

IPR2024-00809

Declaration of Henry Houh, Ph.D. Under 37 C.F.R. § 1.68 in Support of
Petitioner's Reply To Patent Owner's Response for *Inter Partes* Review of U.S.
Patent Nos. 9,198,042

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS,
T-MOBILE USA, INC.,
AT&T SERVICES INC., AT&T MOBILITY LLC, AND AT&T CORPORATION
Petitioners,

v.

HEADWATER PARTNERS I LLC.
Patent Owner.

U.S. Patent No. 9,198,042
Title: SECURITY TECHNIQUES FOR DEVICE ASSISTED SERVICES

Inter Partes Review No.: IPR2024-00809

DECLARATION OF HENRY HOUH, Ph.D., UNDER 37 C.F.R. § 1.68 IN
SUPPORT OF PETITIONER'S REPLY TO PATENT OWNER'S
RESPONSE

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Petition for *Inter Partes* Review of U.S. Patent Nos. 9,198,042

Petitioner's Exhibit List

<i>Exhibit #</i>	<i>Description</i>
1001	U.S. Patent No. 9,198,042 (“the ’042”)
1002	Prosecution history of the ‘042 (“’042 File History”)
1003	Declaration of Petitioner’s Expert Petitioners expert, Dr. Henry Houh
1004	U.S. Publication No. 2007/0006289 (“Limont”)
1005	U.S. Publication No. 2004/0123153 (“Wright”)
1006	U.S. Publication No. 2006/0183461 (“Pearce”)
1007	U.S. Publication No. 2007/0288989 (“Aarnos”)
1008	U.S. Publication No. 2007/0104169 (“Polson”)
1009	Arm TrustZone Microprocessor Reports
1010	Arm TrustZone Papers
1011	U.S. Publication No. 2006/0112427
1012	U.S. Pat. No. 7,849,310
1013	Limont Prosecution History Excerpts (Application No. 11/171,850)

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<i>Exhibit #</i>	<i>Description</i>
1014	U.S. Publication No. 2006/0224742A1
1015	U.S. Publication No. 2009/0265754
1016	U.S. Publication No. 2007/0061535 ("Xu")
1017	U.S. Pat. No. 8,064,417
1018	U.S. Pat. No. 7,672,695
1019	U.S. Pat. No. 7,881,267
1020	U.S. Publication No. 2008/0244018
1021	Plaintiff's Infringement Contention (Verizon case)
1022	Docket Control Order
1023	List of Related Applications
1024	Declaration of Dr. Henry H. Houh in support of Petitioner's Reply To Patent Owner's Response

I, Henry Houh, Ph.D. hereby declare as follows:

I. INTRODUCTION

1. I have been retained as an expert witness on behalf of Cellco Partnership d/b/a Verizon Wireless, T-Mobile USA, Inc., AT&T Services Inc., AT&T Mobility LLC, and AT&T Corporation (collectively, "Petitioners") for the above-captioned Petition(s) for *Inter Partes* Review ("IPR") of claims 1-18 of U.S. Patent No. 9,148,042 ("the '042 patent") (the Challenged Claims).¹ I am being compensated for my time in connection with this IPR at my standard consulting rate of \$820 per hour. My compensation is in no way dependent on the outcome of this matter.

2. I have been asked to provide my opinions regarding whether the Challenged Claims are unpatentable as obvious. I previously provided a declaration in support of the Petition for this matter. In this declaration, I address certain arguments presented by the Patent Owner and its expert in the Patent Owner's Response.

¹ I understand that the AT&T and T-Mobile petitioners are no longer involved in this proceeding and this present declaration is on behalf of Cellco Partnership d/b/a Verizon Wireless.

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Patent Nos. 9,198,042

3. In preparing this declaration, I have reviewed the '042 patent, the file history of the '042 patent, and numerous prior art references from the time of the alleged invention as well as the materials and exhibits submitted by the Petitioners and Patent Owner in this proceeding.

4. In forming the opinions expressed in this declaration, I relied upon my education and experience in the relevant field of the art, and have considered the viewpoint of a person having ordinary skill in the relevant art, as of January 2009.

5. I understand that '042 claims priority through several applications with the earliest filed on January 28, 2009. My analysis as set forth below uses that date as the priority date of the '042 patent and the Challenged Claims.

6. My opinions directed to the unpatentability of the challenged claims are based, at least in part, on the following prior art publications:

Reference	Date of Public Availability
Limont, U.S. Patent Publication No. 2007/0006289	Limont published on January 4, 2007 from an application filed on June 30, 2005 ("Limont") (EX-1004). Limont is prior art

	under at least the pre-AIA version of 35 U.S.C. § 102(a), (b), (e), and (g). Limont is attached as Exhibit 1004 to the IPR.
Wright, U.S. Patent Publication No. 2004/0123153	Wright published on June 24, 2004 from an application filed on April 11, 2003 (“Wright”) (EX-1005). Wright is prior art under at least pre-AIA version of 35 U.S.C. § 102(a), (b) (e), and (g). Wright is attached as Exhibit 1005 to the IPR.
Xu, U.S. Patent Publication No. 2007/0061535	Xu published on March 15, 2007 from an application filed on September 12, 2005 (“Xu”) (EX-1016). Xu is prior art under at least pre-AIA version of 35 U.S.C. § 102(a), (b) € and (g). Xu is attached as Exhibit 1016 to the IPR.

Polson, U.S. Patent Publication No. 2007/0104169	Polson published on March 15, 2007 from an application filed on September 12, 2005 ("Polson") (EX-1008). Polson is prior art under at least pre-AIA version of 35 U.S.C. § 102(a), (b) (e) and (g). Xu is attached as Exhibit 1008 to the IPR.
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II. BACKGROUND AND QUALIFICATIONS

7. My background and expertise that qualify me as an expert in the technical issues in this case are as follows:

8. As indicated on my *Curriculum Vitae* attached as **Exhibit A**, I received a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology ("MIT") in 1998. I also received a Master of Science degree in Electrical Engineering and Computer Science in 1991, a Bachelor of Science Degree in Electrical Engineering and Computer Science in 1989, and a Bachelor of Science Degree in Physics in 1990, all from MIT.

