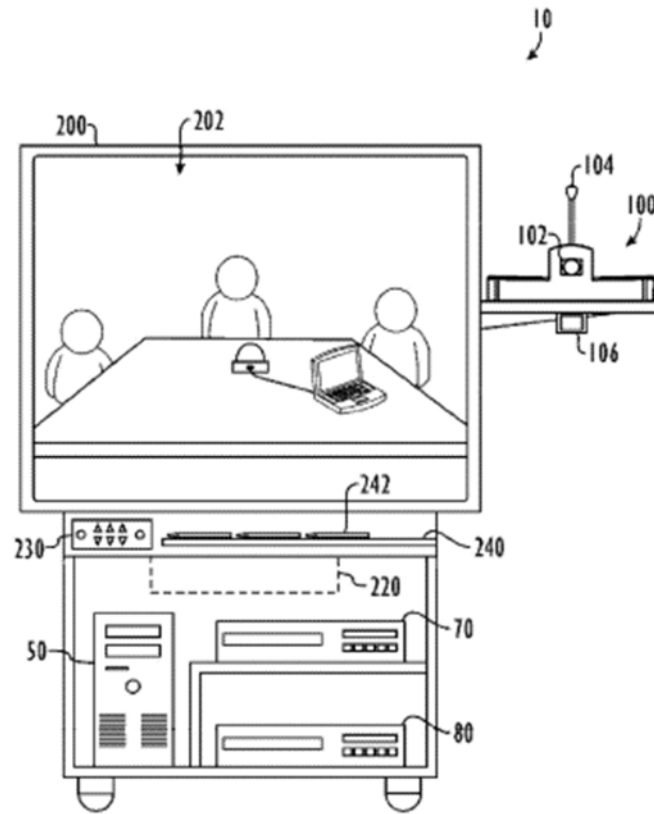


FIG. 2

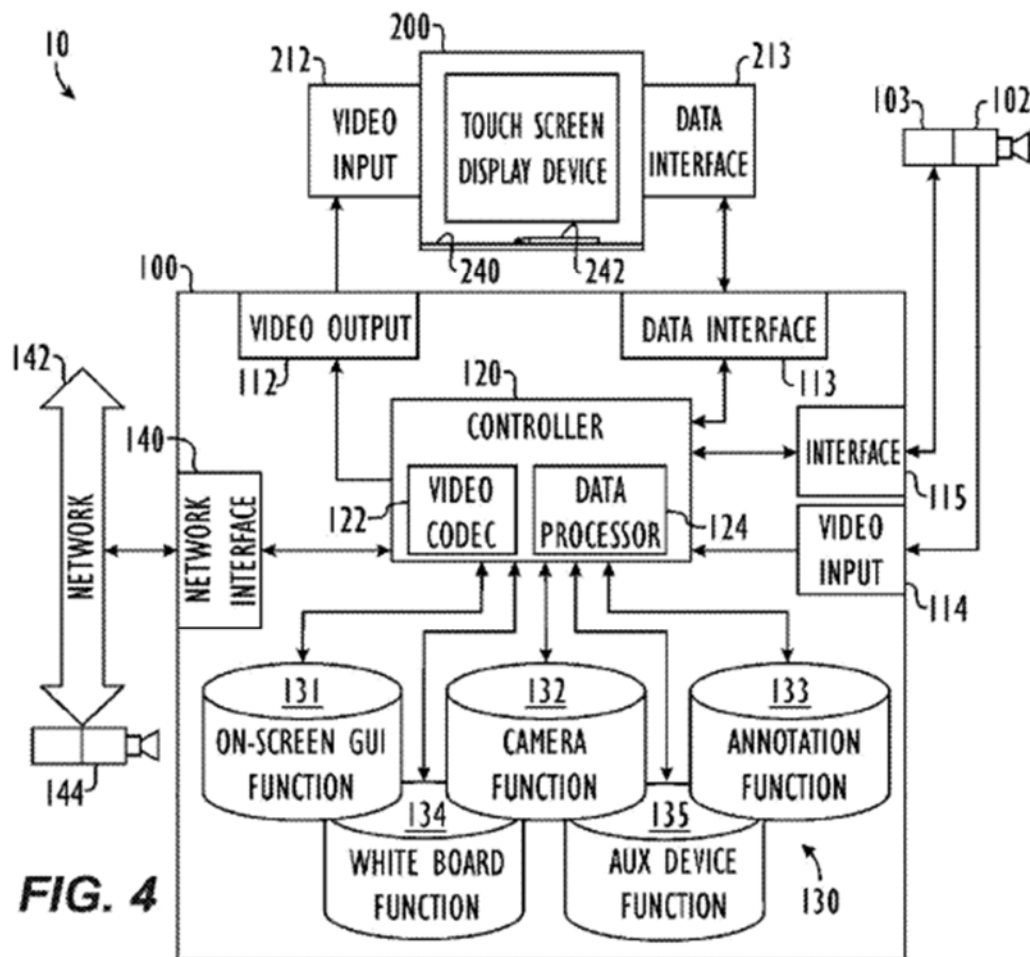


FIG. 4

EX1004, FIGS. 2, 4

4. [Claims 1.b] “a network interface”

97. It is my opinion that Saleh-502 discloses a “network interface” as recited in claim element 1[b] of the ’487 Patent. Saleh-502 expressly describes a network interface 140 that enables the videoconferencing system to communicate via a network with other conferencing devices for the purpose of establishing and maintaining videoconference calls. EX1004, 3:60-63. The network interface 140 is

coupled to a videoconference network 142, which represents the communication infrastructure through which video, audio, and data are transmitted between the local system and remote conferencing endpoints. EX1004, 7:41-50. The network interface 140 is an integral component of the controller 120 architecture, providing the physical and logical connection between the videoconferencing unit and the external network that enables all real-time communication functions including video streaming, audio transmission, H.239 content sharing, and call signaling. Without the network interface 140, the system would be unable to establish connections with remote endpoints or transmit any videoconference data, making it the essential communication component that enables the collaborative functionality of the combined system.

98. In my experience researching and evaluating videoconferencing and networked multimedia systems throughout my career, network interfaces were known components of videoconferencing systems. A network interface in the context of videoconferencing typically implements one or more network communication protocols—such as Ethernet (IEEE 802.3) for local area network connectivity, or ISDN for circuit-switched connections—and provides the physical connector and protocol stack necessary to transmit and receive packetized data over the network. By 2011, commercial videoconferencing systems often included Ethernet network interfaces supporting IP-based communication protocols such as

H.323 or SIP for call signaling and RTP for media transport. The inclusion of a network interface in a videoconferencing system enables the system to perform its purpose of remote communication between geographically separated participants. There is nothing inventive or unexpected about including a network interface in an interactive whiteboard device that has videoconferencing capabilities.

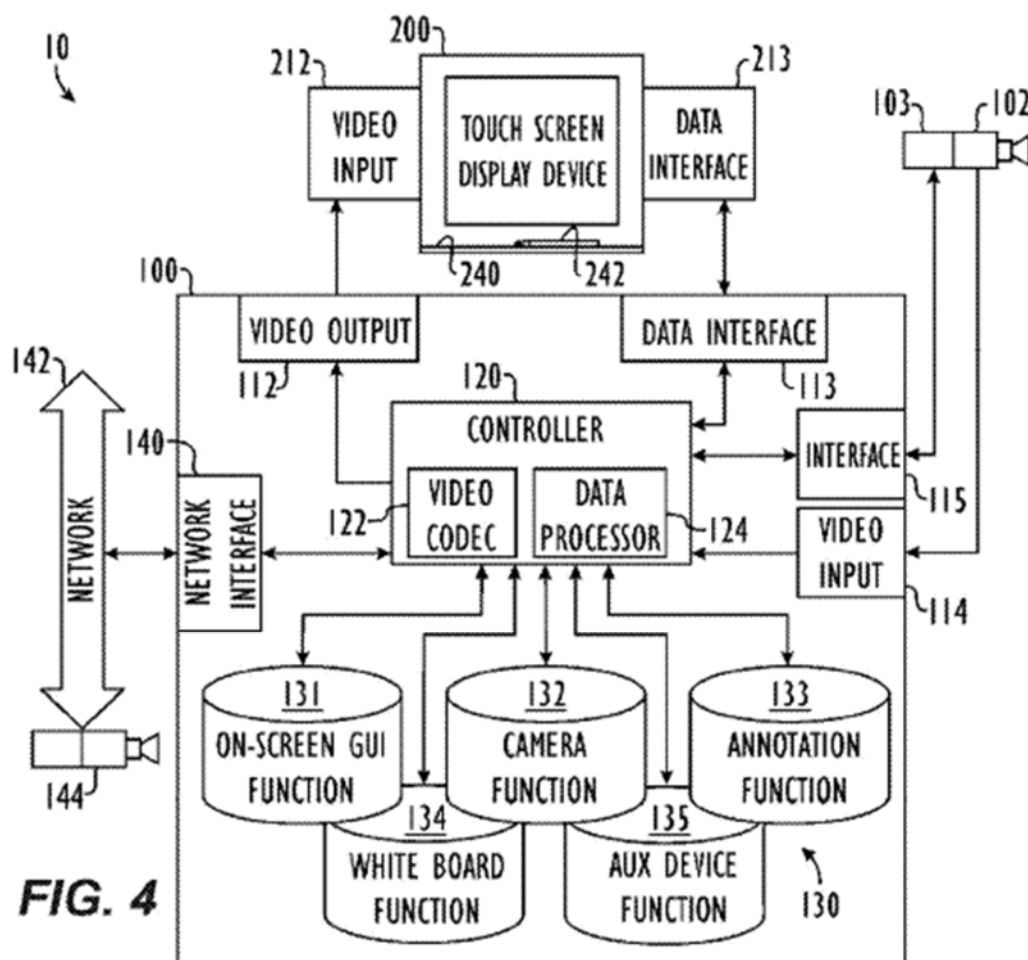


FIG. 4

EX1004, FIGS. 4

99. Thus, a POSITA would have understood that network interface 140 as disclosed in Saleh-502 expressly satisfies the “network interface” limitation of claim element 1[b] of the ’487 Patent. The network interface 140 provides the communication pathway between the whiteboard device and external conferencing networks, enabling the system to establish videoconference calls, transmit video and audio streams, and share content with remote endpoints. The disclosure of network interface 140 is express, requiring no inference or interpretation to map to the claimed limitation, and a POSITA would have immediately recognized this component as the network interface recited in the claims.

5. [Claims 1.c] “one or more processors; and”

100. It is my opinion that Saleh-502 discloses “one or more processors” as recited in claim element 1[c] of the ’487 Patent. Saleh-502 expressly discloses that controller 120 may include processors from the Intel Core processor family, the Intel Pentium processor family, the Intel Celeron processor family, or ARM Cortex processors. EX1004, 4:10-15. Each of these identified processor families represents a commercially available, industry-standard microprocessor product line that was widely used in embedded systems, computing devices, and consumer electronics during the relevant time period. The identification of specific processor families—rather than merely reciting a generic “processor”—demonstrates that Saleh-502 contemplates the use of real, commercially available processor hardware that was

readily obtainable by any system designer or manufacturer at the time of filing. The controller 120 containing these processors is the central computing element that executes the stored operational functions 131-135 to control all aspects of the system's operation, including GUI rendering, video codec operations, whiteboard functionality, and camera control.

101. Saleh-502 identifies Intel Core, Pentium, Celeron, and ARM Cortex processor families as examples of processors that may be included in controller 120. A POSITA would have understood those identified components to be commercially available processor families for implementing the controller functions disclosed in Saleh-502. There is nothing inventive or unexpected about using a commercially available processor to implement the functions of an interactive whiteboard device.

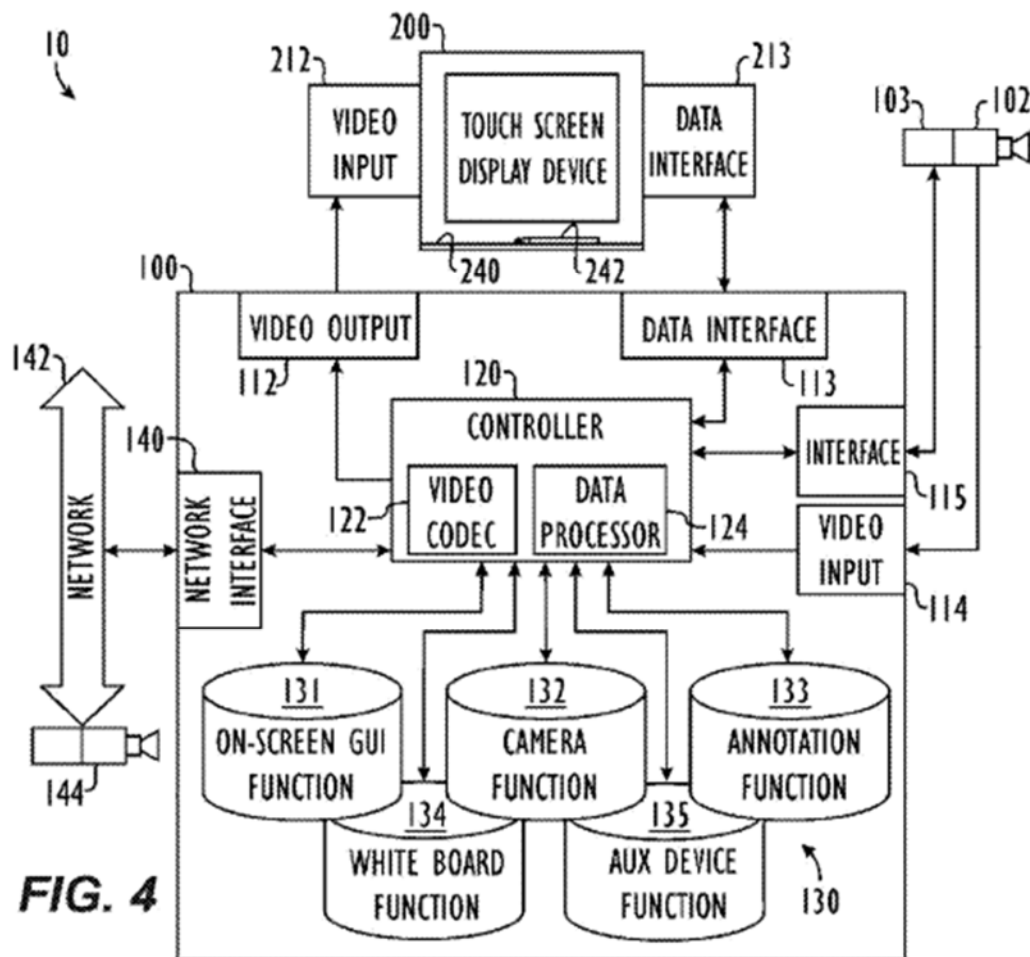


FIG. 4

EX1004, FIG. 4

102. Thus, a POSITA would have understood that when integrated, the whiteboard device disclosed in Saleh-502 includes one or more processors as recited in claim element 1[c] of the '487 Patent. The express disclosure of controller 120 incorporating processors from the Intel Core, Pentium, Celeron, or ARM Cortex families directly satisfies the requirement for “one or more processors” in the combined whiteboard device. The processors within controller 120 are responsible

for executing all of the stored operational functions that enable the system to operate as both an interactive whiteboard and a videoconferencing endpoint, and a POSITA would have immediately recognized these processors as satisfying the claimed limitation.

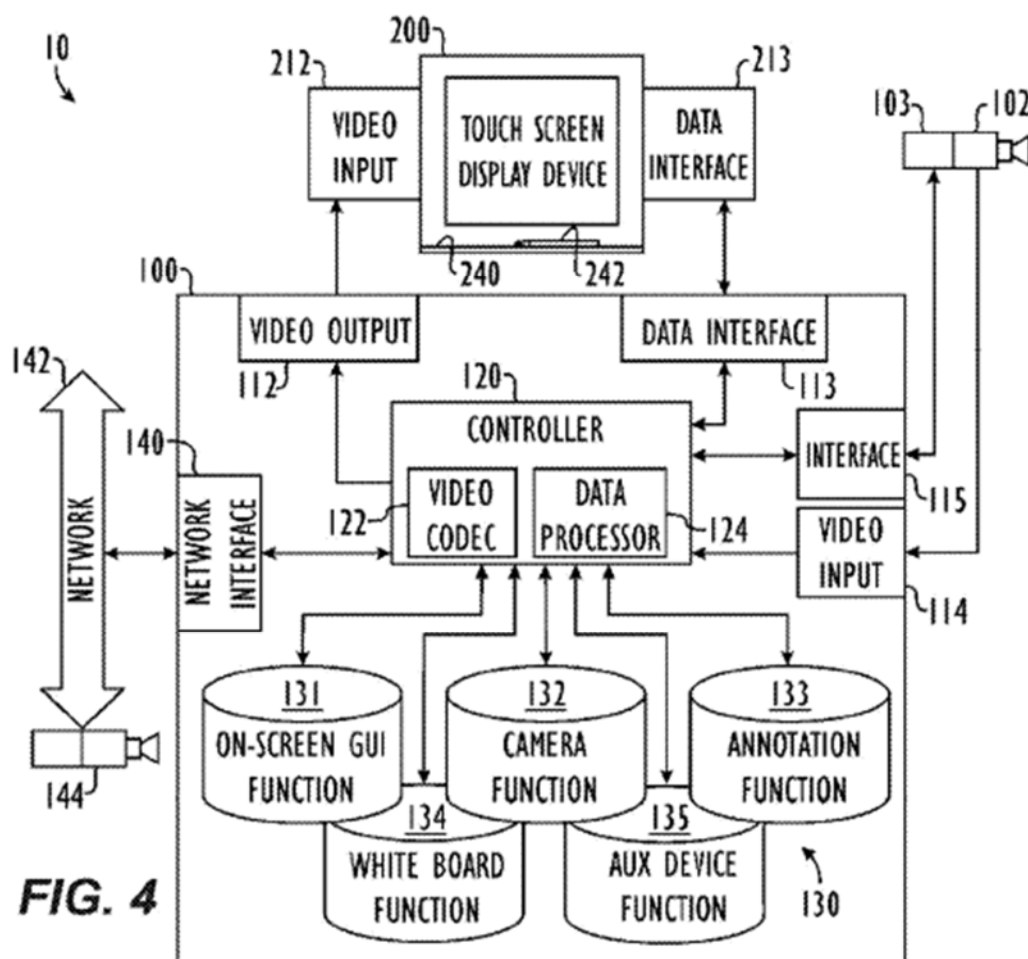
6. [Claims 1.d] “one or more memories communicatively coupled to the one or more processors, the one or more memories storing instructions which, when processed by the one or more processors, cause:”

103. It is my opinion that Saleh-502 discloses this limitation as recited in claim element 1[d] of the '487 Patent. Saleh-502 expressly discloses memory 130 that stores operational functions 131-135, which are executed by controller 120 to perform the various operations of the system including GUI display, camera control, annotation, whiteboard operation, and auxiliary device management. EX1004, 7:42-49. The memory 130 is communicatively coupled to the controller 120 containing the processors, meaning that the processors can read instructions from the memory and execute them to cause the system to perform specified operations. Saleh-502 further specifies that the memory includes “RAM, ROM, PROM, programmable read-write memory, and solid-state memory,” confirming that the system employs standard computer memory technologies for storing executable program instructions and operational data. EX1004, 4:19-23. The coupling between memory 130 and

controller 120 is a standard hardware interface that allows the processor to fetch instructions from memory, decode them, and execute the corresponding operations, which is the fundamental mechanism by which all stored-program computers operate.

104. The operational functions 131-135 stored in memory 130 are instructions that, when processed by the processors in controller 120, cause the system to perform the various operations described throughout Saleh-502. Specifically, when the GUI function 131 is executed by the processor, it causes the system to display touch controls, menus, and dialogs on the screen; when the camera function 132 is executed, it causes the system to control camera operations; when the annotation function 133 is executed, it causes the system to render and manage user annotations; when the whiteboard function 134 is executed, it causes the system to operate in whiteboard mode; and when the auxiliary device function 135 is executed, it causes the system to interface with connected peripheral devices. EX1004, 7:45-54, FIGS. 1, 4. Each of these functions represents a set of programmed instructions stored in memory that, when fetched and executed by the processor, produce specific, deterministic behaviors in the system. The relationship between the stored functions and the resulting system behaviors establishes the causal connection required by the claim language—the instructions stored in memory, when processed by the processors, cause the claimed operations to be

performed. There is nothing novel or inventive about storing operational instructions in memory and having a processor execute those instructions to cause a system to perform specified operations—this has been the standard approach to implementing computer-controlled systems for many years.



EX1004, FIG. 4

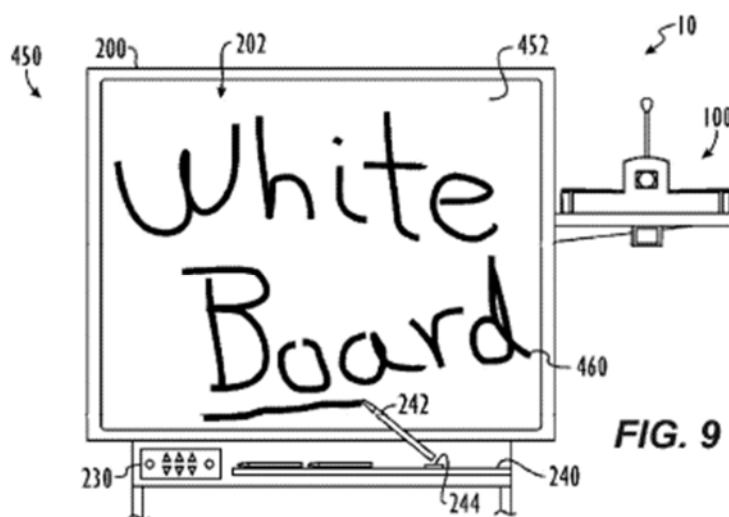
105. Thus, a POSITA would have understood that Saleh-502's disclosure of memory 130 communicatively coupled to controller 120 and storing operational

functions 131-135 that are executed by the controller to cause the system to perform specified operations directly satisfies the “one or more memories communicatively coupled to the one or more processors, the one or more memories storing instructions which, when processed by the one or more processors, cause” limitation of claim element 1[d]. The memory stores the instructions, the instructions are communicated to the processors through the coupling between memory 130 and controller 120, and the processing of those instructions causes the system to perform the operations described in the subsequent claim elements. This disclosure maps directly to the claimed limitation.

7. [Claims 1.e/8.a/15.a] “an interactive whiteboard session window, including at least an interactive whiteboard session content area, to be displayed on the display,”

106. It is my opinion that Saleh-502 discloses this limitation as recited in the claims of the '487 Patent. Saleh-502 discloses a whiteboard mode in which whiteboard content 452 is displayed on the projection screen 202 of the SMART Board, providing the user with a full-screen interactive canvas upon which they can create and view whiteboard content. EX1004, 13:42-53. In this whiteboard mode, the user interacts with the display surface to make annotations 460 using either a pen from the pen tray or touch input, creating user-generated content that is rendered on

the whiteboard display surface in real time as the user draws, writes, or gestures on the screen. EX1004, 13:53-56. The whiteboard content 452 displayed on the screen represents the content area of the interactive whiteboard session—it is the area in which the user’s whiteboard creations are rendered and displayed. This whiteboard mode represents an interactive whiteboard session in which the user actively creates, views, and manipulates whiteboard content on the display surface of the SMART Board.



EX1004, FIG. 9

107. The whiteboard content area disclosed in Saleh-502 occupies the display surface of the SMART Board, providing users with a full-screen interactive canvas for creating whiteboard content. Users draw, annotate, and interact with the whiteboard surface using the pen from the pen tray or through direct touch input on the display surface. The whiteboard session is an interactive session because the

user's inputs—pen strokes, touch gestures, and other interactions—are immediately captured by the touch-sensitive surface and rendered on the display in real time, creating a responsive and interactive drawing experience that mimics the behavior of a physical whiteboard with a dry-erase marker. The whiteboard content 452 shown in FIG. 9 represents the accumulated content created by the user during the whiteboard session, while the annotations 460 represent specific annotation marks made by the user on top of or alongside the whiteboard content. Together, the whiteboard content 452 and annotations 460 constitute the “interactive whiteboard session content area” because they represent the visual content that is created, displayed, and manipulated during the interactive whiteboard session on the SMART Board display.

108. In my experience with networked multimedia and collaborative display systems, the concept of a “whiteboard session window” would include, at least a display area on the screen dedicated to rendering whiteboard content—that is, a region of the display that shows user-created drawings, annotations, text, and other marks made during an interactive whiteboard session. The SMART Board's whiteboard mode provides this functionality: a full-screen interactive canvas on which users can freely draw, write, and annotate, with all user input being captured and rendered in real time on the display surface. In the context of the '487 Patent claims, the “interactive whiteboard session window” is simply the display area that

shows the whiteboard session content—and Saleh-502’s full-screen whiteboard mode, which displays whiteboard content 452 and annotations 460, is precisely such a window.

109. The disclosure of FIG. 9 in Saleh-502, which shows whiteboard content 452 with annotations 460 displayed on the SMART Board screen, corresponds directly to what the ’487 Patent describes as an “interactive whiteboard session window” with an “interactive whiteboard session content area.” FIG. 9 visually depicts the whiteboard mode of operation in which the display surface is dedicated to showing whiteboard content that has been created by the user, with annotations overlaid on or adjacent to that content. The content area shown in FIG. 9 is interactive because users can continue to add new content, modify existing content, erase content, and otherwise manipulate the whiteboard display through touch and pen input on the SMART Board surface. The whiteboard session depicted in FIG. 9 represents a defined period of whiteboard activity during which content is created, displayed, and potentially shared with remote participants via the H.239 protocol. There is a clear correspondence between Saleh-502’s FIG. 9 and the claimed “interactive whiteboard session window.”

110. Thus, a POSITA would have understood that Saleh-502’s whiteboard mode—in which whiteboard content 452 with annotations 460 is displayed on the SMART Board projection screen 202—constitutes an “interactive whiteboard

session window, including at least an interactive whiteboard session content area” that is “displayed on the display” as recited in claim elements 1[e], 8[a], and 15[a] of the ’487 Patent. The whiteboard mode provides an interactive session in which the user creates and views whiteboard content on the display, the content area displays the user’s whiteboard creations, and the entire whiteboard display constitutes the “window” in which the whiteboard session is presented to the user. This disclosure expressly satisfies every aspect of the claimed limitation without requiring any modification, inference, or departure from the express teachings of Saleh-502.

8. [Claims 1.f/8.b/15.b] “wherein a selection menu to receive an instruction for starting a video conference session is overlaid on the interactive whiteboard session window; and”

111. It is my opinion that Saleh-502 discloses this limitation as recited in the claims of the ’487 Patent. Saleh-502 expressly discloses that the on-screen GUI function 131 displays menus and touch controls on the SMART Board display, providing users with graphical interface elements for controlling all aspects of the videoconferencing system. EX1004, 7:52-54, 11:1-5. Specifically, Saleh-502 discloses that pressing button 302 causes a transparent menu 310 to be overlaid on the current screen content, and this transparent menu includes a call button that

allows the user to initiate a videoconference call. EX1004, 10:61-11:13. The transparent menu 310 is overlaid on top of whatever content is currently being displayed on the screen, meaning it appears as a layer on top of the existing display content rather than replacing that content entirely. This overlay behavior is precisely what is recited in the claims of the '487 Patent—a selection menu that is overlaid on the whiteboard session window, meaning it appears on top of the whiteboard content without replacing or dismissing the whiteboard session.

112. Critically, Saleh-502 states that transparent menu 310 is “available from all screens” including “those containing video of participants and content.” EX1004, 10:66-11:5. Because the transparent menu is available from all screens, this includes the whiteboard mode screen in which whiteboard content 452 and annotations 460 are displayed. If the menu is available from all screens, then it is available from the whiteboard screen, the videoconference screen, the PC mode screen, and any other screen that the system may display. This means that when the system is operating in whiteboard mode and displaying whiteboard content 452 with annotations 460, the user can invoke the transparent menu 310 by pressing button 302, and the menu will be overlaid on top of the whiteboard content. The language of Saleh-502’s disclosure—“available from all screens”—teaches that the menu can be invoked and overlaid on the whiteboard session window.

113. The transparent menu 310 disclosed in Saleh-502 includes a “Call button” which directly allows a user to place a videoconference call, thereby initiating a videoconference session with a remote participant or group of participants. EX1004, 11:5-14. Selecting this Call button from within the transparent menu 310 initiates the process of establishing a videoconference connection, which constitutes receiving an “instruction for starting a video conference session” as recited in the claims. The Call button is a user-selectable element within the menu that, when activated by the user through touch input on the SMART Board display, causes the system to begin the process of placing a videoconference call to a remote endpoint. This is precisely the “selection menu to receive an instruction for starting a video conference session” recited in the claims—a menu containing a user-selectable option that, when selected, initiates a videoconference. The Call button within menu 310 serves no other purpose than to enable the user to start a videoconference session, making it a direct and express disclosure of the claimed functionality.

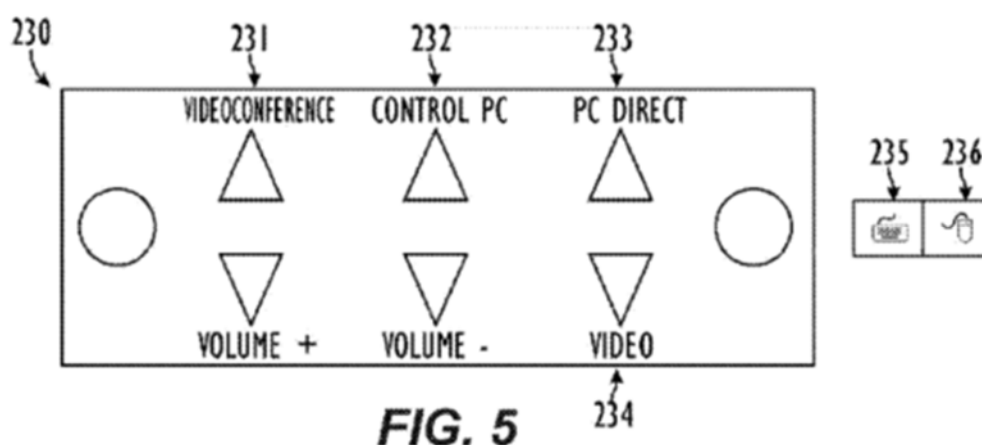
114. In my experience the concept of a persistent overlay menu accessible from all application states—including a whiteboard state—was a fundamental UI design pattern that was widely used before the filing date of the ’487 Patent. When Saleh-502 states that the transparent menu is “available from all screens,” a POSITA would have understood this to mean precisely that: the menu can be invoked

regardless of which mode the system is currently operating in, including the whiteboard mode. This type of global overlay menu—sometimes called a “system menu,” “floating toolbar,” or “always-available menu”—was a standard interface design pattern used in numerous commercial videoconferencing and interactive display products to ensure that users could always access critical system functions such as making calls, adjusting volume, or ending sessions without having to first navigate away from their current activity.

115. The rationale for making such a menu available from all screens is apparent to a user interface designer: users should not have to abandon their current work (such as a whiteboard session) merely to access system-level controls for initiating or managing a videoconference call. Based on my research in interactive multimedia systems, I can confirm that global overlay menus in interactive display systems were known UI design practice before the '487 Patent's priority date. The combination of an overlay menu with a call-initiation button accessible during a whiteboard session was a predictable approach to enabling users to start a videoconference while working on a whiteboard.

116. It is my opinion that because Saleh-502 shows the same device handling both whiteboard and videoconferencing functions through on-screen controls, a POSITA would understand that Saleh-502's GUI menus for initiating a videoconference are displayed on-screen while a whiteboard session is active,

constituting a selection menu overlaid on the whiteboard session window. The fact that Saleh-502 discloses a single integrated device that handles both whiteboard and videoconferencing functions through on-screen touch controls, combined with the express disclosure that the transparent menu is “available from all screens,” supports the conclusion that the menu can be overlaid on the whiteboard session window when the system is operating in whiteboard mode. A POSITA reading Saleh-502 would have understood that the integrated nature of the system—with both whiteboard and videoconferencing functions accessible through the same on-screen interface—means that the videoconference call-initiation menu is available while the whiteboard session is active and displayed on the screen. Saleh-502’s disclosure does not exclude the whiteboard screen from the set of “all screens” on which the transparent menu is available.



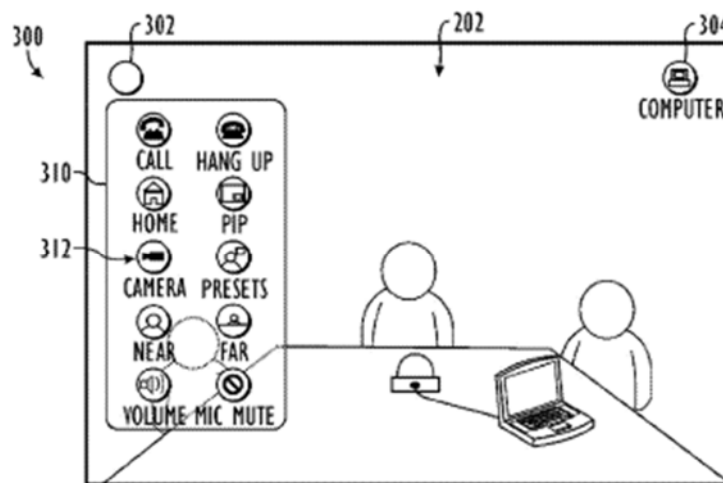


FIG. 6

EX1004, FIGs. 5, 6

117. Thus, a POSITA would have understood that Saleh-502's transparent menu 310, which is expressly disclosed as being available from all screens and which includes a Call button for initiating a videoconference call, constitutes a "selection menu to receive an instruction for starting a video conference session" that is "overlaid on the interactive whiteboard session window" as recited in claim elements 1[f], 8[b], and 15[b] of the '487 Patent. The transparent menu 310 is a selection menu because it contains user-selectable options; it receives an instruction for starting a video conference session because it includes a Call button that initiates a videoconference when selected; and it is overlaid on the interactive whiteboard session window because it is expressly described as available from all screens, which necessarily includes the whiteboard mode screen displaying whiteboard content 452

and annotations 460. Every element of this limitation is expressly disclosed in Saleh-502.

9. **[Claims 1.g/8.c/15.c] “after receiving the instruction for starting the video conference session via the selection menu overlaid on the interactive whiteboard session window, a videoconference window to be overlaid on the interactive whiteboard session window.”**

118. It is my opinion that Saleh-502 discloses or renders obvious this limitation. Saleh-502 teaches that when the system enters videoconference mode, videoconferencing unit 100 establishes a connection with remote endpoints and sends video data to display device 200 for presentation to the user. EX1004, 9:35-40. Specifically, the video content received from remote participants is displayed on screen 202, which is the same screen used for all visual output including whiteboard content, videoconference video, and overlay menus. The menu 310 displayed during videoconference operation includes a PIP (picture-in-picture) button, and the system expressly supports “toggling buttons for muting the audio and producing picture-in-picture on the screen 202.” EX1004, 11:10-20. This PIP functionality is significant because it demonstrates that Saleh-502 explicitly contemplates overlaying one video content stream on top of another on the same physical display screen 202. The PIP

button on menu 310 enables a user to invoke this overlay functionality at any time during a videoconference session, thereby causing a smaller window to be displayed on top of the primary content currently occupying the screen.

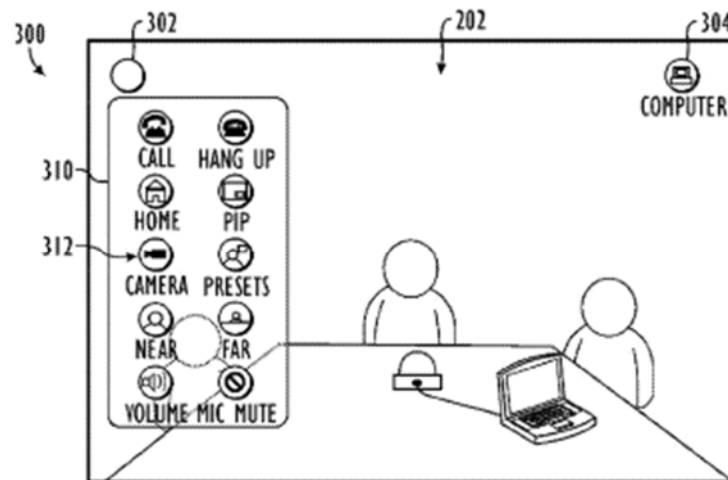


FIG. 6

EX1004, FIG. 6

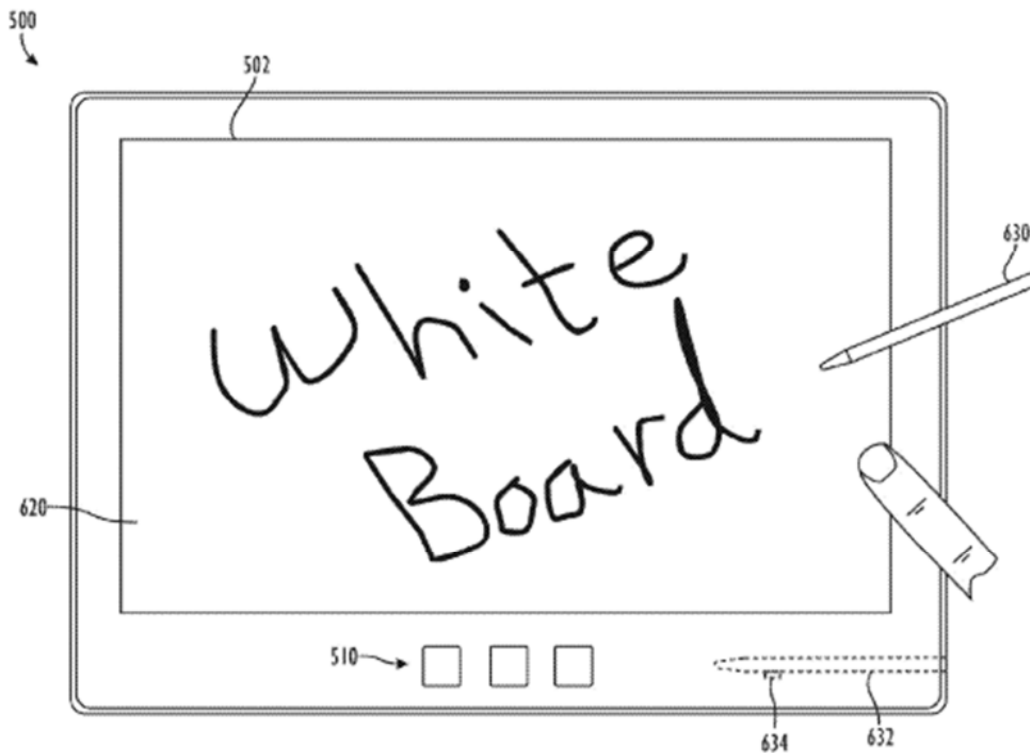


FIG. 22

EX1004, FIG. 22

119. Saleh-502 further discloses that layout control screen 580 allows “adjustment of video size, picture-in-picture properties, including presence and removal” and “dual monitor emulation mode, which allows for two image streams to be displayed side-by-side on a single monitor.” EX1004, 20:21-37. This disclosure is particularly relevant because it demonstrates that the system provides granular user control over how video content is overlaid and arranged on the display, including the ability to adjust the size of overlaid windows, control whether PIP is active or inactive, and even emulate a dual-monitor configuration on a single

physical screen. The layout control screen 580 thus provides compelling evidence that Saleh-502's designers contemplated and implemented sophisticated window overlay and arrangement functionality that goes well beyond a simple static display. The ability to adjust PIP properties, including "presence and removal," indicates that the system dynamically manages overlaid windows and allows users to control which content appears on top of other content at any given time. Furthermore, the dual monitor emulation mode demonstrates that the system is capable of managing multiple simultaneous content streams on the same physical display, arranging them according to user preferences.

120. In my opinion, Saleh-502 anticipates this limitation because the reference satisfies each aspect of the claim language through three independent disclosures that converge on the same conclusion. First, Saleh-502 displays whiteboard content on the same screen 202 that displays videoconference video, establishing that both content streams share the same physical display surface and are therefore capable of being overlaid. Second, Saleh-502 provides overlaid menu controls including a call button to initiate a videoconference session, meaning the system already supports the concept of overlaying interactive elements on top of displayed content. Third, Saleh-502 provides PIP functionality that overlays a smaller video window on top of whatever primary content is currently displayed on screen 202. These three disclosures together establish that the system has the

components and functionality to overlay a videoconference window on top of a whiteboard session window: the shared display, the overlay mechanism, and the PIP implementation that performs this type of overlay operation. A POSITA reading these disclosures together would have understood that the system is capable of overlaying a videoconference window on a whiteboard session.