9. During my college studies, I focused on communications and data networking. I took specialized courses including graduate courses in telecommunications networks, optical communications, and data networking. I, along with other graduate students in a networking research group, maintained both the computer workstations and the networking devices in the research group.

10. I also served as a teaching assistant for the Computation Structures core course a number of times. At the time, the course involved teaching computer architecture at a low level, and the laboratory component involved building a CPU from discrete components at the gate level and higher. When I was enrolled in this course as an undergraduate student, I redesigned the hardware and software, including microcode and nanocode of this CPU, to achieve an average speed up of roughly thirty times. Based in part on this, I became a laboratory assistant, head laboratory assistant, and then a teaching assistant in my second term senior year, which is unusual in that teaching assistantships at MIT are normally reserved for graduate students. I further became head teaching assistant and also taught some recitation sections.

11. As part of my doctoral research at MIT from 1991-1998, I worked as a research assistant in the Telemedia Network Systems ("TNS") group at the Laboratory for Computer Science. The TNS group built a high-speed gigabit ATM

network and applications which ran over the network, such as remote video capture (including audio), processing and display on computer terminals. In addition to helping design the core network components (such as the ATM switch), designing and building the high-speed ATM links, and designing and writing the device drivers for the interface cards, I also set up the group's web server, which at the time was one of the first several hundred web servers in existence. I used programmable logic devices, such as programmable array logic and field programmable gate arrays, and their software development environments, in the design of these components. Our high-speed data network carried multimedia data including video and audio data within ATM cells.

12. The TNS group was the first group to initiate a remote video display over the World Wide Web. Vice President Al Gore visited our group in 1996 and received a demonstration of—and remotely drove—a radio-controlled toy car with a wireless video camera mounted on it; the video was encoded by TNS-designed hardware, streamed over the TNS-designed network and displayed using TNS-designed software. During this time, I also modified a web server to determine the location of client, and present different web pages depending on location.

13.I authored or co-authored twelve papers and conference presentations on our group's research. I also co-edited the final report of the gigabit networking research effort with Professor David Tennenhouse and Senior Research Scientist David Clark. David Clark is generally considered to be one of the fathers of the Internet Protocol and served as Chief Protocol Architect for the Internet. With its focus on networking, the group, including myself, set up and maintained the network and computer systems. These systems included the networking on the workstations and desktops, the distributed file system, desktops and workstations, setting up and maintaining the distributed file system (Network File System) and the authentication system (Network Information Service, formerly known as Yellow Pages). Our system allowed users to log into any of the group's workstations using their username/password, which allowed that all of the user's files would be virtually mounted on that workstation as a networked home directory.

14.I defended and submitted my Ph.D. thesis, titled "Designing Networks for Tomorrow's Traffic," in January 1998. As part of my thesis research, I analyzed local-area and wide-area flows to show a more efficient method for routing packets in a network, based on traffic patterns at the time. My thesis also addressed real-time

streamed audio and video. The network traffic that I analyzed was IP protocol traffic, including UDP and TCP.

15.I have been involved in Voice over Internet Protocol (“VoIP”) technologies since 1997 and have specific experience in designing and testing VoIP networks.

16.From 1997 to 1999, I worked at NBX Corporation, which was acquired by 3Com Corporation in 1999. During this time, I was a Senior Scientist and Engineer working in IP Telephony. NBX delivered the world's first fully featured business telephone system to run over a data network, the NBX100. NBX was one of the first business phone systems to be configurable via a web interface. Users and administrators had access to varying levels of configuration for the phone system.

17.As part of my work at NBX, I designed the core audio reconstruction algorithms for the telephones which depacketized the voice data and reconstructed the audio. In addition, I designed the voice data packet transmission algorithms. I created a system to capture and analyze network packets sent by devices in the NBX system for aid in testing and debugging. I also designed and validated the core packet transport protocol used by the phone system. In addition, I designed and oversaw the development of the underlying transport protocol used by the NBX100 phone system for reliable packet transport. That transport protocol is still used by

the NBX100 system and its successors and is estimated to be used hundreds of millions of times daily. I wrote NBX's first demonstration IP software stack, which added the capability for utilizing the NBX100 phone system on an IP network. NBX first demonstrated a phone in the NBX100 system working over the Internet in 1998 at a trade show in Las Vegas. I was later the lead architect in designing NBX's next-generation highly scalable system, and, after NBX was acquired by 3Com, I did some work with 3Com's cable equipment division, including demonstrating a working NBX IP phone system over 3Com's cable equipment infrastructure using an early version of DOCSIS at a trade show in 1999. The NBX100 was the market's leading business phone system to run on a data network for several years following its introduction. During that time, I became more familiar with the various standards relevant to Internet telephony as well as the problems which designers of commercial telephony operations were faced with in implementing VoIP.

18.I, along with two of NBX's founders, was awarded U.S. Patent No. 6,697,963 titled "Telecommunication method for ensuring on-time delivery of packets containing time-sensitive data," for some of the work we did while at NBX.

19.After NBX, I worked at Teradyne, a test tool company primarily focused on semiconductors. Teradyne had recently acquired Hammer, a company that

specialized in load and functional testing for telecommunications systems. The Hammer product is well known as a telecom test tool. Teradyne spun out Hammer and several other internal divisions into an independent company called Empirix. I became Chief Technologist of the Hammer division of Empirix. Empirix was a leader in VoIP network testing and monitoring.