121. In my experience with multimedia delivery systems and display technology, picture-in-picture is the overlaying of one visual content stream on top of another on the same physical display. The PIP paradigm was used in television and videoconferencing systems before 2015, including consumer televisions that allowed viewers to watch one channel while monitoring another in a smaller overlaid window. A POSITA would have recognized that invoking PIP during whiteboard mode—a mode where the whiteboard content occupies the display—would result in a videoconference window overlaid on the whiteboard session window. In this context, PIP indicates layered display of whiteboard content and videoconference video on the same screen. The technical implementation of PIP involves compositing two image layers, with the smaller PIP window rendered at a higher Z-order than the underlying primary content. This compositing operation is similar regardless of whether the underlying content is a television broadcast, a videoconference feed, or whiteboard annotations—the display hardware and software render one layer on top of another. In my professional experience, PIP implementations generally work on

this principle of layered compositing, and Saleh-502's implementation would be understood in that manner.

122. In addition, considering Saleh-502's exemplary disclosures from the knowledge and perspective of a POSITA, a POSITA would have understood that Saleh-502's system could overlay a videoconference window on a whiteboard session window. PIP is the overlaying of one video window on top of another displayed content, and Saleh-502 already implements this functionality for overlaying video content on screen 202. EX1004, 7:58-64. The system's existing PIP capability means that the technical infrastructure for performing the overlay operation is already present: the compositing logic, the window sizing and positioning algorithms, the Z-order management, and the user interface controls for invoking and dismissing the overlay. Applying this existing PIP functionality to overlay a videoconference window on whiteboard content would involve invoking the same PIP operation that the system already performs, with the only difference being the identity of the content in the background layer. A POSITA would have recognized this as a straightforward application of existing functionality to a different content combination, requiring no inventive effort or unpredictable results.

123. A POSITA would have recognized that the same windowing technique used for PIP in videoconference mode could overlay a videoconference window on whiteboard content with equal ease. The only difference between the existing PIP

functionality and the claimed overlay is the content of the underlying layer—in one case it is a full-screen videoconference feed, and in the other case it is whiteboard content. Because display device 200 already displays both videoconference video and whiteboard content at various times during system operation, and because the system already implements PIP overlay functionality, combining these two existing capabilities represents a straightforward and predictable extension of the system's functionality. EX1004, 11:5-14, 20:21-37. No new hardware, no new software algorithms, and no new user interface paradigms would be required to achieve this combination. The display hardware already renders both types of content; the PIP logic already performs overlay compositing; and the menu system already provides user controls for invoking PIP. A POSITA would have viewed this as using the system's existing tools in a straightforward and expected manner.

124. Moreover, in my professional opinion based on my experience with networked multimedia systems and graphical user interfaces, the concept of displaying one window on top of another was a basic operation supported by the Windows operating system. An application running on Windows could be placed on top of another application by setting its Z-order appropriately, using well-documented APIs such as `SetWindowPos()` with the `HWND_TOP` or `HWND_TOPMOST` flags. A POSITA working with a SMART Board running Windows would have understood that placing a videoconference window on top of

a whiteboard window required standard window management that the operating system provided natively. This was not a complex engineering challenge; it was behavior supported by the windowing system. Windows are positioned in a Z-order stack, and bringing a window to the foreground causes it to overlay windows behind it. The Windows operating system had provided this capability since at least Windows 3.1 in 1992, and a POSITA would have understood window Z-order management as a basic concept of graphical user interfaces.

125. A POSITA would have been motivated to apply PIP overlay functionality to the whiteboard-videoconference context for practical reasons. The primary motivation would have been to allow users to simultaneously monitor the videoconference participants' faces and reactions while continuing to view and interact with whiteboard content, thereby enhancing the collaborative experience. EX1004, 2:8-12, 13:55-60. In a collaborative meeting environment, participants may benefit from maintaining visual awareness of their remote collaborators' expressions and gestures while working on shared content such as whiteboard drawings and annotations. Without PIP overlay, a user would be forced to choose between viewing the videoconference or viewing the whiteboard, losing the benefit of simultaneous visual awareness. This limitation would degrade the collaborative experience that Saleh-502 is designed to facilitate. A POSITA would have recognized that overlaying the videoconference window on the whiteboard provides a useful user

experience for collaborative work, and would have been motivated to implement this straightforward combination of existing system capabilities.

126. Claims 1, 8, and 15 of the '487 Patent share identical functional limitations with respect to this element, differing only in their statutory category—claim 1 is directed to a device, claim 8 is directed to a computer-readable medium, and claim 15 is directed to a method. Because the substantive technical requirements are the same across all three claims, Saleh-502 anticipates and/or renders obvious this limitation for all three claims for the same reasons articulated above. EX1004, 11:5-14, 20:21-37, 22:6-21. Saleh-502's controller/processor satisfies the structural elements of claim 1, its non-transitory memory storing executable functions satisfies the computer-readable medium of claim 8, and its computer-implemented operations satisfy the method steps of claim 15. The functional disclosure of overlaying a videoconference window on a whiteboard session window applies with equal force to each statutory category because the underlying technical operation is identical regardless of whether it is claimed as performed by a device, stored on a medium, or executed as a method.

127. Thus, a POSITA would have understood that Saleh-502 anticipates and/or renders obvious this limitation for claims 1, 8, and 15. The combination of Saleh-502's express PIP disclosure, its shared display architecture showing both whiteboard and videoconference content on screen 202, and the fundamental nature

of window overlay operations in computing systems of the relevant era all support this conclusion. Whether analyzed as anticipation based on the express PIP disclosure or as obviousness based on the straightforward combination of existing system capabilities, the result is the same: this limitation is met by Saleh-502.

10. [Claims 2/9/16] “wherein the videoconference window displays at least content from a device of a participant of the video conference session”

128. It is my opinion that Saleh-502 discloses this limitation. Saleh-502 teaches that video codec 122 processes video data including “video from remote end points of the videoconference” as well as “content from a peripheral device (e.g., VCR, DVD player, computer, document camera, etc.).” EX1004, 7:23-34. When the system is operating in videoconference mode, it establishes a connection with remote endpoints and sends video received from those endpoints to display device 200 for presentation on screen 202. EX1004, 9:35-44. This disclosure expressly establishes that the videoconference window displays content that originates from a remote participant’s device—whether that content is a live camera feed of the participant or content from a peripheral device connected to the participant’s equipment. The video codec 122 is specifically designed to handle multiple types of incoming video streams, all of which represent content generated at and transmitted from a remote participant’s equipment through the videoconference connection. A POSITA would

have understood that displaying video from remote endpoints inherently means displaying content from a participant's device, because the remote endpoint is by definition the device through which a participant contributes video content to the conference.

129. In my opinion, Saleh-502 displays video or data content generated at and transmitted from a remote participant's equipment during a videoconference session. Videoconference systems operate by receiving content from participant devices—typically cameras, but also document cameras, computers sharing presentations, and other peripheral equipment—and displaying that content to local viewers. Saleh-502's express disclosure of receiving and displaying video from remote endpoints is an example of displaying content from a participant's device.

130. Thus, a POSITA would have understood that display of video from remote endpoints expressly satisfies this limitation. Saleh-502's video codec 122 receives video data from remote endpoints through network interface 140, processes that video data, and sends it to display device 200 for presentation on screen 202. This is precisely what the dependent claims require: a videoconference window that displays content from a device of a participant in the videoconference. The remote endpoint is the participant's device, and the video it transmits is the content from that device. Claims 2, 9, and 16 are therefore anticipated by Saleh-502 for the same reasons and through the same disclosures.

11. [Claims 3/10/17] “after the videoconference window being overlaid on the interactive whiteboard session window, display a second selection menu to receive an instruction for stopping the video conference session overlaid on the interactive whiteboard session window”

131. It is my opinion that Saleh-502 discloses this limitation. Saleh-502 teaches that menu 310 includes a “Hang-Up button” that provides the user with the ability to terminate an active videoconference call. EX1004, 11:5-16. The menu 310 is transparent and displayed over video currently shown on screen 202, meaning it constitutes an overlaid selection menu that appears on top of whatever content is being displayed. EX1004, 11:5-8. When a user selects the Hang-Up button, the system “can end a videoconference call or can bring up a hang-up dialog on screen 202 if there is more than one call currently active.” EX1004, 11:20-27. This disclosure establishes that menu 310 provides a user-selectable option for stopping an active videoconference session, and that this menu is overlaid on the current display content. The Hang-Up button is specifically designed for the purpose of terminating videoconference calls, making it a direct disclosure of a selection menu option for stopping the videoconference.

132. Saleh-502 provides additional disclosure of this limitation in the touch panel embodiment. The call control screen 538 in the touch panel interface includes a “hang up icon for terminating the call.” EX1004, 18:65-19:1. This touch panel embodiment provides an alternative user interface for the same call termination functionality, demonstrating that Saleh-502 contemplates multiple ways for users to stop a videoconference session. Whether through the transparent menu 310 overlaid on screen 202 or through the dedicated call control screen 538 on the touch panel, the user has access to controls for stopping the videoconference. Both embodiments satisfy the claim requirement of a selection menu for stopping the videoconference, and a POSITA would have recognized either as meeting this limitation.

133. Because menu 310 is expressly described as “available from all screens,” it constitutes a second selection menu for stopping the videoconference that is accessible while the whiteboard session is active. The phrase “available from all screens” means that regardless of what content is currently displayed—whether whiteboard content, videoconference video, or any other application—the user can invoke menu 310 and access its controls, including the Hang-Up button. This is what the dependent claims require: a selection menu for stopping the videoconference that is available during the whiteboard session. In addition, considering Saleh-502’s disclosure from the knowledge and perspective of a POSITA, a POSITA would have understood that menu 310’s availability from all screens includes screens displaying

whiteboard content. EX1004, 10:61-11:5. The design choice to make menu 310 available from all screens reflects a user-interface principle: critical system controls like call termination should be accessible regardless of the current application context. A POSITA would have understood that restricting access to the Hang-Up button based on which content mode is active could prevent users from ending calls when needed.

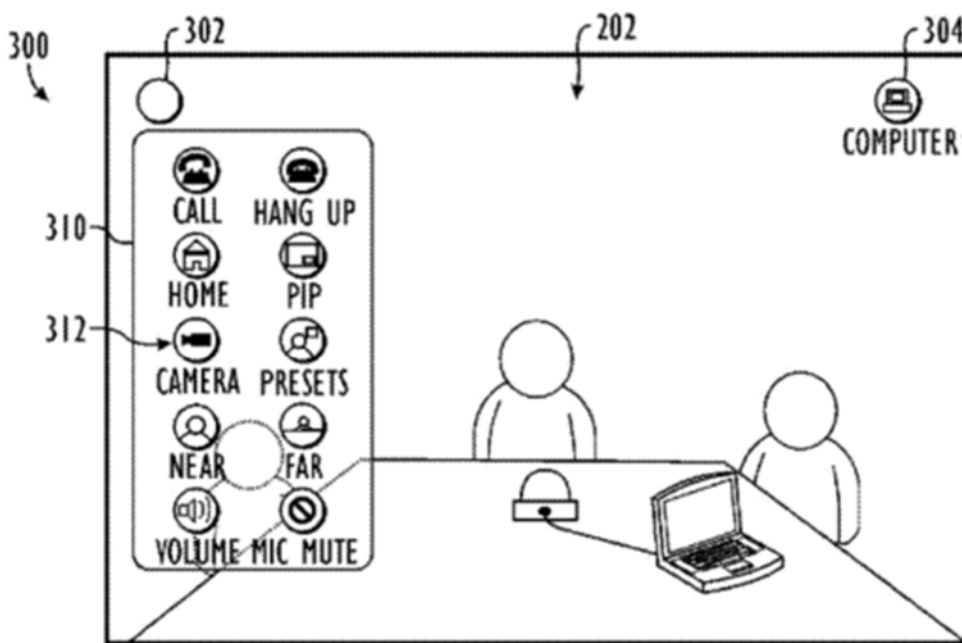


FIG. 6

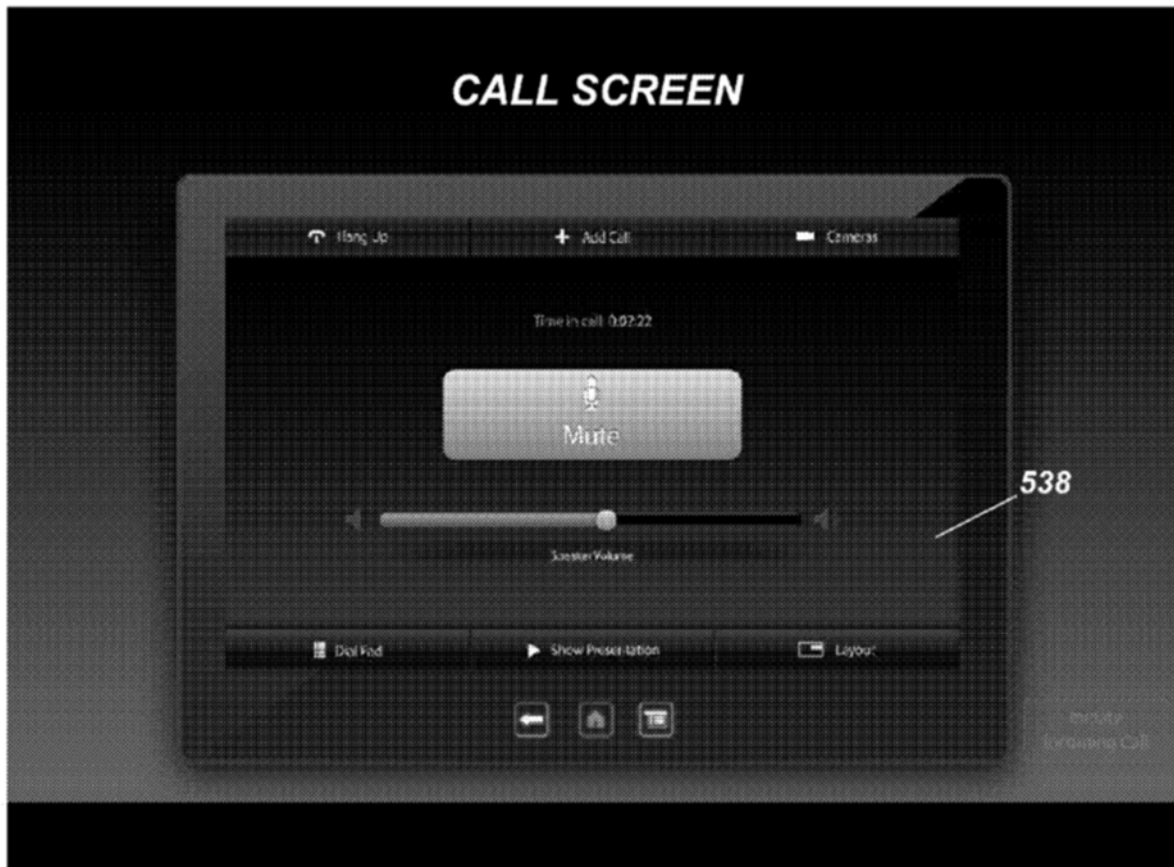


FIG. 12J

EX1004, FIGs. 6, 12J

134. Thus, a POSITA would have understood that Saleh-502's Hang-Up button on menu 310, available from all screens including whiteboard mode, satisfies this limitation. The claim requires a second selection menu for stopping the videoconference session, and Saleh-502 provides that through menu 310's Hang-Up button, which is overlaid on the current display content and accessible regardless of which mode the system is operating in. The transparency of menu 310 and its availability from all screens provide access to call termination controls, satisfying

the claim requirement for both an overlaid menu and the specific functionality of stopping the videoconference. Claims 3, 10, and 17 are therefore anticipated by Saleh-502.

12. [Claims 4/11/18] “after the videoconference window being overlaid on the interactive whiteboard session window, maintain the videoconference window on top of the interactive whiteboard session window during the video conference session”

135. It is my opinion that Saleh-502 discloses or renders obvious this limitation. Saleh-502 teaches that when videoconference mode is active, video is continuously sent to and displayed on display device 200, providing an uninterrupted visual stream of the remote participants to the local user. EX1004, 9:33-40. Furthermore, menu 310 is displayed over “video currently displayed on the screen 202,” confirming that video content occupies the screen and that other elements such as menus are overlaid on top of it. EX1004, 11:5-8. This disclosure establishes that during an active videoconference, the video content remains continuously displayed on screen 202 for the duration of the session, ensuring that participants maintain visual contact throughout the call. The continuous nature of video display during an active session is inherent to the purpose of videoconferencing—a system that

intermittently hid or removed the video window would defeat the entire purpose of conducting a videoconference.

136. Because videoconference video is continuously displayed on screen 202 throughout the duration of the session, it follows that the videoconference window is maintained on top of underlying content such as the whiteboard. This is the natural and predictable system behavior—when a user starts a videoconference, the video remains visible for the duration of the call so that participants can see each other and communicate through visual cues. Removing the videoconference window from the top of the display stack while the call is still active would be counterintuitive, as it would eliminate the user’s ability to see their remote collaborators. In my experience with videoconferencing systems, the video remains visible during an active call unless the user changes the display state. The claim limitation of maintaining the videoconference window on top describes expected behavior of a videoconference window during an active session. A POSITA would have understood that Saleh-502’s continuous video display implies maintaining the videoconference window in a visible position on top of other content, because that is what users would expect during a videoconference.

137. Thus, a POSITA would have understood that maintaining the videoconference window on top during the session is the natural behavior of Saleh-502’s system. The continuous display of videoconference video throughout an active

session is both expressly disclosed and inherent to the purpose of videoconferencing. A user who initiates a videoconference expects and requires that the video remain visible for the duration of the call, and Saleh-502's system delivers this expected behavior by continuously sending video to display device 200. Claims 4, 11, and 18 are therefore anticipated or rendered obvious by Saleh-502.

13. [Claims 5/12/19] “after the video conference session ends, move the interactive whiteboard session window on top of the videoconference window”

138. It is my opinion that Saleh-502 discloses or renders obvious this limitation. Saleh-502 teaches that “[t]ouching the hang up icon will terminate the call and can return the user to the home screen or the screen displayed prior to the call.” EX1004, 18:65-19:1. Where the user was in whiteboard mode prior to starting the videoconference, the system returns to displaying whiteboard content after the call is terminated, because the whiteboard was the “screen displayed prior to the call.” This disclosure directly satisfies the claim requirement that the whiteboard moves on top after termination of the videoconference, because the system restores the pre-call display state when the call ends. A POSITA would have understood that returning to the screen displayed prior to the call necessarily means that whatever content was displayed before the videoconference—in this case, whiteboard content—returns to the foreground of the display.

139. This behavior reflects standard window management in graphical operating systems: when a foreground application is closed or terminated, the background application that was previously visible returns to the foreground and becomes the active display content. This windowing behavior has existed since at least Windows 3.1, released in 1992. The Z-order stack maintained by the window manager promotes the next window in the stack to the foreground when the topmost window is closed or destroyed. No special programming or inventive effort is required to achieve this behavior—it is a default behavior of the operating system’s window management subsystem. In the context of Saleh-502, terminating the videoconference call causes the videoconference window to close, which reveals the whiteboard content that was previously displayed underneath it. This follows from standard window management behavior applied to the specific context of ending a videoconference during a whiteboard session.

140. Thus, a POSITA would have understood that returning to the whiteboard display upon call termination is standard and predictable window management. Saleh-502 expressly discloses returning to the screen displayed prior to the call, and where that screen was displaying whiteboard content, the whiteboard necessarily returns to the foreground. This behavior requires no inventive effort, no special implementation, and no deviation from standard operating system

behavior—it is simply what happens when a foreground window is closed. Claims 5, 12, and 19 are therefore anticipated or rendered obvious by Saleh-502.

14. [Claims 6/13/20] “share the interactive whiteboard session window via a collaboration library during the video conference session”

141. It is my opinion that Saleh-502 discloses this limitation. Saleh-502 teaches that whiteboard function 134 allows the system to operate as a whiteboard, and that whiteboard content 452 with annotations 460 “can be sent to remote endpoints by the videoconferencing unit 100” using the H.239 content sharing protocol via network interface 140. EX1004, 13:25-32, 14:5-14. This disclosure establishes that whiteboard content is shared with remote participants during a videoconference session through a standardized protocol, enabling real-time collaboration between geographically separated users. The system captures whiteboard content including user annotations, encodes that content according to the H.239 standard, and transmits it through the network interface to remote endpoints where it can be viewed by other participants. This constitutes sharing whiteboard content via a programmatic function—specifically, whiteboard function 134 working in conjunction with network interface 140 and the H.239 protocol stack.