20. At Empirix, I laid out a new multi-year product vision for data network testing, secured internal funding for the effort, and led a team to deliver a new technology platform to the market in February 2001. This new product, PacketSphere, initially emulated network behavior so that wide-area VoIP connections could be tested in a lab. A later release allowed PacketSphere to generate high volumes of VoIP calls, including media streams, and to monitor the quality of VoIP voice streams. Later, the core technology was added to other Empirix products such as Empirix's Hammer XMS to monitor thousands of VoIP media streams in real time to determine their quality. PacketSphere was Empirix's most successful new platform introduction. Companies purchased the PacketSphere product to emulate an Internet Protocol network to see the effects of deploying their product on the Internet prior to launch. PacketSphere received several industry awards.

21. During my time at Empirix, I presented lectures on VoIP and data network testing to companies including Lucent Labs (formerly AT&T Bell Labs). I was also invited to present several guest lectures in a software engineering course at MIT. Since then, I have also participated twice as a unit lecturer (two weeks) in an experimental course that was taught by an Institute Professor (the highest award that a MIT Professor can achieve) and sponsored by the Chairman of the MIT Corporation (MIT's board of trustees).

22. From 2004 to 2008, I was employed by BBN Technologies Corp., a technology research and development company located in Cambridge, Massachusetts. BBN Technologies is a world-renowned company with expertise in acoustics, speech recognition, and communications technology. BBN Technologies staff have pioneered many internetworking technologies and Internet applications, and built some of the world's largest government and commercial data networks.

23. My duties and responsibilities at BBN Technologies generally included commercialization of the technologies developed by BBN Technologies, which included spinning off companies and growing commercial businesses in-house. More particularly, I was involved in utilizing the award-winning AVOKE STX speech recognition technology to create the public audio/video search engine

EveryZing (formerly known as PodZinger) which was spun out into a stand-alone company now known as RAMP, Inc. PodZinger won the 2006 MITX Technology Award for best Web 2.0 Application and was also named the 2006 Forbes Favorite Video & Audio Search Engine, beating out Google, Yahoo, and other companies. After managing the creation of the initial prototype system, PodZinger built out a full streaming audio and video search solution when I was the Vice President of Operations and Technology there. I was also involved in the Boomerang Mobile Shooter Detection project as the Vice President of Engineering for the program. The Boomerang system was deployed to Iraq and Afghanistan, and was credited with saving many lives.

24. From 1989 to 1990, I worked at AT&T Bell Laboratories on optical computers. This work generated six peer-reviewed papers, and multiple U.S. and European patent applications in which I was named as a co-author or inventor. I also interned at AT&T Bell Laboratories in 1987 and 1988. Additional relevant experience in the field of optical computers is listed in my *Curriculum Vitae*.

25. I am a named inventor on several patents and published patent applications that are related to the VoIP technology including: U.S. Patent No. 6,967,963, entitled "Telecommunication Method for Ensuring On-time Delivery of Packets Containing

Time- Sensitive Data”; U.S. Patent Application Publication No. 20020015387, entitled “Voice Traffic Packet Capture and Analysis Tool for a Data Network”; U.S. Patent Application Publication No. 20020016708, entitled “Method and Apparatus for Utilizing a Network Processor as Part of a Test System”; U.S. Patent Application Publication No. 20020016937, entitled “Method and Apparatus for Utilizing a Network Processor as Part of a Test System”; and U.S. Patent No. 7,590,542, entitled “Method of Generating Test Scripts Using a Voice-Capable Markup Language.”

26.[This paragraph left intentionally blank].

III. MATERIALS CONSIDERED FOR THIS DECLARATION

27.In addition to my general knowledge, education, and experience, I have considered all of the materials referenced in my declaration as well as the materials listed in **Exhibit B** in forming my opinions.

IV. PRIOR OPINIONS

28.Based on my review of the ‘042 patent and its prosecution history, the other materials I have considered, and my knowledge and experience, my opinions are as follows. The prior art renders the claims obvious for the ‘042 patent as identified below.

29. In my analysis herein and in my prior declaration, I have considered the various disclosures (e.g., the '042 patent, the prior art, ...) from the view of an person of ordinary skill in the art ("POSA") at the time of the invention, which I have also referenced as the "priority date" herein.

30. I have presented my opinion in my prior declaration regarding the challenged claims based on the following grounds:

Ground	Claims	Basis	Reference
1	1-2, 6-18	§ 103	Limont, Wright and optionally Xu
2	3-5	§ 103	Limont, Wright and optionally Xu with Polson

31. [This paragraph left intentionally blank].

V. OVERVIEW OF THE '042 PATENT

A. Overview of the '042 Patent.

32. The application that became the parent '899 patent was filed May 23, 2013 as non-provisional application 13/901,466. The application that became the '042

patent (14/584,897) asserts itself to be a continuation of the parent '899 patent's application.

33. At a high level, the '042 patent is generally directed to "Methods and systems for receiving a report from an end-user device, the report comprising information about a device service state; determining, based on the report, that a particular service policy setting of the end-user device needs to be modified, the particular service policy setting associated with a service profile that provides for access to a network data service over a wireless access network and configured to assist in controlling one or more communications between the end-user device and the wireless access network, the particular service policy setting stored in a protected partition configured to deter or prevent unauthorized modifications to the particular service policy setting; and, in response to determining that the particular service policy setting needs to be modified, sending configuration information to the end-user device, the configuration information configured to assist in modifying or allowing modifications to the particular service policy setting." EX-1001, Abstract.