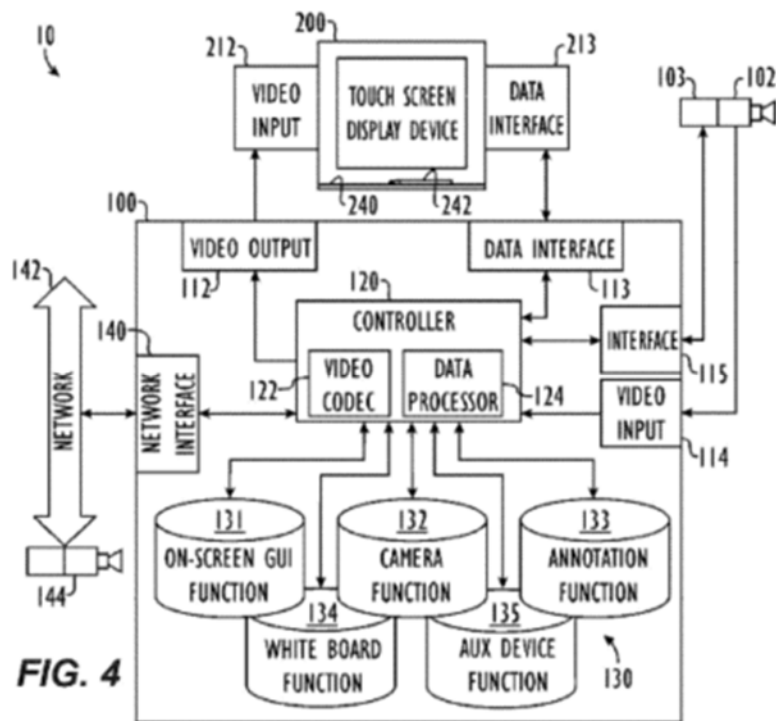


FIG. 4

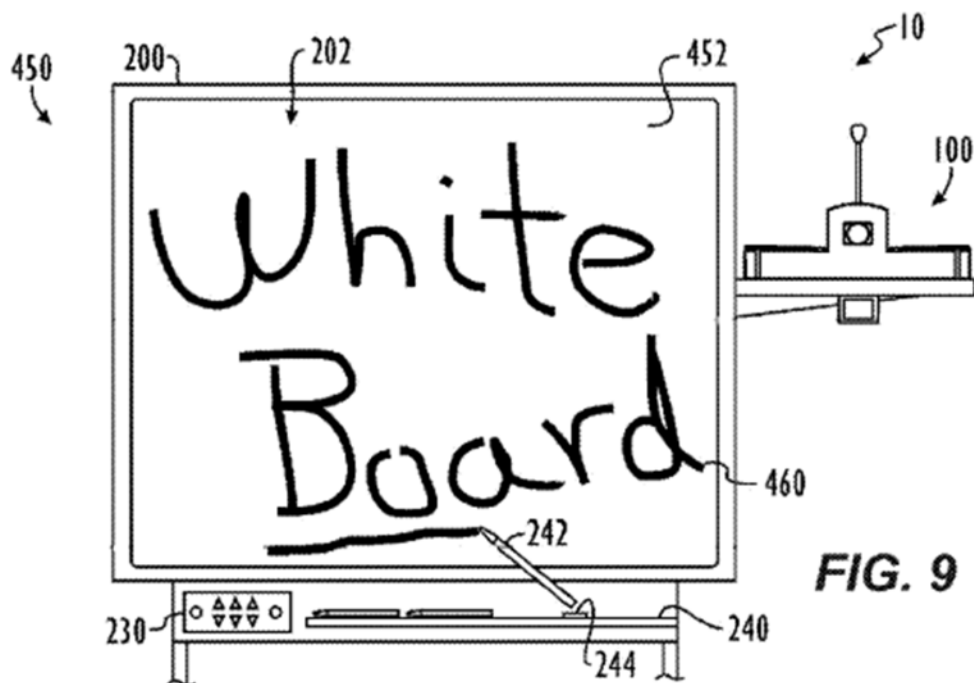


FIG. 9

EX1004, FIGs. 4, 9

142. The operational functions 131-135 stored in memory 130 constitute a “collaboration library” within the meaning of the claims because they represent programmatic functionality that is invoked to share whiteboard content with remote participants during a videoconference session. The H.239 protocol was a known ITU-T standard for content sharing in videoconferencing systems, published in 2003 and adopted for sharing presentation and document content during video calls. Implementing content sharing through stored software functions that can be invoked programmatically is consistent with a “library” in the software engineering sense—a collection of pre-written code that provides specific functionality and can be called upon by other parts of the system when needed. Saleh-502’s operational functions 131-135, stored in non-transitory memory 130 and executed by the controller/processor, are pre-written, stored in memory, provide defined functionality, and are invoked programmatically when the system needs to perform specific operations like whiteboard sharing. A POSITA would have recognized these stored operational functions as constituting a collaboration library because they provide the programmatic interface through which the system’s collaboration features—including whiteboard sharing—are accessed and executed.

143. Thus, a POSITA would have understood that organizing Saleh-502’s whiteboard-sharing functionality into a callable library satisfies this limitation. The operational functions stored in memory 130 provide the programmatic infrastructure

for sharing whiteboard content with remote participants via the H.239 protocol, and these functions constitute a collaboration library as that term would be understood by a POSITA. The combination of stored executable functions, standardized content-sharing protocols, and the ability to transmit whiteboard content to remote endpoints during an active videoconference session satisfies every aspect of the claim requirement. Claims 6, 13, and 20 are therefore anticipated by Saleh-502.

15. [Claims 7/14] “a selection menu change when switching between the interactive whiteboard session window and the videoconference window”

144. It is my opinion that Saleh-502 discloses or renders obvious this limitation. Saleh-502 teaches that call control screen 538 updates dynamically in response to user actions and system state changes: specifically, the “Show Presentation” icon is replaced with a “stop presentation icon” when the user begins sharing a presentation. EX1004, 20:13-20. Additionally, buttons 231-233 are provided for switching between different operating modes of the system, enabling users to transition between whiteboard mode, videoconference mode, and other display modes. EX1004, 9:33-54. Dynamic menu updating based on application state was a known UI design pattern by 2011. A POSITA would have recognized that updating the selection menu when switching between whiteboard and videoconference sessions would have been a predictable design choice because

presenting relevant menu options based on the current application context improves usability. Software platforms, including office applications, browsers, and videoconferencing systems, used dynamic menus that updated based on application context.

145. Thus, a POSITA would have understood that dynamically updating the menu when switching between whiteboard and videoconference sessions is a standard design choice. Saleh-502 expressly discloses dynamic menu updating through the replacement of “Show Presentation” with “stop presentation icon,” demonstrating that the system already implements context-sensitive menu changes. Extending this same dynamic updating principle to the transition between whiteboard and videoconference sessions would have been obvious to a POSITA because it applies the same UI design pattern already implemented in Saleh-502 to an analogous state transition within the same system. A POSITA would have expected the menu to reflect the current session state, providing relevant options for the active mode while removing or modifying options that are not applicable. Claims 7 and 14 are therefore anticipated or rendered obvious by Saleh-502.

**B. Ground 2: Gurevich in View of Saleh-502 Renders Obvious
Claims 1-20**

1. Summary of Prior Art: Gurevich (EX1005)

146. Gurevich (US 2016/0301729 A1), published October 13, 2016 and assigned to SMART Technologies ULC of Calgary, Alberta, Canada, is directed to presenting video in a context-sensitive manner during a conference session conducted on an interactive whiteboard system. EX1005, ¶[0001]. The Gurevich application was filed on April 9, 2015, which is one month before the '487 Patent's claimed priority date of May 9, 2015. As a published patent application with an effective filing date prior to the '487 Patent's earliest claimed priority date, Gurevich qualifies as prior art under 35 U.S.C. §102(a)(2). Gurevich is relevant to the present analysis because it addresses the same fundamental technical problem that the '487 Patent purports to solve—namely, the integration of third-party videoconferencing functionality with an interactive whiteboard system in a manner that provides an improved user experience. Significantly, Gurevich discloses the use of the Microsoft Lync videoconferencing software (referenced in the '487 Patent specification) and the SMART Board interactive whiteboard hardware that is identified in Saleh.

147. Gurevich explicitly recognizes that video conferencing functionality in an interactive whiteboard environment is typically handled by a third-party software component, specifically identifying “Lync 2010 provided by Microsoft

Corporation” as the video application component used within its system. EX1005, ¶¶[0004], [0042]. Gurevich further acknowledges the central problem that such third-party video components present: their native user interfaces “often do[es] not interface well with the user interface of the shared whiteboard application resulting in a less than desirable conferencing experience.” EX1005, ¶[0004]. This is precisely the same problem that the ’487 Patent purports to address—the difficulty of integrating a third-party videoconferencing client’s interface with the whiteboard application’s interface in a seamless and user-friendly manner. Gurevich’s recognition of this problem and its proposed solution of suppressing the native Lync interface and replacing it with an alternative presentation interface that better integrates with the whiteboard application demonstrates that skilled artisans in this field were well aware of this challenge and actively developing solutions before the ’487 Patent’s priority date. The language used in Gurevich to describe the problem—a “less than desirable conferencing experience” caused by mismatched interfaces—mirrors the motivation described in the ’487 Patent for developing an integrated solution.

148. Gurevich discloses a detailed system architecture that includes a computing device 30 equipped with one or more processors, system memory (both volatile and non-volatile), network connectivity, and various peripheral devices including a microphone 32, a video camera 36, speakers 38, and an interactive board

(IB) 40 having an interactive surface 42 for displaying content and receiving touch input from users. EX1005, ¶¶[0036]-[0037]. The interactive board 40 is specifically identified as a SMART Board product from SMART Technologies, which includes models such as the SMART Board 4000, 6000, M600, and 800 series. EX1005, ¶[0037]. The system executes a host conferencing application comprising three principal software components: (1) an interactive board application component provided by SMART Technologies for managing whiteboard content and collaboration; (2) a video application component implemented as Microsoft Lync 2010 for handling video conferencing communications; and (3) a video interface application component that mediates between the Lync video streams and the interactive surface display. EX1005, ¶¶[0041]-[0042]. This three-component architecture is significant because it demonstrates the modular approach to integrating third-party video conferencing with interactive whiteboard functionality that was well-known in the art before the '487 Patent's priority date. The use of distinct software components for whiteboard management, video conferencing, and interface mediation reflects standard software engineering practices for integrating disparate systems.

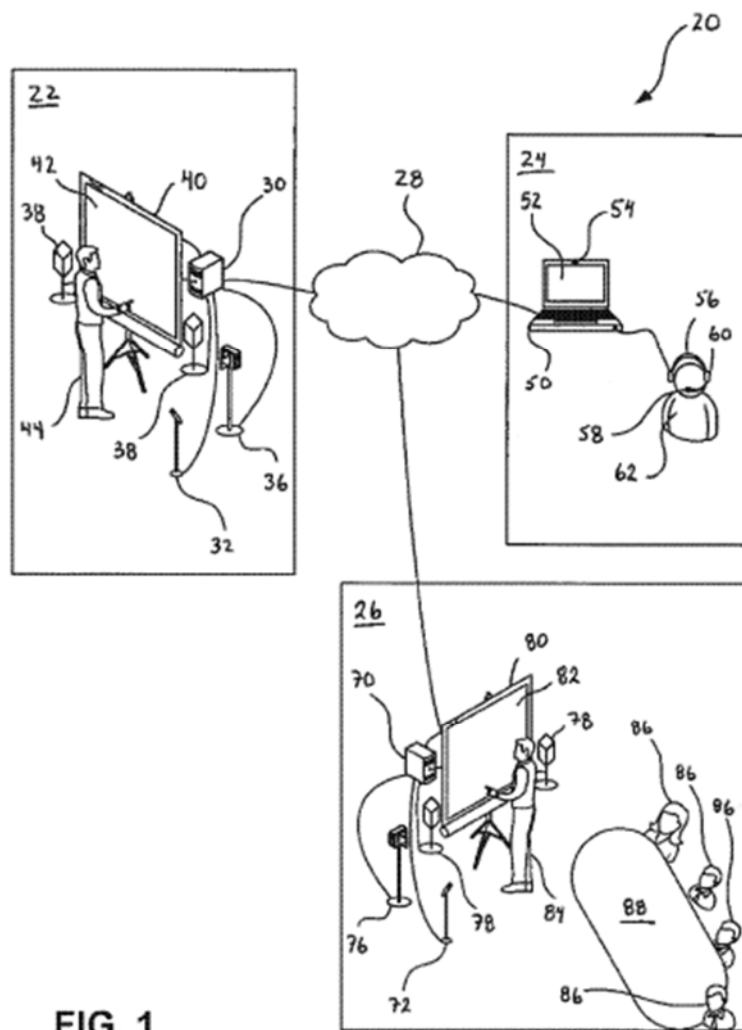
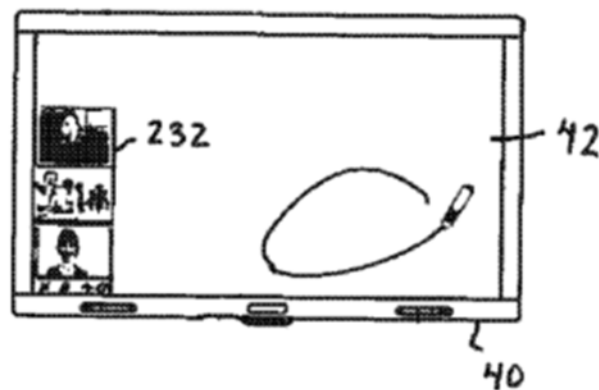
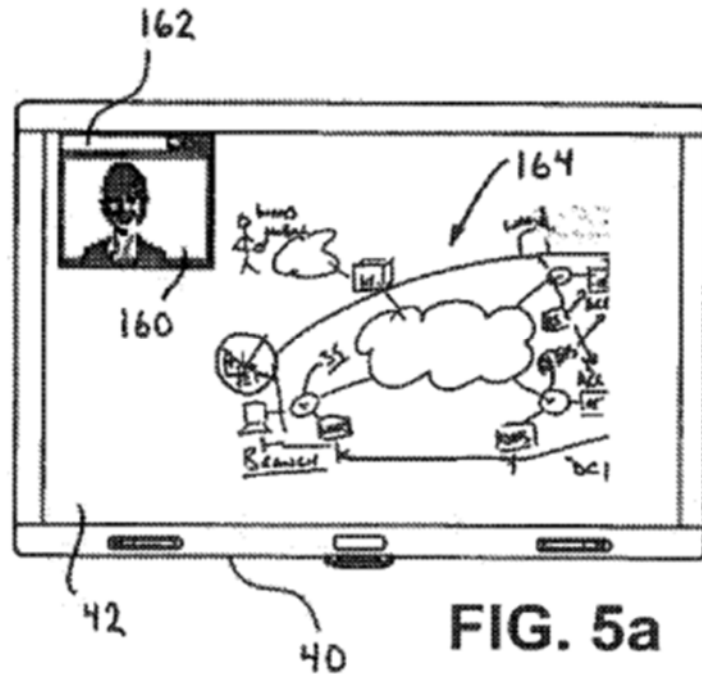


FIG. 1



EX1005, FIGs. 1, 5a, 9

149. The video interface application component in Gurevich performs several critical functions that are directly relevant to the claimed invention of the '487 Patent. First, it receives the video stream output from the Microsoft Lync 2010 video application component. Second, it suppresses the default native interface that

Lync would ordinarily display, preventing the Lync window from appearing in its standard form on the interactive surface. Third, it separates the video content from the suppressed interface by bit-splitting techniques, extracting the raw video data. Fourth, it processes the extracted video by resizing, flipping, and/or relocating the video streams as needed for optimal presentation. Fifth, it presents the processed video on the interactive surface 42 within an alternative presentation interface that is designed to integrate harmoniously with the interactive board application's whiteboard display. EX1005, ¶¶[0050]-[0053]. The alternative presentation interface disclosed in Gurevich includes a tool bar with selectable control elements for managing video display, participant icons for identifying remote conference participants, transparency adjustment controls that allow the user to modify the opacity of video overlays relative to the underlying whiteboard content, and controls for removing or repositioning individual video streams within a configurable video strip that can be arranged in various orientations on the interactive surface. EX1005, ¶¶[0057], [0059]-[0061], [0067]. This comprehensive set of features demonstrates that Gurevich provides a fully-realized implementation of integrated whiteboard-videoconference functionality with overlaid video windows, configurable controls, and interactive management capabilities.

150. In my professional judgment, Gurevich's explicit use of Microsoft Lync 2010 as the video application component is significant. The '487 Patent

likewise identifies Microsoft Lync as the collaboration client used within its system. This means that two independent engineering teams—one at SMART Technologies (Gurevich) and one at the eventual assignee of the '487 Patent—independently recognized the same problem and developed systems integrating the same Microsoft Lync videoconferencing software with similar whiteboard hardware. This convergence confirms that the alleged invention of the '487 Patent was not novel but rather represented an obvious next step that multiple teams arrived at independently. When two independent groups of skilled engineers, working with the same commercially available components, arrive at essentially the same solution to the same problem at approximately the same time, it is evidence that the solution was obvious to a person of ordinary skill in the art. This is not a case of inventive insight—it is a case of routine engineering applied to well-known commercial products that were designed to work together. The Microsoft Lync SDK documentation available at the time provided guidance on integrating Lync video capabilities into third-party applications, making such integration possible for software engineers familiar with the platform.

151. Moreover, Gurevich was filed on April 9, 2015—one month before the '487 Patent's claimed priority date of May 9, 2015. The near-simultaneous filing dates further demonstrate that skilled artisans in this field were converging on the same solution at the same time, confirming that the combination was within the

ordinary skill of those working in this area. The temporal proximity of these filings reflects development in the interactive whiteboard and videoconferencing industry during this period. By early 2015, enterprise customers were demanding better integration between their video conferencing systems and their interactive whiteboard hardware, and engineers at multiple companies were responding to this market demand by integrating these two existing technologies. The fact that SMART Technologies was independently developing its own integrated solution confirms that such integration was within the ordinary capabilities of skilled practitioners in this field and did not require an inventive leap beyond the application of known engineering principles to known commercial products.

152. In my opinion, Gurevich solves this integration problem by combining Microsoft Lync 2010 with a SMART Board interactive whiteboard and improving video presentation on the whiteboard surface—the same fundamental goal as the '487 Patent, including the same Microsoft Lync video application. EX1005, ¶¶[0004], [0042], [0050]-[0053]. Specifically, the interactive board 40, computing device 30 with processors and memory, network connectivity, and host conferencing application correspond to the structural limitations of independent claims 1, 8, and 15. EX1005, ¶¶[0036]-[0042]. The selectable GUI controls, toolbars, and transparency controls disclose or render obvious controls for stopping or altering videoconference video. EX1005, ¶¶[0057], [0059]-[0061], [0067]. Gurevich

discloses maintaining video over the whiteboard workspace—and returning the whiteboard to the foreground—because video is presented in designated areas on the same surface as whiteboard content, with dynamic adjustments to position, transparency, and visibility in response to user annotations. EX1005, ¶¶[0053], [0059], [0064], [0067]. Finally, Gurevich discloses sharing the whiteboard session with external devices because the host conferencing application shares images, annotations, and data among local and remote sites using SDKs/APIs. EX1005, ¶¶[0041]-[0045], [0079]. As explained above, Saleh-502 explicitly discloses overlaid selection menus. Thus, Gurevich in view of Saleh-502 renders obvious claims 1-20 of the '487 Patent.

2. Motivation to Combine Gurevich (EX1005) and Saleh-502 (EX1004)

153. Both Gurevich and Saleh-502 constitute analogous prior art that addresses the same fundamental problem: integrating videoconferencing functionality with SMART Technologies interactive whiteboard systems to provide users with a seamless, unified experience in enterprise meeting room environments. EX1005, ¶¶[0002]-[0004]; EX1004, 1:53-65, 4:55-5:14. Both references disclose systems that utilize SMART Board interactive whiteboard hardware as the primary display and interaction surface. EX1005, ¶[0037]; EX1004, 4:62-65. Both references target the same use case of enterprise meeting rooms where participants gather

around an interactive whiteboard to collaborate while simultaneously conducting videoconference sessions with remote participants. Both references recognize the same core challenge—that third-party videoconferencing software does not natively integrate well with interactive whiteboard applications, creating a disjointed user experience. EX1005, ¶[0004]; EX1004, 2:8-12. A person of ordinary skill in the art working in the field of interactive whiteboard systems and videoconferencing integration would have reason to consider both Gurevich and Saleh-502 as relevant solutions to the same technical challenge. The analogous nature of these references makes their combination appropriate for an obviousness analysis, as a POSITA seeking to design an improved whiteboard-videoconference system would consider existing solutions addressing this problem.

154. The motivation to combine is straightforward. Gurevich teaches the use of Microsoft Lync video conferencing integrated with a SMART Technologies whiteboard and teaches improving the presentation of videoconference video on the whiteboard surface, while Saleh-502 teaches concrete user-interface techniques for initiating, controlling, switching, and terminating videoconference and whiteboard modes also on a SMART Technologies whiteboard-based conferencing system. EX1005, ¶¶[0042], [0050]-[0053], [0057], [0059]; EX1004, 9:33-54, 10:61-11:14, 13:42-60, 18:48-59. A POSITA implementing Gurevich's Lync-SMART Board system would have had reason to look to Saleh-502 for well-known user interface

controls and mode-switching behavior because Saleh-502 expressly teaches how users of an integrated SMART Board videoconferencing system can initiate a videoconference, switch between videoconference and whiteboard modes, display overlay menus, stop a videoconference, and share whiteboard content with remote endpoints. EX1004, 9:33-54, 10:61-11:24, 13:42-14:14.

155. Combining Gurevich and Saleh-502 would have yielded predictable results. Gurevich already provides the Lync video stream, SMART Board whiteboard workspace, and alternative video presentation interface with menu controls; Saleh-502 supplies complementary and conventional GUI controls for launching, controlling, ending, and switching between whiteboard and videoconference functions on a SMART Board whiteboard display. EX1005, ¶¶[0041]-[0045], [0050]-[0053]; EX1004, 7:42-54, 9:33-54, 10:61-11:24. The combined system would merely apply known videoconference control menus and mode-switching techniques from Saleh-502 to Gurevich's known Lync-integrated SMART Board conferencing system with overlaid session windows and menus, thereby achieving the predictable and beneficial result of a more intuitive user interface for managing videoconference and whiteboard sessions on the same interactive display. EX1005, ¶[0004]; EX1004, 4:55-5:14.

156. The combination of Gurevich and Saleh-502 yields predictable results, as each reference contributes capabilities that function independently and do not

interfere with the operation of the other's contributions. Gurevich provides the underlying video stream acquisition from Microsoft Lync, the SMART Board interactive whiteboard workspace for collaborative content creation, and the alternative presentation interface with overlaid menu controls for video management. Saleh-502 supplies complementary graphical user interface controls for launching a videoconference session from the whiteboard interface, controlling the videoconference during operation, ending the videoconference session, and returning to the prior application state. The combined system applies known user interface techniques from Saleh-502 to the known integrated whiteboard-videoconference system of Gurevich, resulting in a system that operates as one would expect based on the individual teachings of each reference. There is no synergistic or unexpected result from this combination—each component continues to perform its known function in its known manner. The Lync video integration taught by Gurevich continues to suppress the native interface, process video streams, and present them in an alternative interface; the UI controls taught by Saleh-502 continue to provide users with intuitive mechanisms for managing the videoconference session lifecycle. A POSITA would have had a reasonable expectation of success in making this combination because both systems were designed for the same hardware platform and used compatible software architectures.

157. Based on my experience researching networked multimedia systems and collaborating with industry in the development of content delivery and videoconferencing technologies, I can state that when designing a new integrated whiteboard-videoconference system, an engineer would consider existing solutions for user interface patterns and interaction paradigms. Saleh-502 represents the type of prior implementation that a person of ordinary skill in the art would have considered when developing a new product in this space. In my career, I have observed that engineers study competitor products and prior implementations to identify proven UI patterns and incorporate them into new designs—this is a known practice in software engineering and is not considered inventive activity. The SMART Room System software embodied in Saleh-502 was a commercially available product that was known to professionals working with SMART Board interactive whiteboard systems, and an engineer tasked with developing new software for the SMART Board platform would have had reason to consider its user interface conventions and capabilities. Drawing upon these proven patterns when implementing a new system like that described in Gurevich would have been a routine approach for an engineer in this field.

158. No novel engineering insight or inventive leap is required to combine the teachings of Gurevich and Saleh-502; the combination merges two sets of well-understood techniques that have been independently demonstrated on the same

category of hardware platform. Gurevich demonstrates how to intercept and reprocess Lync video streams for presentation on a SMART Board interactive surface, while Saleh-502 demonstrates how to provide users with intuitive graphical controls for managing videoconference sessions on that same platform. Combining these teachings involves incorporating Saleh-502's session-management UI patterns into Gurevich's video processing and presentation framework—an exercise that would be within the capabilities of an ordinary software engineer with experience in the interactive whiteboard and videoconferencing field. The interfaces between these components are straightforward: Saleh-502's call-initiation control triggers Gurevich's Lync video connection logic; Saleh-502's call-termination control triggers Gurevich's video stream disconnection and interface cleanup logic; and Saleh-502's mode-switching controls trigger transitions between the whiteboard and videoconference display states already contemplated by Gurevich. Each of these integration points involves standard event-driven programming techniques that are fundamental to graphical user interface development on any platform.

3. [Claims 1.pre/8.pre/15.pre] “A whiteboard device comprising:” / “A computing device comprising:” / “A method comprising:”

159. It is my opinion that Gurevich discloses the preamble limitations of claims 1, 8, and 15 of the '487 Patent. Gurevich explicitly discloses an interactive

board (IB) 40 with an interactive surface 42 that serves as both a display for visual content and an input device for receiving touch-based user interactions. EX1005, ¶¶[0036]-[0037]. The interactive board 40 is specifically identified as a commercially available SMART Board product, with Gurevich listing specific models including the SMART Board 4000 series, 6000 series, M600 series, and 800 series as suitable implementations. EX1005, ¶[0037]. These are large-format interactive display systems designed for enterprise meeting rooms and educational environments, providing a touch-sensitive display surface that allows users to interact with displayed content using fingers, styluses, or other pointing instruments. The SMART Board hardware includes integrated touch detection technology, display projection or direct-view LCD capability, and USB connectivity to a host computing device that drives the display and processes touch input. This is the same category of “interactive whiteboard” device contemplated by the preamble of claim 1 of the ’487 Patent.

160. The systems described in both Gurevich and the ’487 Patent operate on the similar hardware platforms, and software development platforms, and integrate with the same Microsoft Lync videoconferencing client, supporting the conclusion that the claimed invention is an obvious variation of what was already being developed by multiple engineering teams working independently.

- a. **[Claim 8.pre] “One or more non-transitory computer-readable media storing instructions which, when processed by one or more processors, cause:”**

161. It is my opinion that Gurevich expressly discloses non-transitory computer-readable media storing instructions as recited in the preamble of claim 8. Gurevich discloses computing device 30 that includes one or more processors, system memory, network connectivity, and peripheral device interfaces for connecting to the interactive board and other hardware components. EX1005, ¶[0036]. Gurevich discloses that computing device 30 comprises “a processing unit comprising one or more processors, system memory (volatile and/or non-volatile memory), other non-removable memory and/or optional removable memory (e.g. a hard disk drive, RAM, ROM, EEPROM, CD-ROM, DVD, flash memory, etc.) and a system bus coupling the various components to the processing unit.” EX1005, ¶[0036]. Gurevich further discloses that the host conferencing application “may comprise program modules including routines, object components, data structures, and the like, embodied as computer readable program code stored on a non-transitory computer readable medium.” EX1005, ¶[0079]. These stored program modules constitute instructions that, when processed by the processors, cause the system to perform the described whiteboard display and videoconferencing operations. Thus, the preamble of claim 8 is fully disclosed by Gurevich.

b. [Claim 15.pre] “A computer-implemented method comprising:”

162. It is my opinion that Gurevich discloses a computer-implemented method as recited in the preamble of claim 15. Gurevich discloses methods performed by the computing device 30 executing the host conferencing application software, including the methods of receiving video streams, processing video data, presenting video on the interactive surface, and responding to user input through the tool bar controls. EX1005, ¶¶[0041]-[0042], [0050]-[0053]. The computing device 30 is described as having a processing unit comprising one or more processors, volatile and non-volatile system memory, and various storage media, and it executes the host conferencing application software stored in its memory to perform the disclosed methods. EX1005, ¶¶[0036], [0079]. Because claim 15 recites the same functional limitations as claim 1 in method form, Gurevich discloses or renders obvious claim 15 for the same reasons that it discloses or renders obvious claim 1. Thus, the hardware, apparatus, and method preambles of all three independent claims are fully disclosed by Gurevich’s system architecture.

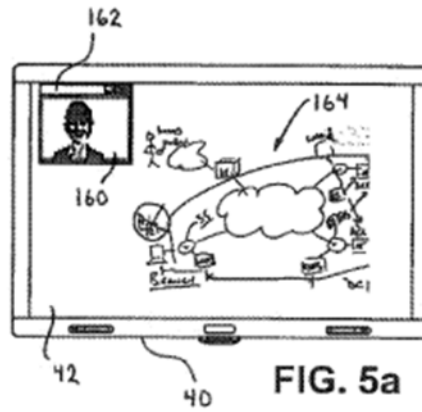
163. Thus, a POSITA would have understood that Gurevich discloses an interactive whiteboard system, a computing device, and methods performed thereby, satisfying the preamble limitations of claims 1, 8, and 15 of the ’487 Patent. A person of ordinary skill in the art reading both references would immediately recognize that

they describe systems built on similar hardware platforms executing software with overlapping functionality.

4. [Claims 1.a/8.a] “a display”

164. It is my opinion that Gurevich discloses “a display” as recited in claim 1 of the ’487 Patent. The interactive surface 42 of the interactive board 40 serves as the display on which all visual content is presented to the user, including whiteboard content such as annotations and drawings, video streams from remote conference participants, tool bar controls for managing the video display, and other graphical user interface elements. EX1005, ¶¶[0036], [0045], [0053]. Gurevich describes that the interactive surface 42 presents a “computer desktop comprising icons representing selectable application programs and files, one or more windows relating to selected application programs, annotations input by participant 44” as well as video content from remote participants that is processed and displayed within the alternative presentation interface. EX1005, ¶[0045]. The interactive surface 42 functions both as an output display for presenting visual information to the user and as an input surface for receiving touch-based interactions. As a display device, it renders all graphical content generated by the host conferencing application, including the whiteboard workspace, video windows, control tool bars, and participant identification elements. The interactive surface 42 is implemented as a large-format display suitable for group viewing in a conference room setting,

providing sufficient screen area to simultaneously display whiteboard content and overlaid video conference windows.



EX1005, FIG. 5a

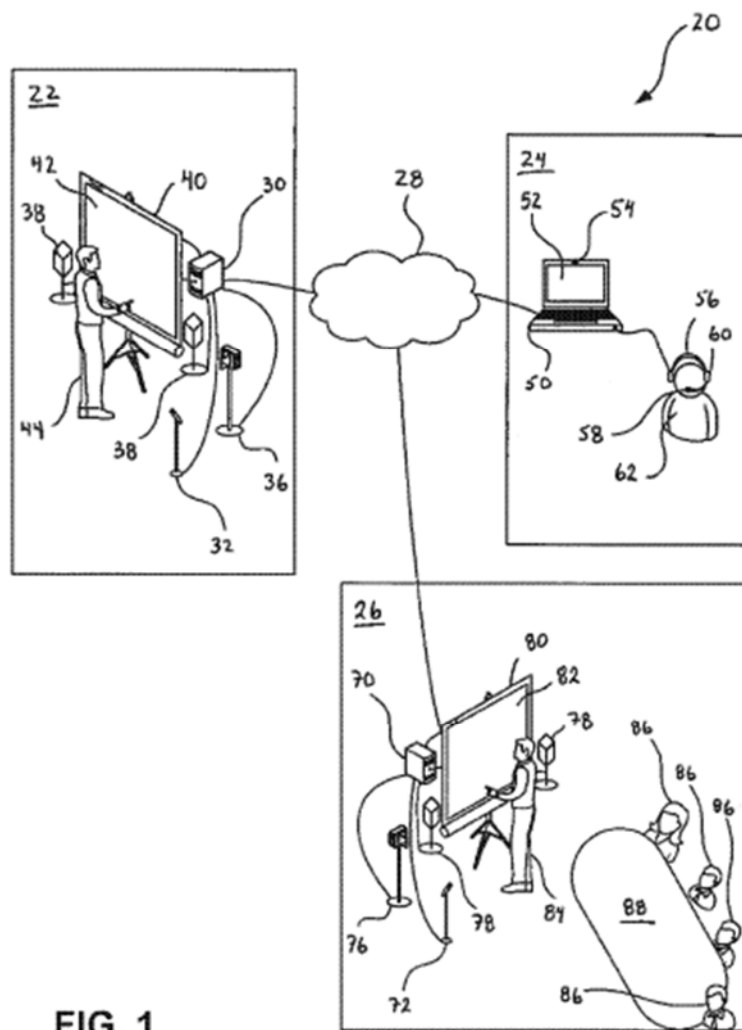


FIG. 1

EX1005, FIG. 1

165. Interactive whiteboard surfaces have served as displays for computer-generated content since the earliest SMART Board products in the 1990s. The interactive surface 42 in Gurevich receives display output from the computing device 30 and renders it visually for the user to see, which is the function of a display device. Whether implemented as a projected image on a touch-sensitive surface or as a direct-view LCD panel with integrated touch sensors, the interactive surface 42

performs the display function contemplated by claim 1. Gurevich's interactive surface 42 constitutes a display because it is used throughout Gurevich to render visual output for the user.

166. Thus, a POSITA would have understood that Gurevich's interactive surface 42 of the interactive board 40 constitutes "a display" as recited in claim 1 of the '487 Patent. The interactive surface 42 displays all visual content generated by the system, including whiteboard content, video conference windows, and graphical user interface controls, and it provides the visual output device through which users view and interact with the integrated whiteboard-videoconference system. This is precisely the type of display contemplated by the '487 Patent claims.

5. [Claims 1.b] "a network interface"

167. It is my opinion that Gurevich discloses "a network interface" as recited in claim 1 of the '487 Patent. Gurevich describes that computing device 30 communicates with other computing devices through network 28, which may comprise various network topologies including local area networks (LAN), wide area networks (WAN), and the Internet. EX1005, ¶¶[0035]-[0036]. The network 28 provides the communication infrastructure through which computing device 30 exchanges videoconference data with remote participants, including audio streams, video streams, and collaboration data for the shared whiteboard session. In order for computing device 30 to communicate over network 28, it necessarily includes a

network interface—whether implemented as an Ethernet adapter for wired LAN connectivity, a wireless network adapter for Wi-Fi connectivity, or both—that provides the physical and logical connection between the computing device and the network infrastructure. The Microsoft Lync 2010 video application component relies upon this network connectivity to establish video conference sessions with remote participants and exchange real-time audio and video data. EX1005, ¶¶[0041]-[0042]. Without a network interface, the fundamental videoconferencing functionality of Gurevich’s system would be impossible, as there would be no mechanism for communicating with remote conference participants. The network interface enables all of the remote collaboration features disclosed throughout Gurevich, including receiving video streams from remote cameras, sharing whiteboard content with remote participants, and conducting real-time audio communication.

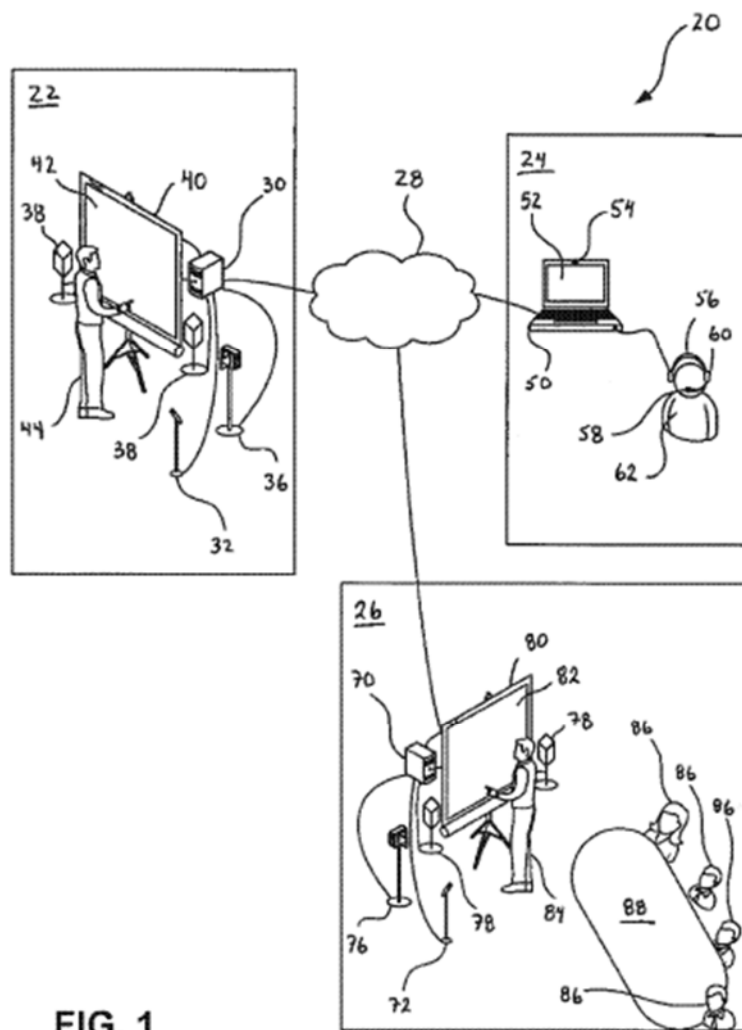


FIG. 1

EX1005, FIG. 1

168. Thus, a POSITA would have understood that Gurevich's computing device 30, which communicates with remote devices through network 28 for video conferencing and whiteboard collaboration, necessarily includes a network interface as recited in claim 1 of the '487 Patent. The ability to conduct real-time video conferencing over local and wide area networks requires network interface hardware and associated protocol stack software, and a person of ordinary skill in the art would

have understood that computing device 30 includes such a network interface. This is a fundamental component of a networked computing system, and its presence in Gurevich's system is indicated by the network communication capabilities described and required by the videoconferencing functionality that is central to the reference.

6. [Claims 1.c/1.d] “one or more processors” and “one or more memories storing instructions”

169. It is my opinion that Gurevich discloses “one or more processors” and “one or more memories” as recited in claims 1[c] and 1[d] of the '487 Patent. Gurevich provides a description of the computing hardware within computing device 30, stating that it includes a “processing unit comprising one or more processors, system memory (volatile and/or non-volatile), other non-removable memory and/or optional removable memory (hard disk drive, RAM, ROM, EEPROM, CD-ROM, DVD, flash memory, etc.) and a system bus” that interconnects these components. EX1005, ¶[0036]. This disclosure expressly recites both one or more processors (the processing unit comprising one or more processors) and one or more memories (system memory including volatile RAM and non-volatile storage such as hard disk drives, ROM, EEPROM, flash memory, and optical media). The system bus connects the processors to the memories and other system components, enabling the processors to fetch and execute instructions stored in the memories and to read and write data during program execution. This is a conventional computer architecture

that would be understood by a person of ordinary skill in the art, and Gurevich's enumeration of these components identifies their presence in computing device 30.