34. The "Background of The Invention" states: "With the advent of mass market digital communications, applications and content distribution, many access networks such as wireless networks, cable networks and DSL (Digital Subscriber

Line) networks are pressed for user capacity, with, for example, EVDO (Evolution-Data Optimized), HSPA (High Speed Packet Access), LTE (Long Term Evolution), WiMax (Worldwide Interoperability for Microwave Access), DOCSIS, DSL, and Wi-Fi (Wireless Fidelity) becoming user capacity constrained. In the wireless case, although network capacity will increase with new higher capacity wireless radio access technologies, such as MIMO (Multiple-Input Multiple-Output), and with more frequency spectrum and cell splitting being deployed in the future, these capacity gains are likely to be less than what is required to meet growing digital networking demand. Similarly, although wire line access networks, such as cable and DSL, can have higher average capacity per user compared to wireless, wire line user service consumption habits are trending toward very high bandwidth applications and content that can quickly consume the available capacity and degrade overall network service experience. Because some components of service provider costs go up with increasing bandwidth, this trend will also negatively impact service provider profits.” EX-1001, 1:47-2:3.

35. The ‘042 Title is “Security techniques for device assisted services.” The ‘042 patent does not identify any specific problem that it seeks to solve nor does it characterize anything within its disclosure as solution.

36. As issued, the '042 patent includes 18 claims. I have been asked to opine on the Challenged Claims in my analysis, which I have included below:

1. A method comprising:

receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state;

determining, based on the report, that a particular service policy setting of the wireless end-user device needs to be modified, the particular service policy setting being stored in a protected partition of the wireless end-user device, the protected partition configured to deter or prevent unauthorized modifications to the particular service policy setting, the particular service policy setting being associated with a service profile that provides for access by the wireless end-user device to a network data service over a wireless access network, the particular service policy setting configured to assist in controlling one or more communications associated with the wireless end-user device over the wireless access network; and

is in response to determining that the particular service policy setting needs to be modified, sending configuration information to the wireless end-user device over the service control link, the configuration information configured to assist in modifying or allowing modifications to the particular service policy setting.

2. The method of claim 1, wherein the particular service policy setting assists in implementing a roaming control, a parental control, or an enterprise wireless wide-area network (WWAN) management control.

3. The method of claim 1, wherein the wireless end-user device is an intermediate networking device for forwarding traffic between a wireless wide-area network (WWAN) and a wireless local-area network (WLAN).

4. The method of claim 1, wherein the wireless end-user device is an intermediate networking device comprising a cellular device, the intermediate networking device for forwarding traffic between the wireless access network and a second network.

5. The method of claim 1, wherein the wireless end-user device is an intermediate networking device, and the particular service policy

setting assists one or more other end-user devices in communicating
over the wireless access network via the intermediate networking
device.

6. The method of claim 1, further comprising:

obtaining a service usage measure, the service usage measure
accounting for the one or more communications associated with
the wireless end-user device over the wireless access network;
and

based on the service usage measure, taking an action.

7. The method of claim 6, wherein the service usage measure
comprises a measure of a service usage activity.

8. The method of claim 6, wherein the action is to verify the service
usage measure.

9. The method of claim 6, wherein the action is to quarantine or
suspend the wireless end-user device.

10. The method of claim 6, further comprising obtaining secondary
information associated with the wireless end-user device, and wherein

the action is to verify the service usage measure using the secondary information.

11. The method of claim 1, further comprising receiving, from the wireless end-user device, an integrity report configured to assist a network element in identifying an access control integrity violation.

12. The method of claim 1, wherein the configuration information comprises at least a portion of the service profile.

13. The method of claim 1, wherein the service control link is secured by an encryption protocol.

14. The method of claim 1, wherein the device service state comprises a service profile setting, a service usage policy setting, or a device-assisted services (DAS) setting.

15. The method of claim 1, wherein the device service state provides information about a user preference.

16. The method of claim 1, wherein the device service state comprises information associated with an encryption key.

17. The method of claim 1, wherein the device service state comprises
an agent report, a service usage record, a transaction record, or an
integrity report.

18. The method of claim 1, wherein the device service state comprises
user status information, device status information, application status
information, a device location, or a device quality-of-service (QOS)
state.

37.[This paragraph left intentionally blank].

VI. OPINIONS

38.I have reviewed the Patent Owner's Response ("POR") and the attached
Exhibits including the Declaration Of Erik De La Inglesia In Support Of Patent
Owner's Response (EX-2032).

39.While the POR and EX-2032 take varying positions on the meaning of
"network data service," I understand the POR and EX-2032 to at least assert the
following:

A POSITA would understand that "network data service" is a term of
art, and refers to a service in which access to network data is provided.
Notably, "data" in this context is a reference to data accessibility (i.e.,

a data plan or data connectivity), as opposed to other types of network services (such as network SMS service or network voice service). Specifically, “network data service” refers to connectivity to an access network such that data service can be used, rather than specific services that might make use of such network data services.

40.EX-2032, ¶34.

41.I disagree “network data service” is a term of art and that it has a defined meaning in the art. I further disagree that “network data service” has the defined meaning that the POR and EX-2032 asserted that it does. I further disagree that “network data service” has a defined meaning particularly in the context of the ‘042 patent disclosure.

42.As an initial matter, I note that the ‘042 patent specification does not include the words “network data service.” The ‘042 patent specification also does not include the terms “network data” or “data service.” This claim term was apparently added to the ‘042 patent claim 1 and Abstract when the application leading to the ‘042 patent was filed in 2013 (claiming priority to a series of previous applications leading back to a January 2009 application).

43.I disagree with the analysis in EX-2032. I note that, as a prerequisite to the conclusion regarding the meaning of “network data service,” Dr. De La Englesia re-

defines “data” to mean something in addition to the plain meaning of “data.” EX-2032, ¶34 (“Notably, ‘data’ in this context is a reference to data accessibility (i.e., a data plan or data connectivity), as opposed to other types of network services (such as network SMS service or network voice service).”). It is certainly not the case that the term “data” would be understood to have a plain and ordinary meaning of “to data accessibility (i.e., a data plan or data connectivity), as opposed to other types of network services (such as network SMS service or network voice service)” in the context of the ‘042 patent or in any other context.