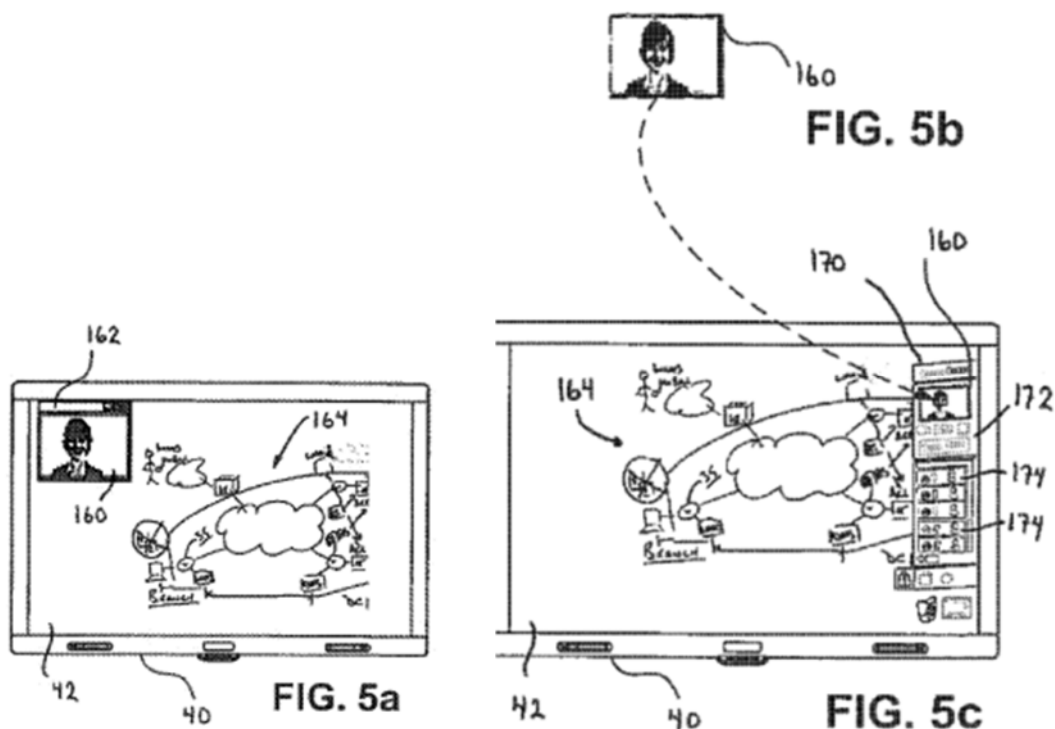
170. Gurevich further confirms the functional relationship between the processors and memories by disclosing that the host conferencing application—comprising the interactive board application component, the video application component (Lync 2010), and the video interface application component—is stored in the memory of computing device 30 and executed by the processors to perform the video conferencing and whiteboard collaboration functions described throughout the reference. EX1005, ¶¶[0041]-[0042], [0079]. Paragraph [0079] of Gurevich specifically states that the described functionality may be implemented as “computer-executable instructions stored on a non-transitory machine-readable medium” that are “executed by one or more processors,” further confirming that the system comprises processors that execute program instructions stored in memory to carry out the disclosed methods. The memories store not only the application code but also runtime data including video frame buffers, processed video streams, user interface element definitions, whiteboard content data, and configuration information. The processors execute the stored instructions to perform real-time video processing, user interface rendering, touch input processing, network communication, and all other computational tasks required by the integrated system.

171. Thus, a POSITA would have understood that Gurevich's computing device 30, with its explicitly disclosed processing unit comprising one or more processors and system memory comprising volatile and non-volatile storage media, satisfies the "one or more processors" and "one or more memories" limitations of claims 1[c] and 1[d] of the '487 Patent. Gurevich identifies processors, identifies multiple types of memory, and describes the functional relationship between them in executing the host conferencing application software. In my opinion, that disclosed computing architecture meets these limitations.

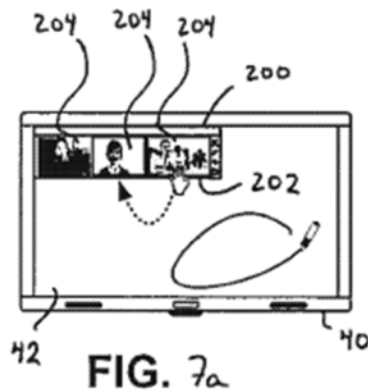
7. [Claims 1.e/8.a/15.a] "an interactive whiteboard session window displayed by the display"

172. It is my opinion that Gurevich discloses "an interactive whiteboard session window" as recited in claims 1[e], 8[a], and 15[a] of the '487 Patent. Gurevich describes that the interactive board application component presents content on the interactive surface 42, including a "computer desktop comprising icons representing selectable application programs and files, one or more windows relating to selected application programs, annotations input by participant 44." EX1005, ¶[0045]. The interactive board application component is specifically identified as SMART Technologies software that provides collaborative whiteboard functionality, enabling users to create annotations, draw on the whiteboard surface, manipulate objects, and share whiteboard content with remote participants through

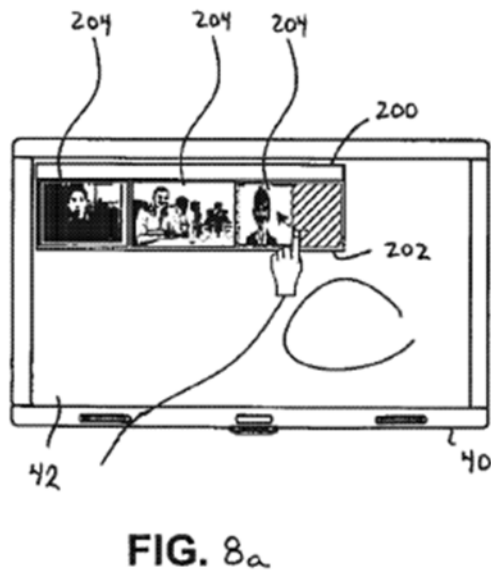
the conferencing session. The whiteboard content area displayed on the interactive surface 42 constitutes an interactive whiteboard session window—it provides a defined visual region in which users can collaboratively create and edit whiteboard content during a conferencing session. The “session” aspect is satisfied by Gurevich’s disclosure of multi-participant conferencing in which whiteboard content is shared among local and remote participants simultaneously, creating a collaborative whiteboard session. The “window” aspect is satisfied by the windowed display environment described in Gurevich, where the whiteboard content occupies a defined area of the interactive surface alongside other interface elements such as video windows and tool bars.



EX1005, FIGs 5a-c



EX1005, FIG. 7a



EX1005, FIG. 8a

173. The SMART Technologies interactive board application component provides the core collaborative whiteboard functionality within Gurevich's system, enabling participants to create, edit, and share content on the interactive surface

during a conferencing session. EX1005, ¶¶[0041]-[0042]. This application component presents a workspace on the interactive surface 42 where users can write, draw, annotate, manipulate objects, import content, and perform other collaborative whiteboard activities. The SMART Technologies interactive board application is specifically identified as the whiteboard software component of the tripartite host conferencing application architecture, responsible for managing the whiteboard content and providing the collaborative workspace environment. The session window displayed by this application component provides the interactive canvas where whiteboard collaboration takes place, and it remains visible on the interactive surface throughout the conferencing session, underlying the video windows and control elements that are overlaid on top of it. This persistent display of the whiteboard workspace is a fundamental design characteristic of the system, as the primary purpose of the interactive board is to provide a collaborative whiteboard environment—the video conferencing is an added capability that supplements the core whiteboard functionality.

174. The interactive board application component's display on the interactive surface 42 clearly constitutes an “interactive whiteboard session window” as contemplated by the '487 Patent claims. The SMART Technologies whiteboard software is the industry-leading collaborative whiteboard application, specifically designed to provide an interactive session-based workspace where

multiple participants can collaboratively create and edit content in real time. Any person of ordinary skill in the art reading Gurevich would immediately recognize that the whiteboard workspace presented by the interactive board application component constitutes an interactive whiteboard session window, as this is the standard terminology used to describe such functionality in the interactive whiteboard industry.

175. FIGS. 5a, 7a, and 8a of Gurevich all depict the whiteboard content area on the interactive surface, showing the collaborative workspace where users create and interact with whiteboard content during a conferencing session. These figures illustrate the visual presentation of the interactive whiteboard session window, with the whiteboard content occupying the primary display area and various interface elements such as video strips and tool bars arranged around or overlaid upon the whiteboard workspace. The consistency of the whiteboard display across multiple figures in Gurevich demonstrates that the interactive whiteboard session window is a persistent, central feature of the system's user interface, providing the foundational visual layer upon which other elements—including videoconference windows and control menus—are overlaid. The whiteboard content visible in these figures includes annotations, drawings, and other collaborative content that participants have created during the session, confirming that this is an active, interactive session workspace rather than a static display.

176. Thus, a POSITA would have understood that Gurevich's interactive board application component, which presents a collaborative whiteboard workspace on the interactive surface 42 during a multi-participant conferencing session, constitutes an "interactive whiteboard session window" as recited in claims 1[e], 8[a], and 15[a] of the '487 Patent. The whiteboard session window provides the interactive collaborative canvas that is the primary feature of the SMART Board system, and it is displayed on the interactive surface throughout the conferencing session as shown in multiple figures throughout Gurevich. This is the same interactive whiteboard session window functionality that the '487 Patent claims, implemented on a similar hardware platform.

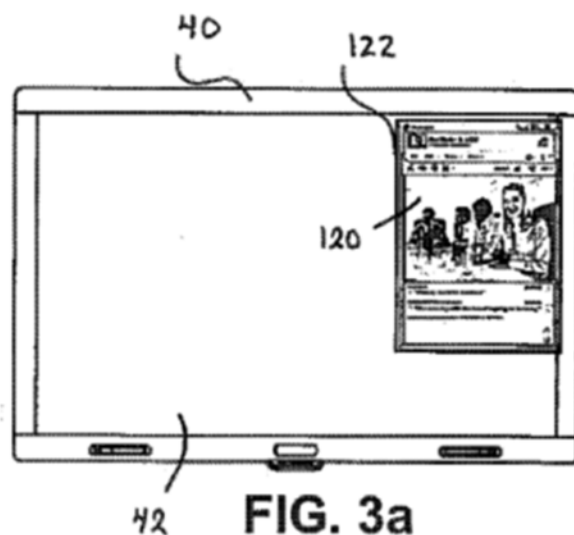
8. [Claims 1.f/8.b/15.b] "wherein a selection menu is overlaid on the interactive whiteboard session window, the selection menu configured to receive, from a user of the whiteboard device, an instruction for starting a video conference session"

177. It is my opinion that the combination of Gurevich and Saleh-502 discloses a "selection menu overlaid on the interactive whiteboard session window" as recited in claims 1[f], 8[b], and 15[b] of the '487 Patent. Gurevich discloses an alternative presentation interface that includes "GUI elements such as selectable control elements" displayed on the interactive surface 42 during the conferencing

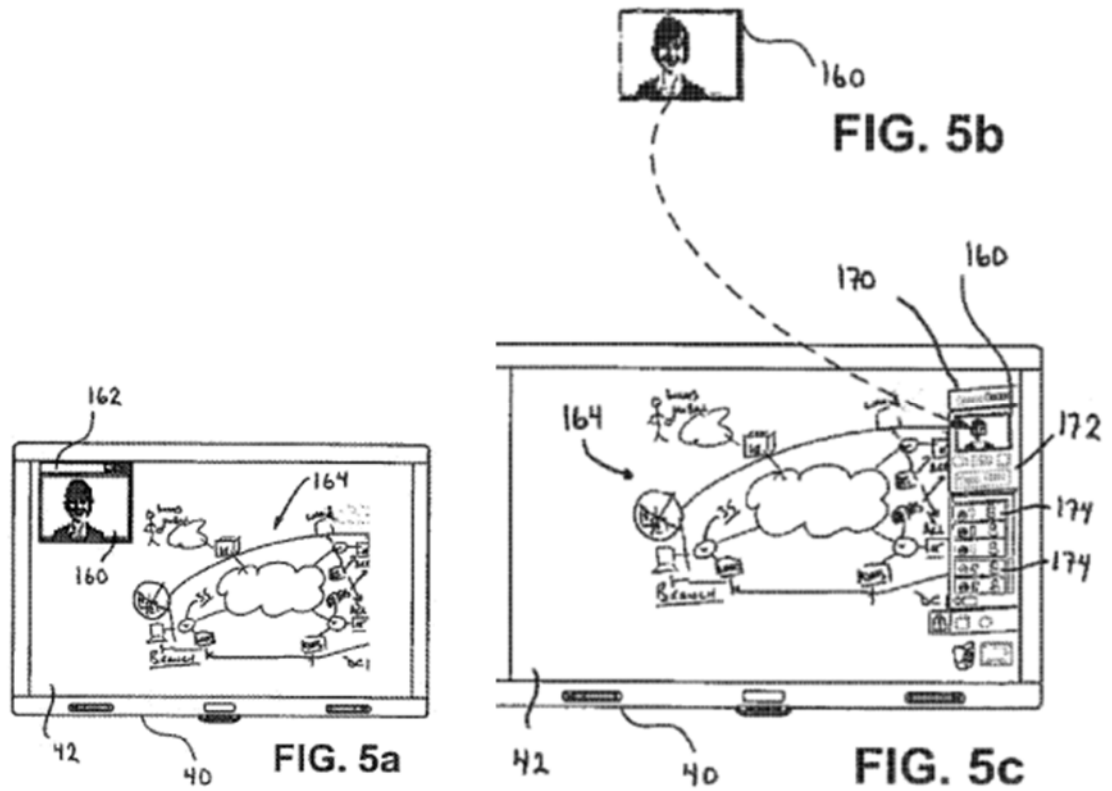
session. EX1005, ¶[0053]. More specifically, Gurevich discloses a tool bar 210 comprising “selectable control elements 212” that is displayed on the interactive surface 42 overlaid on the whiteboard content area during a video conferencing session. EX1005, ¶[0059]. The tool bar 210 provides user-selectable controls for managing the video display, including controls for adding or removing video streams from the display, repositioning video windows, adjusting transparency settings, and other video management functions. This tool bar is overlaid on the interactive whiteboard session window—it appears on top of the whiteboard content area, allowing users to interact with its controls while the underlying whiteboard content remains visible. The overlaid nature of the tool bar is confirmed by Gurevich’s disclosure of transparency controls that adjust the opacity of elements relative to the underlying whiteboard content, which would be meaningless if the tool bar and whiteboard occupied separate, non-overlapping display regions.

178. Saleh-502 supplements Gurevich’s disclosure by teaching a specific selection menu control for initiating a videoconference session from the whiteboard interface. Saleh-502 discloses a call button available on menu 310 that is accessible from all screens within the application, providing users with the ability to initiate a videoconference session at any time during their whiteboard session without navigating away from the current screen or application context. EX1004, 10:61-11:13. The menu 310 in Saleh-502 is displayed as an overlaid control element on the

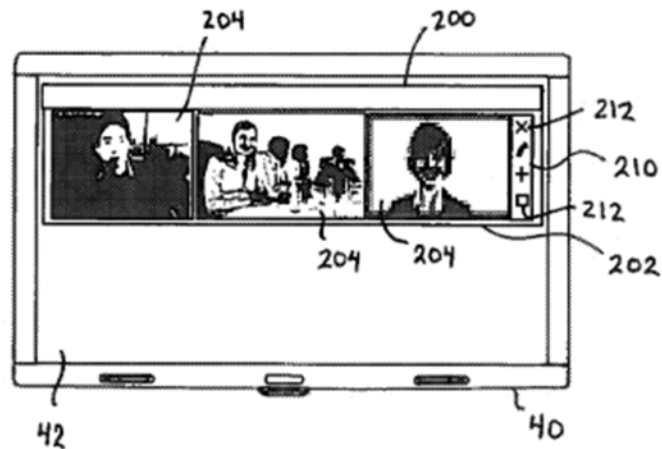
interactive whiteboard surface, available regardless of which screen or mode the user is currently viewing, ensuring that the user can always access the call-initiation functionality without disrupting their current workflow. This persistent, overlaid menu with call-initiation capability represents a well-known UI pattern for providing users with ready access to videoconferencing controls within a whiteboard application environment. The menu 310 qualifies as a “selection menu” because it presents users with selectable options—including the call button—that the user can choose to invoke particular functions of the system.



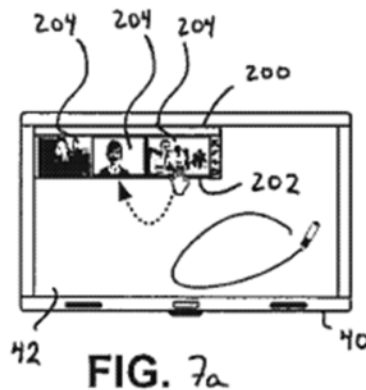
EX1005, FIG. 3a



EX1005, FIGs 5a-c



EX1005, FIG. 6a



EX1005, FIG. 7a

179. Combining Saleh-502's call-initiation control element with Gurevich's overlaid tool bar is a straightforward integration that would have been apparent to a person of ordinary skill in the art. Gurevich already discloses an overlaid tool bar with selectable control elements for managing video conferencing functions; adding a call-initiation control—as taught by Saleh-502—to this existing tool bar requires adding an additional selectable element to the existing interface. This is standard graphical user interface development—adding a button to an existing toolbar is a common operation in UI programming. Moreover, Saleh-502's menu 310 demonstrates that it was known in the art to provide call-initiation controls as part of an always-available overlaid menu in a whiteboard-videoconference system. A POSITA implementing Gurevich's system would recognize the need for a call-

initiation control and would naturally look to Saleh-502's proven implementation as a model for incorporating such functionality. The resulting combined system would display a selection menu overlaid on the interactive whiteboard session window, with selectable controls including at minimum a call-initiation option, video management controls, and other session management functions.

180. FIG. 6a of Gurevich depicts the alternative presentation interface with the tool bar and selectable control elements overlaid on the interactive surface during a conferencing session, visually confirming that the selection menu elements are displayed on top of the interactive whiteboard session window. The figure shows the tool bar positioned within the display area of the interactive surface, with the whiteboard content visible in the background beneath the overlaid control elements. This visual representation clearly demonstrates the overlaid spatial relationship between the selection menu controls and the underlying whiteboard session window. The selectable control elements shown in the tool bar provide the user with options for managing the video display and conferencing session, constituting a selection menu from which the user can choose among available functions.

181. Thus, a POSITA would have understood that the combination of Gurevich's overlaid tool bar 210 with selectable control elements 212 and Saleh-502's call-initiation menu control provides a "selection menu overlaid on the interactive whiteboard session window" as recited in claims 1[f], 8[b], and 15[b] of

the '487 Patent. Gurevich provides the overlaid tool bar framework with selectable controls displayed on the interactive surface during a conferencing session, and Saleh-502 contributes the specific call-initiation selection control that is available from all screens. The combination of these teachings yields a selection menu overlaid on the whiteboard session window that provides users with selectable options for managing videoconference sessions, which is precisely the functionality claimed in the '487 Patent.

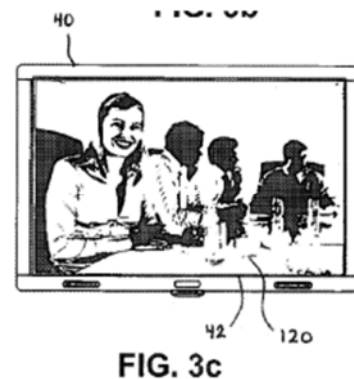
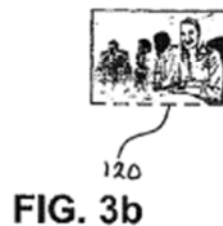
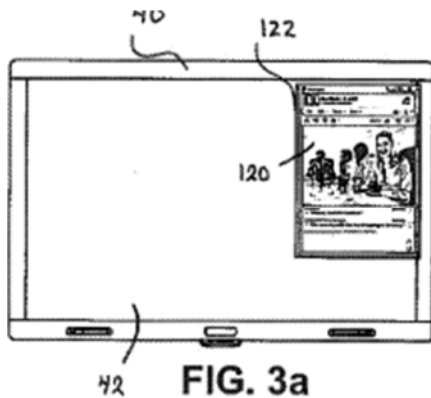
9. **[Claims 1.g/8.c/15.c] “after receiving the instruction for starting the video conference session via the selection menu overlaid on the interactive whiteboard session window, a videoconference window to be overlaid on the interactive whiteboard session window.”**

182. It is my opinion that Gurevich discloses a “videoconference window overlaid on the interactive whiteboard session window” as recited in claims 1[g], 8[c], and 15[c] of the '487 Patent. Gurevich teaches that video streams received from remote participants via Microsoft Lync are processed by the video interface application component and presented “on the interactive surface 42 within an alternative presentation interface.” EX1005, ¶¶[0050]-[0053]. The video content is displayed in a “smaller window centered or positioned at alternative location on

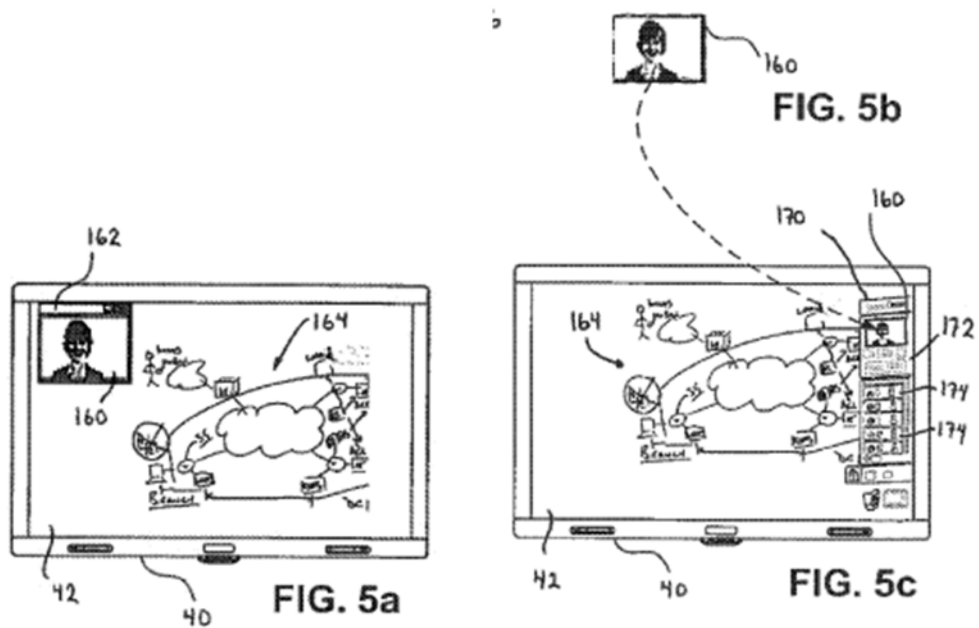
interactive surface 42 or within designated video area” of the presentation interface. EX1005, ¶[0053]. This video window is displayed on the same interactive surface 42 where the interactive whiteboard session window is presented, and it is displayed on top of or alongside the whiteboard content, creating an overlaid spatial relationship in which the videoconference window is layered above the underlying whiteboard session window. The video window contains live video feeds from remote conference participants, showing their faces and environments as captured by their cameras, providing the visual communication channel that is essential to videoconferencing. The positioning of this video window on the interactive surface 42 while the whiteboard content remains visible constitutes overlaying the videoconference window on the interactive whiteboard session window.

183. Gurevich further discloses that multiple video streams from multiple remote participants can be arranged in a configurable video strip within the alternative presentation interface, with the video strip positioned on the interactive surface 42 in various orientations and locations that can be adjusted by the user. EX1005, ¶¶[0059]-[0061]. The configurable video strip is an area within the presentation interface that displays video thumbnails or frames from multiple remote participants, arranged in a row or column format that can be moved and resized on the interactive surface. Critically, the whiteboard content remains visible on the

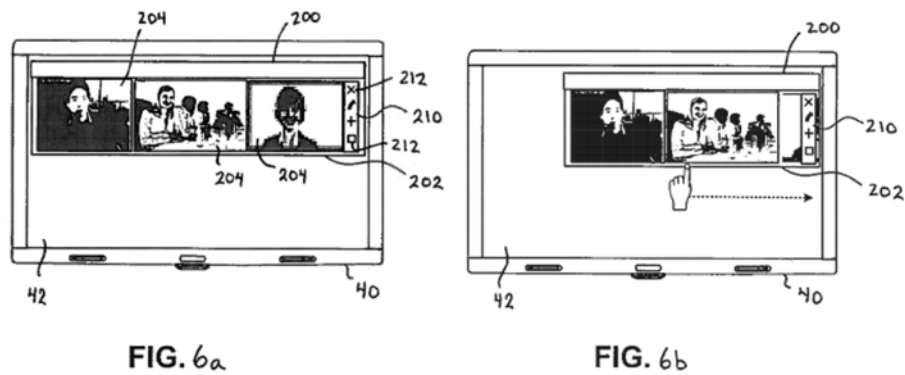
same interactive surface while the video strip and individual video windows are displayed, confirming that the video content is overlaid on the whiteboard session window rather than replacing it. The simultaneous display of both whiteboard content and video content on the same interactive surface is a fundamental design principle of Gurevich's system—the entire purpose of the alternative presentation interface is to present video in a manner that coexists with the whiteboard content rather than displacing it. This coexistence of video and whiteboard content on the same display surface necessarily means that the video windows are overlaid on the whiteboard session window.



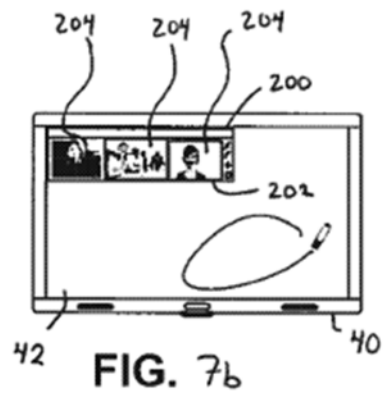
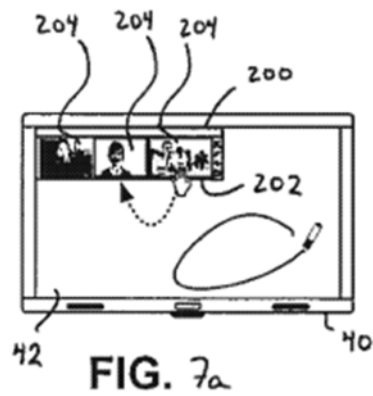
EX1005, FIGS. 3a, 3b, 3c



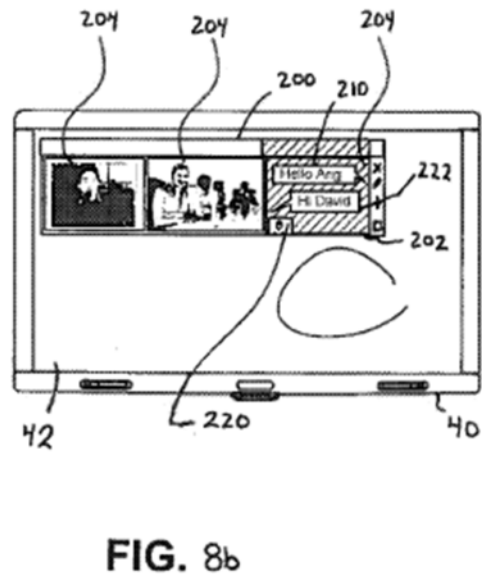
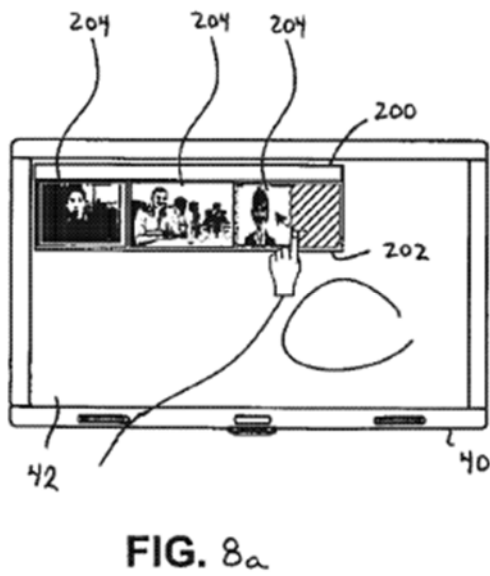
EX1005, FIGS. 5a, 5b, 5c



EX1005, FIGS. 6a, 6b



EX1005, FIGS. 7a, 7b



EX1005, FIGS. 8a, 8b

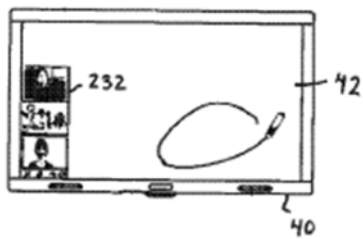


FIG. 9

EX1005, FIG. 9

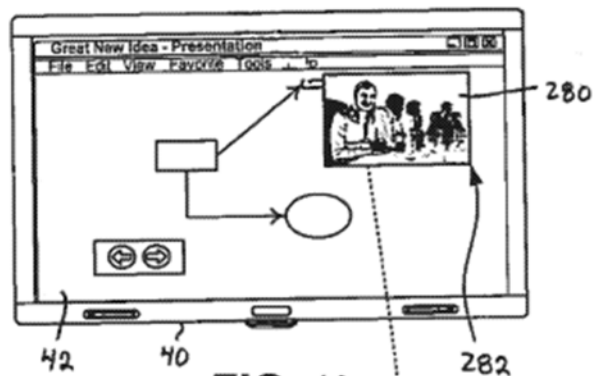


FIG. 10a

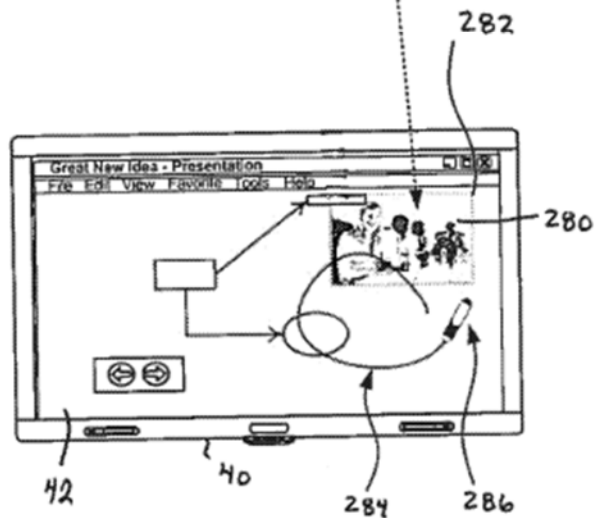


FIG. 10b

EX1005, FIGS. 10a, 10b

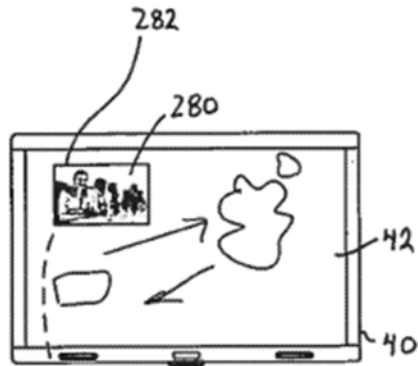


FIG. 11a

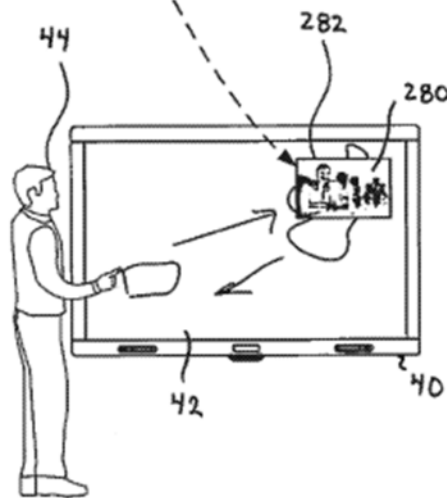


FIG. 11b

EX1005, FIGS. 11a, 11b

184. The figures of Gurevich provide clear visual confirmation of the overlaid relationship between the videoconference windows and the whiteboard session window. FIGS. 3a, 3b, and 3c show various video presentation interface configurations in which video from remote participants is displayed within defined

windows or regions on the interactive surface. FIGS. 5a, 5b, and 5c show the whiteboard session content area with collaborative workspace content visible on the interactive surface. FIG. 6a shows the video strip with video from remote participants overlaid on the interactive surface alongside the whiteboard content, with the tool bar controls also visible. Taken together, these figures demonstrate that Gurevich's system simultaneously displays both whiteboard session content and videoconference video windows on the same interactive surface, with the video windows positioned on top of or overlaying the whiteboard session window. The visual layout shown in these figures is entirely consistent with the overlaid window arrangement claimed in the '487 Patent—video content from remote participants is displayed in a window or region that is layered above the underlying whiteboard workspace.

185. Because Gurevich presents videoconference video within a window on the interactive surface 42 while whiteboard content is also displayed, this constitutes overlaying a videoconference window on the whiteboard session window. The transparency controls disclosed in Gurevich further confirm the layering relationship—transparency would be meaningful when the video is layered on top of the whiteboard content. Specifically, Gurevich discloses adjusting the transparency of video elements relative to the underlying content, which is a graphical operation that has meaning when two visual layers are superimposed in a

z-order stack with one layer on top of another. If the video and whiteboard occupied completely separate regions of the screen with no overlap, transparency adjustment would serve little purpose because there would be no underlying content to see through the video layer. The existence of transparency controls in Gurevich's system supports the conclusion that the video windows are overlaid on the whiteboard session window in a layered z-order arrangement. This is the same type of overlaid window architecture claimed in the '487 Patent, implemented on SMART Board hardware using Microsoft Lync video conferencing software.

186. Gurevich's disclosure of transparency adjustment functionality "to highlight the visibility of the input annotations" explicitly confirms that the video content is displayed on top of the whiteboard content in a layered arrangement. EX1005, ¶[0067]. The purpose of adjusting transparency is to allow the underlying whiteboard annotations to "show through" the overlaid video content—this is only possible when the video is positioned above the whiteboard in the display z-order, creating a layered composition in which the video window is overlaid on the whiteboard session window. The phrase "to highlight the visibility of the input annotations" indicates that annotations created on the whiteboard are positioned below the video layer and that reducing the opacity of the video layer makes these annotations more visible to the user. This explicitly confirms the overlaid spatial relationship between the videoconference video and the whiteboard session content.

The transparency feature is a user-adjustable control that allows participants to balance the visibility of video content against the visibility of whiteboard content based on their current needs—when the whiteboard content is more important, they can increase video transparency; when the video is more important, they can decrease transparency. This functionality is only meaningful in an overlaid window arrangement.

187. Thus, a POSITA would have understood that Gurevich’s presentation of videoconference video in windows on the interactive surface 42 while the whiteboard session content remains visible, combined with the transparency controls that confirm the layered z-order relationship between video and whiteboard content, constitutes a “videoconference window overlaid on the interactive whiteboard session window” as recited in claims 1[g], 8[c], and 15[c] of the ’487 Patent. The overlaid relationship is confirmed by multiple disclosures in Gurevich: the simultaneous display of video and whiteboard content on the same surface, the configurable positioning of video windows within the whiteboard display area, the transparency controls that adjust video opacity relative to underlying whiteboard content, and the figures showing video overlaid on the whiteboard workspace. Together, these disclosures support the conclusion that Gurevich’s system displays videoconference windows overlaid on the interactive whiteboard session window as claimed in the ’487 Patent.

10. [Claims 2/9/16] “wherein the videoconference window displays at least content from a device of a participant of the video conference session”

188. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 2, 9, and 16 of the '487 Patent. These claims require that the videoconference window displays at least content from a device of a participant of the video conference session. Gurevich explicitly discloses that when a conference session is established between local site 22 and remote sites 24 and 26, the host conferencing applications on computing devices 30, 50, and 70 allow “audio, video and data to be shared between the local and remote sites.” EX1005, ¶[0045]. Remote site 24 includes computing device 50 with video camera 54 and participant 62; remote site 26 includes computing device 70 with video camera 76 and participants 84 and 86. EX1005, ¶¶[0038]-[0039], [0047]. The shared image on interactive surface 42 may include “video captured by the video cameras 54 and 76 and/or other data received from the computing devices 50 and 70.” EX1005, ¶[0045]. The incoming video streams from remote sites are handled by the Lync 2010 video application component and then processed by the video interface application component for display on interactive surface 42. EX1005, ¶¶[0050]-[0053]. Thus, the videoconference window displays content from devices of conference participants—specifically, video captured by cameras at the remote

participants' locations, transmitted through the Lync conferencing infrastructure, and presented within the video windows on the interactive surface.

189. Displaying video content received from remote participants is a purpose of videoconferencing systems and was a known feature before the priority date. The claim limitation that the videoconference window “displays at least content from a device of a participant” describes receiving and displaying video from remote cameras. Gurevich's explicit disclosure of receiving video from cameras 54 and 76 at remote sites and displaying that video on the interactive surface satisfies this limitation.

190. Thus, a POSITA would have understood that Gurevich's disclosure of displaying video content from remote participants' cameras on the interactive surface 42 satisfies the requirement that the videoconference window displays content from a device of a participant of the video conference session. EX1005, ¶¶[0045], [0051]-[0053]. Claims 2, 9, and 16 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

11. **[Claims 3/10/17] “after the videoconference window being overlaid on the interactive whiteboard session window, display a second selection menu to receive an instruction for stopping the video conference session**

**overlaid on the interactive whiteboard session
window”**

191. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 3, 10, and 17 of the '487 Patent. These claims require that, after the videoconference window is overlaid on the interactive whiteboard session window, a second selection menu is displayed to receive an instruction for stopping the video conference session. Gurevich recognizes that third-party video applications like Microsoft Lync display video within native user interfaces including “windows, borders, selectable control buttons and other GUI elements.” EX1005, ¶[0004]. Gurevich solves this problem by separating Lync video from its native presentation interface and presenting it within an alternative presentation interface customized for the interactive board. EX1005, ¶¶[0050]-[0053]. This alternative interface includes “GUI elements such as selectable control elements.” EX1005, ¶[0053]. Tool bar 172 provides selectable control elements with icons 174. EX1005, ¶[0057]. Tool bar 210 provides selectable control elements 212 including controls for “removing a video stream from the video strip.” EX1005, ¶[0059]. A POSITA would have understood that such selectable controls include a control for stopping the videoconference session.

192. In addition, considering Saleh-502’s disclosure from the knowledge and perspective of a POSITA, this limitation is rendered obvious in view of Saleh-

502. Saleh-502 discloses overlaid menu 310 with a Hang-Up button; selecting the Hang-Up button “can end a videoconference call or can bring up a hang-up dialog on screen 202 if there is more than one call currently active.” EX1004, 11:5-33. Saleh-502 further discloses a call control screen 538 with a “hang up icon for terminating the call,” and “[t]ouching the hang up icon will terminate the call and can return the user to the home screen or the screen displayed prior to the call.” EX1004, 18:48-59. Incorporating Saleh-502’s known Hang-Up button into Gurevich’s overlaid tool bar interface provides the claimed stop-videoconference selection menu functionality. A POSITA would have been motivated to include a call termination control in Gurevich’s alternative presentation interface because the ability to end a call is an expected feature of a videoconferencing system.

193. Providing call termination controls is an expected user interface element in telephone, videoconference, and communication applications. A hang-up control is a basic feature of a communication application. A videoconference system would ordinarily provide users a mechanism to end the call. The inclusion of such a control in an overlaid menu—where it is accessible during the session—is a predictable design choice and does not require inventive effort.

194. Thus, a POSITA would have understood that Gurevich’s selectable control elements in tool bars 172 and 210, combined with Saleh-502’s expressly disclosed Hang-Up button available on the overlaid menu 310, satisfy the

requirement for a second selection menu to receive an instruction for stopping the video conference session. Claims 3, 10, and 17 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

12. [Claims 4/11/18] “after the videoconference window being overlaid on the interactive whiteboard session window, maintain the videoconference window on top of the interactive whiteboard session window during the video conference session”

195. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 4, 11, and 18 of the '487 Patent. These claims require that the videoconferencing window is maintained on top of the interactive whiteboard window during a videoconferencing session. Gurevich discloses that interactive surface 42 displays a shared whiteboard image that includes video from remote cameras and data from remote computing devices. EX1005, ¶[0045]. The video interface application component presents incoming video streams on the same interactive surface within the alternative presentation interface. EX1005, ¶¶[0050]-[0053], [0064]. Video is presented in a “smaller window centered or positioned at alternative location on interactive surface 42.” EX1005, ¶[0053]. The system supports simultaneous presentation of multiple video streams in panels or panes of a video strip. EX1005, ¶¶[0058]-[0059]. This shows that the

videoconference window is maintained as visible on top of the shared whiteboard workspace throughout the duration of the session, as confirmed by Gurevich's FIGS. 3a-c, 5a-c, 6a-b, 7a-b, 8a-b, 9, 10a-b, and 11a-b.

196. In addition, considering Gurevich's disclosures from the knowledge and perspective of a POSITA, a POSITA would have understood that maintaining the videoconference window on top during the session was a predictable design choice. Gurevich's interface includes transparency controls and adjustments in response to user interaction, including increasing transparency when a participant inputs annotations on the interactive surface. EX1005, ¶¶[0059], [0064], [0067]. These transparency controls demonstrate that the video windows remain overlapping with the whiteboard content throughout the session—the system manages relative visibility between the two layers rather than removing one or the other. The simultaneous display of video windows on top of whiteboard content is the default state of Gurevich's system during an active conference.