44. The POR and EX-2032 ignore critical passages in the ‘042 specification. As quoted above, both the POR and EX-2032 assert that

Specifically, “network data service” refers to connectivity to an access network such that data service can be used, rather than specific services that might make use of such network data services.

45. POR at 7, EX-2032, ¶34.

46. The ‘042 patent does not define “network data service” in this way. However, the ‘042 patent does provide examples of different usages of services that include the POR definition – along with many other different types of services. In particular, the ‘042 patent teaches the POR “connection to an access network” as one of many

different types of services that can be used by a device to access network data. This is shown in the passages below.

In some embodiments, traffic type refers to one or more of the following: best effort network traffic, real-time traffic (e.g., live voice such as VoIP, live video, etc.), streaming traffic, multi-cast traffic, unicast traffic, point to point traffic, file types, traffic associated with an application, real time traffic, traffic with an assigned priority, traffic without an assigned priority, and traffic for a certain network

In some embodiments, service usage activity refers to a usage of service by a device. In some embodiments, service usage activity can be one or more of connection to an access network, connection to certain destinations, URLs or addresses on a network, connection to the network by one or more applications, transmission of certain types of traffic, a type of transaction based service, a type of advertising based services, or a combination of one or more of the following: an application type, a network destination/address/URL, a traffic type, and a transaction type.

47.'042 Patent, 5:4-20.

48.As is shown in the quotation above, the construction from the POR and EX-2032 is found almost verbatim in the specification (just replacing “connectivity” in the construction with “connection” in the specification). This shows to a POSITA

that one of the types of service that may be used in the '042 patent includes
“connection to a data access network.”

49.However, this “connection to a data access network” is only one of many
different enumerated types of service that may be used in the '042 patent for network
data service. In particular, the passage from the '042 patent teaches to a POSITA
that, in the context of the '042 patent, there are many different types of options for a
type of network service (**highlighted in green**). Those options specifically include
the type of network data services cited in the Petition.

50.For example, as noted above, the '042 specification teaches that using services
includes “**connection to certain destinations, URLs or addresses on a network**.” This
teaches to a POSITA that, in the context of the '042 patent, the term “network data
services” would include a service that allows for usage of (and controlling
communications to) a connection to certain destinations, URLs or address on a
network. A POSITA would understand the '042 disclosure to teach that this type of
service provides for specific network data service to a particular “**destinations, URLs
or addresses on a network**.”

51.As explained in my prior declaration, the prior art Limont reference teaches,
as a network data service, controlling service access to the connection to a particular

server computer (which may host a website or email service) which is a “connection to [a] destination[]” that uses a “URL[] or addresses on a network.” EX-1004, [0045] (controlled accesses services include “electronic mail messages [and] Web pages”, [0073] (connection to “a Web server”), [0004] (“a computer system requesting access to a Web page can be required to have access to a Uniform Resource Location (‘URL’) used to located the Web page”); [0076-0077] (accessed network service “data 197A can be electronic mail messages and data 197B can be Web pages.”); [0080] (“Request 176 can be a request for data, such, as, for example, a Web page request”); [0082] (“accessing data (e.g., Web pages in data store 197) maintained by server module 193B (e.g., a Web server)”).

52. The ‘042 patent also teaches that service activities include “connection to the network by one or more applications.” A POSITA would understand this is a form of “network data service” that provides for the policies to control access to a connection to the network on an application-specific basis – for example, allowing only certain applications to have connections to network data service.

53. Limont teaches a “connection to the network by one or more applications” when its email application or its web browser application connect to the network and retrieve mail messages and web pages (as referenced in the paragraph immediately

above). As described in my prior declaration, Limont teaches the ability to update policies that control communications for specific applications across a wireless network

54. The '042 patent similarly teaches that “transmission of certain types of traffic” or “traffic types” (EX-1001, 5:16-20) are services that may be used by the '042 patent mobile device. As I have quoted above, the '042 patent identifies what “traffic types” may be applicable to the '042 patent disclosure:

In some embodiments, traffic type refers to one or more of the following: best effort network traffic, real-time traffic (e.g., live voice such as VoIP, live video, etc.), streaming traffic, multi-cast traffic, uni-cast traffic, point to point traffic, file types, traffic associated with an application, real time traffic, traffic with an assigned priority, traffic without an assigned priority, and traffic for a certain network

55. EX-1001, 5:4-11.

56. In light of this disclosure, a POSITA would understand that, in the context of the '042 patent, such transmissions for specific traffic types reflect “network data services” to the same extent and for the same reason that the POR construction (“connection / connectivity to an access network”) show such services.

57. Similarly, a POSITA would understand Limont's mail messages and web pages are "transmission of certain types of traffic" or "traffic types" (EX-1001, 5:16-20) because Limont teaches that these "traffic types" are "traffic associated with a particular application" and a "file type" as noted in the '042 patent. Limont's mail messages and web pages are both a "file type" (e.g., an HTTP file for a web page) and "traffic associated with an application" (e.g., Limont's mail application and/or Limont's web browser application). EX-1004, [0072], [0076-0077], [0085]. Thus, the "traffic types" are a further type of service in embodiments of the '042 that are in parallel to the "connection to an access network" that PO asserts is a form of network data service.

58. Thus, as shown above, the '042 patent context shows that the POR's "connectivity [connection] to an access network" (POR at 7) may correspond to one of the embodiments of a number of different embodiments of types of service activities / usages of service disclosed in the '042 patent specification. The '042 patent does not distinguish between these different embodiments. Rather, a POSITA would understand each of these embodiments reflect different types of network data services that the '042 patent teaches can be controlled using the policy-based settings

recited in the '042 specification and in the claims (and in the Limont prior art as shown in my declaration).

59. The '042 patent, the POR and EX-2032 all do not provide any basis for the Board to adopt a construction that uses one of many different enumerated service activities and exclude all of the remainder of those activities. A POSITA would not understand that there is any reasoned basis to adopt one of these embodiments of service usage as “network data service” and exclude the other embodiments in light of the '042 disclosure.

60. [This paragraph left intentionally blank].

61. Even if the Board adopts PO's construction that “network data service is a service that provides network data *connectivity*” (POR at 1), Limont's still teach this “network data service” element. As detailed in the Petition (along with citations to my declaration), Limont's system provides for updating a “policy setting configured to assist in controlling one or more communications associated with the wireless end-user device over the wireless access network” ('042 patent, claim 1). E.g., Pet., at 44-46 (element [1.5]). This “controlling one or more communications” provides (and enforces controls on) the network data connectivity for Limont's mail messages and web pages by either allowing the connectivity or not allowing the connectivity

to the requested data across the network. That is the fundamental teaching of Limont.

62.[This paragraph left intentionally blank].

63.The POR and EX-2032 rely heavily on a passage in the Background section of the '042 patent at EX-1001 at 1:45-2:3. I disagree that this Background section would teach to a POSITA that the '042 disclosure is limited to only the type of “connection / connectivity to an access network” that the POR and EX-2032 posit. As an initial matter, this is merely a Background section, not the disclosure of the invention of the '042 patent. A POSITA would not read the Background of a patent to impose limitations on the breadth of the disclosure of the disclosed invention in the patent. Moreover, this particular Background section does not define “network data services” in the manner posited by the POR and EX-2032.

64. Furthermore, both the POR and EX-2032 seek to use this Background section as a basis to limit the claims to only certain types of entities (e.g., “providers of network data service.”). See EX-2032, ¶¶40-43. I disagree that the disclosure of the '042 patent would be read by a POSITA to impose a limitation on the claims such that only certain types of companies (“providers of network data service”) would meet the claims.

65. The POR and EX-2032 apparently assert that two different companies (e.g., a “service provider” and some other type of company) could do exactly the same operations using exactly the same equipment run in exactly the same manner and only one of those companies would meet the elements of the claims of the ‘042 patent. I am unaware of any basis in the ‘042 patent that a POSITA would use to understand the claims to be limited based upon the nature of the company that used a particular system (whether it be for infringement or invalidity).

66. Furthermore, Limont's disclosure is not limited to the usage of Limont's system by any particular type of company. So, even if the claims were limited to particular types of entities operating a system, Limont would still invalidate the claims. Limont's system is as equally applicable to a “service provider” as it is to any other company.

67. The POR and EX-2032 did not identify any specific basis on which Limont's teachings are excluded from being used by “service providers.” At most, the POR and EX-2032 imply that because Limont teaches mail services and web access as exemplary embodiments, the company using Limont's disclosed technology cannot be a service provider. There is no basis for such a conclusion. Even under such a limiting theory, service providers routinely provide messaging services such as text

messages and email. Service providers also routinely provide access to websites – such as websites that allow subscribers to view and/or modify parameters of their subscription. Thus, there simply is no basis (even if the '042 patent supported it) to exclude service provider companies from using Limont's disclosed technology.

68. Limont's disclosure actually confirms that the underlying technology is not limited to usage by any particular type or category of company and that service providers would be a beneficial user of Limont's technology. Limont broadly teaches that its "present invention extends to methods, systems, and computer program products for enforcing device settings for mobile devices." EX-1004, Abstract. Limont teaches that "[t]he foregoing problems with the prior state of the art are overcome by the principles of the present invention, which are directed towards methods, systems, and computer program products for enforcing device settings for mobile devices." EX-1004, [0016]. Limont's "computer system enforces mobile device access policies prior to permitting mobile device access to maintained data." EX-1004, [0018]. Indeed, Limont's disclosure focuses on, and is devoted to, controlling access by mobile devices to data across wireless networks. EX-1004, Figs. 1-4, [0032-0094]. Virtually every paragraph in Limont references "mobile devices" or wireless networks. With such pervasive teachings of

applicability to policy settings on mobile devices, there is no basis to assert that Limont's teaches exclude implementations of Limont's system by an "entity that provides access network connectivity" (POR at 13). Although Limont recites controlling access to types of services such as mail and web pages, such services can also be provided by an "entity that provides access network connectivity" (POR at 13) just as those entities provide other types of network data services such as voice or text.

69. Moreover, the POR does not state any basis to assert any specific differences between "text" and "mail" being provided by the operator of Limont's systems. Both such systems provide messaging to end users using similar equipment (although the specific protocols and applications vary between text and mail messaging). A POSITA would not understand Limont's disclosure to exclude usage of Limont's disclosed technology for other messaging technologies / protocols (such as text messages) beyond the mail messaging explicitly disclosed in Limont.

70. [This paragraph left intentionally blank].

71. The POR and EX-2032 cite to a wide variety of purported "extrinsic evidence" to support their construction seeking to exclude the embodiments of the '042 patent as I have discussed above.

72.I disagree that the cited extrinsic evidence defines “network data service” in any particular fashion. I also further disagree that the cited extrinsic evidence defines “network data service” in a manner that would exclude all other definitions beyond that posited by the POR and EX-2032. I also further disagree that the extrinsic evidence is sufficiently tied to the specific disclosure of the ‘042 patent such that this extrinsic evidence re-defines “network data service” in the context of the ‘042 patent.

73.The first extrinsic evidence cited by the POR and EX-2032 is a 1969 “Survey of Telecommunications Technology.” E.g., EX-2032, ¶45. This document does not define “network data services.” At most, it uses the term, but it does not seek to define it. A POSITA would not understand that such a document would define “network data services” for all purposes and in all contexts going forward. Moreover, given that this document is from 1969, a POSITA would not understand this document to even be relevant to a discussion of the term “network data services” in the 2009 time frame given the tremendous changes in technology (which include the development and commercialization of both the Internet and wireless data networks during that intervening time frame).