197. Maintaining video on top during a session is standard windowing behavior that ensures the user can see both the video and the underlying content simultaneously. Removing the videoconference window from the top of the display stack while the call is still active would be counterintuitive, as it would eliminate the user's ability to see their remote collaborators. In my experience with

videoconferencing systems, video generally remains visible during an active call unless the user changes the display state.

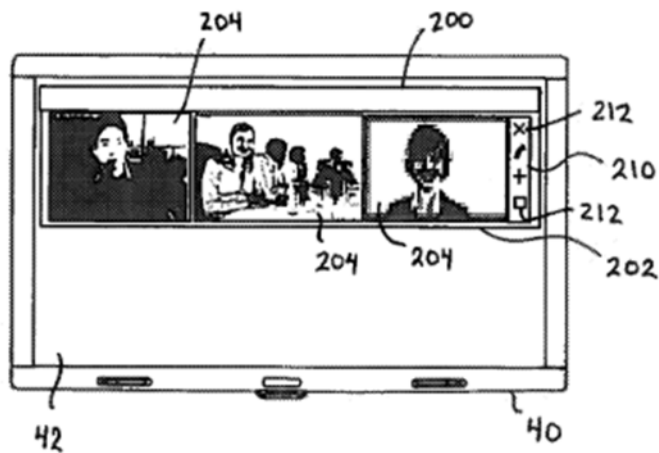


FIG. 6a

EX1005, FIG. 6a

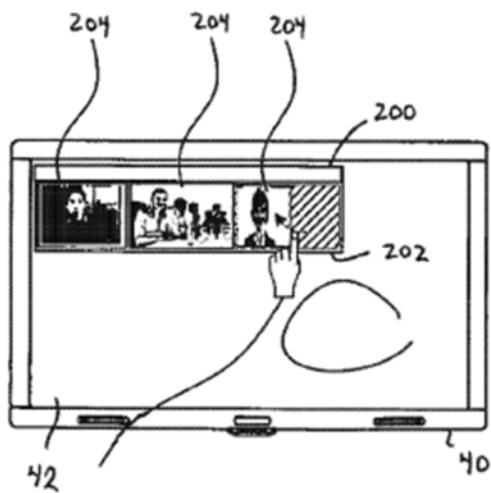


FIG. 8a

EX1005, FIG. 8a

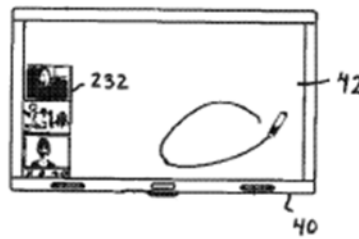


FIG. 9

EX1005, FIG. 9

198. Thus, a POSITA would have understood that Gurevich's presentation of video windows on top of the shared whiteboard workspace throughout the conferencing session, with transparency controls confirming the persistent layered relationship, satisfies the requirement that the videoconferencing window is maintained on top of the interactive whiteboard window during the session. Claims 4, 11, and 18 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

13. [Claims 5/12/19] “after the video conference session ends, move the interactive whiteboard session window on top of the videoconference window”

199. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 5, 12, and 19 of the '487 Patent. These claims require that processing of the instructions further causes the interactive whiteboard session window to be moved on top of the videoconference window in

response to termination of the video conference session. Gurevich discloses that interactive surface 42 presents the shared whiteboard image during the conference session. EX1005, ¶[0045]. Video streams are presented within the alternative presentation interface, and selectable controls may “remov[e] a video stream from the video strip.” EX1005, ¶¶[0053], [0059]. Where video is removed or the videoconference is ended, the underlying shared whiteboard image remains as the principal content on interactive surface 42. EX1005, ¶[0045]. The system is designed so that the video interface application presents video customized for the interactive board while the IB application component continues providing the shared whiteboard workspace. EX1005, ¶¶[0042], [0050]-[0053]. Once the videoconference window is removed or stopped, restoring the whiteboard to the foreground is the natural and predictable system behavior.

200. In addition, considering Saleh-502’s disclosure from the knowledge and perspective of a POSITA, a POSITA would have understood to apply this same behavior in Gurevich’s system. Saleh-502 explicitly teaches that touching the hang-up icon “will terminate the call and can return the user to the home screen or the screen displayed prior to the call.” EX1004, 18:65-19:1. Where the user was in whiteboard mode prior to starting the videoconference, the system returns to displaying whiteboard content after the call is terminated because the whiteboard was the “screen displayed prior to the call.” A POSITA would have found it obvious

to apply this same behavior in Gurevich's system—when the videoconference ends, the whiteboard session window returns to the foreground.

201. This behavior reflects standard window management in graphical operating systems: when a foreground application is closed or terminated, the background application that was previously visible returns to the foreground. This windowing behavior has existed since at least Windows 3.1 in 1992. The Z-order stack maintained by the window manager automatically promotes the next window when the topmost window is closed. This behavior is part of the operating system's window management subsystem.

202. Thus, a POSITA would have understood that restoring the whiteboard to the foreground upon termination of the videoconference session is the natural and predictable behavior of both Gurevich's system and any standard windowed computing environment. Claims 5, 12, and 19 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

14. [Claims 6/13/20] “share the interactive whiteboard session window via a collaboration library during the video conference session”

203. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 6, 13, and 20 of the '487 Patent. These claims require that processing of the instructions further causes an interactive

whiteboard session to be shared with one or more client devices external to the whiteboard device by invoking functionality provided by a collaboration library on the whiteboard device. Gurevich discloses that host conferencing applications on computing devices 30, 50, and 70 allow “audio, video and data to be shared between the local and remote sites.” EX1005, ¶¶[0041], [0045]. Interactive surface 42 presents a shared image that is also displayed at remote sites including display screen 52 and interactive surface 82. EX1005, ¶[0045]. The shared image includes application windows, annotations input by local and remote participants, video, and other data. EX1005, ¶¶[0045]-[0047]. The host conferencing application further includes a data conferencing application component that transmits and receives data such as images and annotations between the local and remote sites. EX1005, ¶¶[0041], [0043]. This discloses sharing the whiteboard session with external client devices.

204. Gurevich also renders obvious the “collaboration library” limitation. Gurevich discloses that the video application component vendors provide SDKs and APIs for integration, and specifically identifies the Lync 2010 video application as the component used. EX1005, ¶[0042]. The host conferencing application comprises “program modules, routines, object components, [and] data structures” stored on non-transitory computer-readable media. EX1005, ¶[0079]. A POSITA would have understood that these SDK and API disclosures teach invoking collaboration

functionality through a library—the Microsoft Lync SDK is, by definition, a collaboration library that provides programmatic interfaces for controlling conferencing functionality. EX1005, ¶¶[0041]-[0042], [0079].

205. Sharing whiteboard content over a network using collaboration libraries is the core functionality that distinguishes networked whiteboards from standalone whiteboards. The Microsoft Lync SDK was publicly available, providing developers with pre-built libraries for implementing content-sharing, video conferencing, and presence features.

206. Thus, a POSITA would have understood that Gurevich’s disclosure of sharing whiteboard content with remote sites through the conferencing application architecture, combined with the use of SDKs and APIs from the Lync platform, satisfies the requirement that the interactive whiteboard session is shared by invoking functionality provided by a collaboration library. Claims 6, 13, and 20 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

15. [Claims 7/14] “a selection menu change when switching between the interactive whiteboard session window and the videoconference window”

207. It is my opinion that the combination of Gurevich and Saleh-502 renders obvious the limitations of dependent claims 7 and 14 of the ’487 Patent. These claims require that processing of the instructions further causes the selection

menu to be updated in response to detecting a user selection of a particular control on the selection menu for switching between an interactive whiteboard session and the video conference session. Gurevich discloses that the alternative presentation interface includes GUI elements and selectable control elements to alter video stream display. EX1005, ¶[0053]. Tool bar 172 provides selectable control elements and participant icons. EX1005, ¶[0057]. Tool bar 210 provides controls for “removing a video stream from video strip, changing transparency of presentation interface.” EX1005, ¶[0059]. The interface responds dynamically to user interaction: a participant may select and drag video panels to alter their order, initiate a private chat by a gesture that minimizes the video stream, and input annotations causing the video interface to become more transparent. EX1005, ¶¶[0060]-[0061], [0067]. This teaches that the interface—including its selectable controls—updates dynamically in response to user selections and interactions.

208. Gurevich’s purpose is to provide a video presentation interface that is better integrated with the whiteboard application, with selectable controls and dynamic interface changes in response to user selections and interactions. EX1005, ¶¶[0004], [0053], [0057], [0059]. In addition, considering Saleh-502’s disclosure from the knowledge and perspective of a POSITA, this limitation is rendered obvious in view of Saleh-502. Saleh-502 discloses menu controls for Call, Hang-Up, Cameras, and a call control screen whose icons change based on system state—

specifically, a “Show Presentation” icon is replaced with a “stop presentation icon” when the user begins sharing a presentation. EX1004, 11:5-33, 20:13-37. Saleh-502 further teaches switching between operational modes using SMART Board controls. EX1004, 9:33-54. A POSITA would have found it obvious to apply Saleh-502’s dynamic menu updating and mode-switching controls to Gurevich’s Lync-whiteboard interface, because contextual menu updating is a principle of UI design that ensures users are presented with relevant options at each stage of their workflow. EX1005, ¶¶[0053], [0057], [0059]; EX1004, 9:33-54, 20:55-60.

209. Updating menu options dynamically based on application state is a principle of graphical user interface design. Office applications, web browsers, and mobile applications provide examples of menus or toolbars that change based on context or mode. A POSITA designing an integrated whiteboard-videoconference interface would have implemented dynamic menu updating as a matter of routine design practice, because presenting relevant options at the appropriate stage of the workflow improves usability.

210. Thus, a POSITA would have understood that Gurevich’s dynamic interface responses to user selections, combined with Saleh-502’s expressly disclosed state-dependent menu updating and mode-switching controls, satisfy the requirement that the selection menu is updated in response to detecting a user selection for switching between whiteboard and videoconference sessions. Claims 7

and 14 are therefore rendered obvious by the combination of Gurevich and Saleh-502.

IX. CONCLUSION

211. It is my opinion that the Challenged Claims—claims 1–20 of U.S. Patent No. 10,904,487—are unpatentable under 35 U.S.C. §§ 102 and 103 and should be canceled pursuant to 35 U.S.C. § 318(b).

* * *

212. 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: June 30, 2026



Dr. Kevin C. Almeroth

Appendix A

Kevin C. Almeroth

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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

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

62. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[A Practical Framework for 802.11 MIMO Rate Adaptation](#)," *Computer Networks*, vol. 83, num. 6, pp. 332-348, June 2015.
61. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[Intelligent Channel Bonding in 802.11n WLANs](#)," *IEEE Transactions on Mobile Computing*, vol. 13, num. 6, pp. 1242-1255, June 2014.
60. H. Zhang and K. Almeroth, "[Alternatives for Monitoring and Limiting Network Access to Students in Network-Connected Classrooms](#)," *Journal of Interactive Learning Research (JILR)*, vol. 24, num. 3, pp. 237-265, July 2013.
59. M. Tavakolifard and K. Almeroth, "[A Taxonomy to Express Open Challenges in Trust and Reputation Systems](#)," *Journal of Communications*, vol. 7, num. 7, pp. 538-551, July 2012.
58. M. Tavakolifard and K. Almeroth, "[Social Computing: An Intersection of Recommender Systems, Trust/Reputation Systems, and Social Networks](#)," *IEEE Network*, vol. 26, num. 4, pp. 53-58, July/August 2012.
57. M. Tavakolifard, K. Almeroth, and P. Ozturk, "[Subjectivity Handling of Ratings for Trust and Reputation Systems: An Abductive Reasoning Approach](#)," *International Journal of Digital Content Technology and its Applications (JDCTA)*, vol. 5, num. 11, pp. 359-377, November 2011.
56. R. Raghavendra, P. Acharya, E. Belding and K. Almeroth, "[MeshMon: A Multi-Tiered Framework for Wireless Mesh Network Monitoring](#)," *Wireless Communications and Mobile Computing (WCMC) Journal*, vol. 11, num. 8, pp. 1182-1196, August 2011.
55. A. Knight and K. Almeroth, "[Automatic Plagiarism Detection with PAIRwise 2.0](#)," *Journal of Interactive Learning Research (JILR)*, vol. 22, num. 3, pp. 379-400, July 2011.
54. V. Kone, M. Zheleva, M. Wittie, B. Zhao, E. Belding, H. Zheng, and K. Almeroth, "[AirLab: Consistency, Fidelity and Privacy in Wireless Measurements](#)," *ACM Computer Communications Review*, vol. 41, num. 1, pp. 60-65, January 2011.
53. G. Swamynathan, K. Almeroth, and B. Zhao, "[The Design of a Reliable Reputation System](#)," *Electronic Commerce Research Journal*, vol. 10, num. 3-4, pp. 239-270, December 2010.
52. P. Acharya, A. Sharma, E. Belding, K. Almeroth and K. Papagiannaki, "[Rate Adaptation in Congested Wireless Networks through Real-Time Measurements](#)," *IEEE Transactions on Mobile Computing*, vol. 9, num. 11, pp. 1535-1550, November 2010.
51. R. Raghavendra, E. Belding, K. Papagiannaki, and K. Almeroth, "[Unwanted Link Layer Traffic in Large IEEE 802.11 Wireless Networks](#)," *IEEE Transactions on Mobile Computing*, vol. 9, num. 9, pp. 1212-1225, September 2010.
50. H. Zhang and K. Almeroth, "[Moodog: Tracking Student Activity in Online Course Management Systems](#)," *Journal of Interactive Learning Research (JILR)*, vol. 21, num. 3, pp. 407-429, July 2010.
49. R. Chertov and K. Almeroth, "[Qualitative Comparison of Link Shaping Techniques](#)," *International*

48. A. Knight and K. Almeroth, "[Fast Caption Alignment for Automatic Indexing of Audio](#)," International Journal of Multimedia Data Engineering and Management, vol. 1, num. 2, pp. 1-17, April-June 2010.
47. K. Harras and K. Almeroth, "[Scheduling Messengers in Disconnected Clustered Mobile Networks](#)," Ad Hoc & Sensor Wireless Networks, vol. 9, num. 3-4, pp. 275-304, March-April 2010.
46. A. Jardosh, K. Papagiannaki, E. Belding, K. Almeroth, G. Iannaccone, and B. Vinnakota, "[Green WLANs: On-Demand WLAN Infrastructures](#)," ACM Journal on Mobile Networks and Applications (MONET), vol. 14, num. 6, pp. 798-814, December 2009.
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38. I. Sheriff, K. Ramachandran, E. Belding, and K. Almeroth, "[A Multi-Radio 802.11 Mesh Network Architecture](#)," ACM Journal on Mobile Networks and Applications (MONET), vol. 13, num. 1-2, pp. 132-146, April 2008.
37. M. Bulger, R. Mayer, K. Almeroth, and S. Blau, "[Measuring Learner Engagement in Computer-Equipped College Classrooms](#)," Journal of Educational Multimedia and Hypermedia, vol. 17, num. 2, pp. 129-143, April 2008.
36. G. Swamynathan, B. Zhao, and K. Almeroth, "[Exploring the Feasibility of Proactive Reputations](#)," Concurrency and Computation: Practice and Experience, vol. 20, num. 2, pp. 155-166, February 2008.
35. G. Swamynathan, B. Zhao, K. Almeroth, and H. Zheng, "[Globally Decoupled Reputations for Large Distributed Networks](#)," Advances in Multimedia, vol. 2007, pp. 1-14, 2007.

34. R. Mayer, A. Stull, J. Campbell, K. Almeroth, B. Bimber, D. Chun and A. Knight, "[Overestimation Bias in Self-reported SAT Scores](#)," Educational Psychology Review, vol. 19, num. 4, pp. 443-454, December 2007.
33. P. Namburi, K. Sarac and K. Almeroth, "[Practical Utilities for Monitoring Multicast Service Availability](#)," Computer Communications Special Issue on Monitoring and Measurement of IP Networks, vol. 29, num. 10, pp. 1675-1686, June 2006.
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29. A. Garyfalos and K. Almeroth, "[A Flexible Overlay Architecture for Mobile IPv6 Multicast](#)," Journal on Selected Areas in Communications (JSAC) Special Issue on Wireless Overlay Networks Based on Mobile IPv6, vol. 23, num. 11, pp. 2194-2205, November 2005.
28. K. Sarac and K. Almeroth, "[Monitoring IP Multicast in the Internet: Recent Advances and Ongoing Challenges](#)," IEEE Communications, vol. 43, num. 10, pp. 85-91, October 2005.
27. K. Sarac and K. Almeroth, "[Application Layer Reachability Monitoring for IP Multicast](#)," Computer Networks, vol. 48, num. 2, pp. 195-213, June 2005.
26. A. Jardosh, E. Belding, K. Almeroth and S. Suri, "[Real-world Environment Models for Mobile Network Evaluation](#)," Journal on Selected Areas in Communications Special Issue on Wireless Ad hoc Networks, vol. 23, num. 3, pp. 622-632, March 2005.
25. S. Rollins and K. Almeroth, "[Evaluating Performance Tradeoffs in a One-to-Many Peer Content Distribution Architecture](#)," Journal of Internet Technology, vol. 5, num. 4, pp. 373-387, Fall 2004.
24. K. Sarac and K. Almeroth, "[Tracetree: A Scalable Mechanism to Discover Multicast Tree Topologies in the Network](#)," IEEE/ACM Transactions on Networking, vol. 12, num. 5, pp. 795-808, October 2004.
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22. P. Rajvaidya, K. Ramachandran and K. Almeroth, "[Managing and Securing the Global Multicast Infrastructure](#)," Journal of Network and Systems Management, vol. 12, num. 3, pp. 297-326, September 2004.
21. P. Rajvaidya and K. Almeroth, "[Multicast Routing Instabilities](#)," IEEE Internet Computing, vol. 8, num. 5, pp. 42-49, September/October 2004.
20. D. Johnson, R. Patton, B. Bimber, K. Almeroth and G. Michaels, "[Technology and Plagiarism in the University: Brief Report of a Trial in Detecting Cheating](#)," Association for the Advancement of Computing in Education (AACE) Journal, vol. 12, num. 3, pp. 281-299, Summer 2004.

19. R. Chalmers and K. Almeroth, "[A Security Architecture for Mobility-Related Services](#)," Journal of Wireless Personal Communications, vol 29, num. 3, pp. 247-261, June 2004.
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17. S. Rollins and K. Almeroth, "[Lessons Learned Deploying a Digital Classroom](#)," Journal of Interactive Learning Research (JILR), vol. 15, num. 2, pp. 169-185, April 2004.
16. S. Jagannathan and K. Almeroth, "[A Dynamic Pricing Scheme for E-Content at Multiple Levels-of-Service](#)," Computer Communications, vol. 27, num. 4, pp. 374-385, March 2004.
15. K. Almeroth, "[Using Satellite Links in the Delivery of Terrestrial Multicast Traffic](#)," Internetworking and Computing over Satellites, Kluwer Academic Publishers, 2003.
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13. S. Jagannathan, J. Nayak, K. Almeroth, and M. Hofmann, "[On Pricing Algorithms for Batched Content Delivery Systems](#)," Electronic Commerce Research and Applications Journal, vol. 1, num. 3-4, pp. 264-280, Fall 2002.
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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)*,

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 the well-known 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. Working

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.

- "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 Technical Meeting

sponsored by the National Center for Network Engineering (NLNR), 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. Flanagin 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

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

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

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: 1995-1997

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

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:

- Trial testimony in Two Way Media LTD v. Telefonica (517/2017-X, Barcelona, Spain). 12/2015-05/2022.
- A deposition and claim construction hearing testimony in Peloton Interactive, Inc. v. Icon Health and Fitness, Inc. (1:20-cv-00662-RGA, D. Del.). 10/2020-05/2022.
- Depositions in Icon Health and Fitness, Inc. v. Peloton Interactive, Inc. (20-1386-RGA, D. Del.). 10/2020-05/2022.
- A deposition and hearing testimony in UMG Recordings, Inc., et al. v. Bright House Networks, LLC (8:19-cv-00710-MSS-TGW, M. D. Fla.). 11/2019-05/2022.
- 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; Winstrom 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. Oxyllabs, 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.