74.EX-2032 cites next to a “2003 publication by University of Texas Professors in collaboration with a Swedish researcher.” And “In 2012, Consumer Action published a “Cell Phone Savvy Training Manual”” EX-2032, ¶¶46-47. These appear to be a random documents located by the Patent Owner that use the term “network data services.” A POSITA would not recognize these documents as any form of authority defining particular definitions across all contexts. A POSITA would not even recognize these documents to provide the POR and EX-2032 definition in the context of these document themselves.

75.Finally, the POR and EX-2032 cite to patents owned by AT&T and Verizon. A POSITA would not understand these documents to provide any support for a definition of “network data services” within either those patents, the ‘042 patent, or broadly across the telecommunications industry. For example, PO cites to U.S. Pat. No. 8,743,790 (“‘790 patent”) as allegedly providing a supportive definition of “network data service.” POR at 16-17. The ‘970 patent does not use the term “network data service” in its specification or drawings and certainly does not define “network data service” in the manner that PO presently seeks. Rather, the ‘970 patent recites “network data service” in five claims as an example of a type of

“service.” These examples do not provide any exclusionary construction to a POSITA.

76. Similarly, PO cites to U.S. Pat. No. 8,208,403 (the ‘403 patent) to support PO’s exclusionary construction. POR at 17-18. The ‘403 patent specification uses the term “network data services” in one passage in a listing of various “telecommunication services.” EX-2037, 1:66-2:5. A POSITA would not understand this listing of exemplary services to provide the type of exclusionary definition that PO seeks.

77. As I understand the position in the POR and EX-2032, “network data services” would have a known meaning that applies across all contexts and all patents regardless of their own context. A POSITA would not understand there to be such a known definition across all contexts nor would the POR definition apply in the context of the ‘042 patent.

VII. CONCLUSION

78. I may utilize the documents cited and/or listed herein, or portions of those documents, as exhibits at any hearing or trial in this proceeding. I may further prepare and use exhibits that summarize portions of my testimony or key terms or

concepts presented therein, or other demonstrative exhibits, at any hearing or trial in this proceeding.

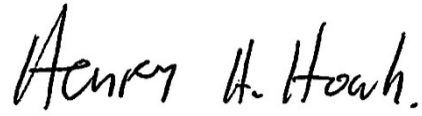
79.I reserve the right to supplement my testimony and this report in response to any judicial determinations, in response to the opinions expressed by the Patent Owner's experts in this proceeding, and/or in light of additional evidence or testimony brought forth at trial or otherwise brought to my attention after the date of my signature below.

80.I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1004.

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Patent Nos. 9,198,042

Date: April 30, 2025

A handwritten signature in black ink that reads "Henry H. Houh." The signature is written in a cursive style with a period at the end.

Henry Houh

Henry H. Houh

15 Ballard Ter.
Lexington, MA 02420
henry.houh@gmail.com
cell: 781-325-8273

Education

Massachusetts Institute of Technology, Cambridge, MA

- PhD in Electrical Engineering and Computer Science, February 1998. "Designing Networks for Tomorrow's Traffic," thesis supervised by Professor David Tennenhouse and Professor John Guttag. GPA 4.7/5.0
- Master of Science in Electrical Engineering and Computer Science, February 1991. "Demonstration of a laser repetition rate multiplier," thesis. GPA 4.5/5.0
- Bachelor of Science in Electrical Engineering and Computer Science, June 1989. "Boundary element analysis of arbitrarily shaped dielectric structures," thesis. GPA 4.7/5.0
- Bachelor of Science in Physics, February 1990. GPA 4.7/5.0

MITx, Cambridge, MA

- September 2020 – present: Enrolled in Statistics and Data Science MicroMasters program, a sequence of five MIT-offered graduate-level courses in statistics and machine learning, culminating in a MicroMasters certificate. Have completed four of five required courses.

Experience

Houh Consulting Inc. / Independent Consultant

- 2009 - present: Technical consultant specializing in Social Networking, Web 2.0, Web Site Development, Data Networking, Optical Networking, Telecommunications, Media Streaming and Voice Over IP. Clients include: Akin Gump Strauss Hauer & Feld LLP, Arnold & Porter Kaye Scholer LLP, BBN, Baker Botts LLP, Barnes & Thornburg LLP, BBN Technologies, Beus Gilbert McGroder PLLC, Bracewell LLP, Christensen O'Connor Johnson Kindness PLLC, Cooley LLP, Covington & Burling LLP, Cozen O'Connor P.C., DLA Piper, Davis Polk & Wardwell LLP, Desmarais LLP, Duane Morris

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LLP, Erise IP, P.A., Faegre Baker Daniels LLP, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, Fish & Richardson P.C., Goldman Ismail Tomaselli Brennan & Baum LLP, Haynes and Boone, LLP, Kaye Scholer, Kellogg Huber Hanson Todd Evans & Figel PLLC, Kirkland & Ellis LLP, Klarquist Sparkman, LLP, McCarthy Tetrault LLP, McGuireWoods LLP, Morgan, Lewis & Bockius LLP, Munger Tolles & Olson LLP, Orrick, Herrington & Sutcliffe LLP, O'Melveny & Myers LLP, Orrick, Herrington & Sutcliffe LLP, Paul Hastings LLP, Paul, Weiss, Rifkind, Wharton & Garrison LLP, Perkins Coie LLP, Quinn Emanuel Urquhart & Sullivan, LLP, Sidley Austin LLP, Smith Baluch LLP, Sterne, Kessler, Goldstein & Fox PLLC, Troutman Sanders LLP, Venable LLP, Weil, Gotshal & Manges LLP, Wiley Rein LLP, Wilmer Cutler Pickering Hale and Dorr LLP, and Winston & Strawn LLP.

BlocksCAD Inc. (H3XL spin-out)

- 2014 - present: Founder and member of Board of Directors. BlocksCAD is a visual Computer-Aided Design (CAD) program, designed to teach children mathematics and geometric visualization. BlocksCAD is being used in U.S. schools and worldwide in maker spaces, with 350,000+ users. BlocksCAD was selected to be part of the LearnLaunch 2017 Boost Accelerator, the MIT Play Labs 2018 Summer Accelerator, and the MassChallenge 2018 Boston Cohort. Recipient of DARPA DSO grant in 2014, and SBIR grant from the USDA in 2019.

H3XL Inc. d/b/a Einstein's Workshop (formerly Lexington Robotics)

- 2009 - 2022: Founder and President. Started a science, technology, engineering and math enrichment program and creative/maker space, in 7,000 square feet of space. Serve 2,000+ kids and families annually. As of end of 2022, have delivered an estimated 250,000 student-instruction-hours of STEM courses. Principle Investigator for 2-year DARPA grant to improve 3D Computer Aided Design tool developed in-house for the purposes of teaching 8 year olds and up 3D CAD.

Eons

- 2008 - 2009: Chief Technology Officer. Created product that Eons acquired from BBN Technologies. Integrated BBN product with Eons social networking platform and significantly increased the Eons group creation rate. Helped evaluate advertisement platform offerings and rolled out the "Boom Network" advertising network. Eons raised \$32 million from General Catalyst Partners, Charles River Ventures, Sequoia Capital, and Intel Capital.

BBN Technologies

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- 2007 - 2008: Delta Division, Vice President of Technology. Grew “Boomerang” counter-sniper project engineering team and significantly de-risked \$10 million worth of product deliveries. Identified sales team leading to \$10 million dollars of new sales within 6 months and \$100+ million in additional orders in the following two years. Boomerang was a significant asset leading to the acquisition of BBN by Raytheon in 2009. Created new business plan and grew team; launched new fully-featured social networking web site in 5 months. Served as lead expert witness in patent infringement lawsuit, resulting in \$58 million jury award to client; verdict for patents I testified on were upheld on appeal which resulted in a \$120 million settlement.
- 2004 - 2007: Delta Division, Director of Technology, responsible for commercializing IP and creating new businesses. Hired and grew division's initial engineering team. Wrote three business plans, two of which were funded. For call center business plan, acted as general manager, hiring and managing engineering team, inside sales team, and identifying and recruiting a new general manager. Identified and recruited other key employees to Delta Division, including senior members of team leading to successful internal sales growth and spin-outs of projects. Contracted by BBN to BBN spin-out PodZinger as VP of Operations and Technology. Additional areas studied include mesh networking, network security, satellite communications, and semantic web.

PodZinger Inc. (BBN spin-out, also known as EveryZing and now RAMP)

- 2006: Vice President of Operations and Technology. Significantly upgraded capability of consumer-facing search site and redeployed web site from company to co-location facility. Identified key portions of infrastructure for upgrading and cost reduction. Helped write business plan, evaluating advertisement models of revenue. Hired in operations replacement and phased back to BBN.

Commonwealth Capital

- 2004: Entrepreneur-in-residence (informally), performed technical due diligence on business plans, brainstormed ideas for new businesses with venture partner. With venture partner, left for portfolio company BBN to form core of commercialization team.

Empirix, Inc./Teradyne, Inc.

- 2001 - 2004: Chief Technologist, Engineering Manager, Web Application Test Group. Researched potential new product areas; developed product plan and prototype. Responsible for three new and existing products. Managed off-shore development team. Chief architect for all web testing products. Re-architected core testing product, helped write javascript interpreter. Provided technical vision for core product.

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- 2000 - 2001: Chief Technologist, Communication Infrastructure Test Group. Responsible for incorporating new technology internally, tracking new technologies, technical evaluation of partnerships and potential acquisitions. Helped develop division strategy. Developed plans which formed core capabilities for successful new products introduced in 2004-5.
- 2000 - 2001: Engineering Manager, Communications Infrastructure Test Group. Execution of new product plan developed in prior role. Grew team from four existing engineers to team of over 30 on immediate team and over 40 on project. Delivered new platform in one year. Platform and derivatives accounted for large portion of booked products for the division within 2 years and is currently (2008) a key portion of new product offerings.
- 2000: Empirix was formed as a spin-out of Teradyne in January 2000. Reported to CEO in carve-out of Empirix from Teradyne.
- 1999: (Teradyne) Director of Business Development, Software Test Units. Reported directly to Chairman of the Board/Founder and then to general manager of software test unit (6 divisions of Teradyne). Evaluated and researched acquisition and partnership candidates. Internally assessed technology position in market and gaps in product lines. Worked with senior division staff to develop new product strategies. Attended internal Teradyne divisional board meetings. Chairman served as my mentor.

3Com Corporation/NBX Corporation

- 1999: Software Engineer 5. Continued work after 3Com acquisition of NBX. Built cross-division relationships for new products and research directions. NBX was acquired by 3Com in March 1999.
- 1997 - 1999: (NBX) Senior Scientist and Engineer. Work in IP Telephony. Architected next-generation product. Protocol design and validation for core protocol now used tens of millions of times daily. Led team in integration of IP protocols into current product. Designed audio reconstruction algorithms. Developed applications for bug analysis and diagnosis of system problems. Implementation of network simulator. Work on collaborative projects with external partners. Worked to identify gaps in product. Representative at numerous trade shows. Innovated novel methods of using product.

MIT Department of Electrical Engineering and Computer Science, Cambridge, MA

- 1991 - 1998: Research assistant, Telemedia Network Systems Group. Design, development, and implementation of Gigabit ATM network for distributed multimedia system. Studied host interface design issues. ATM network simulation.
- Spring 1989, Fall 1990, Spring 1995: Teaching assistant, Computation Structures digital systems course. (Spring 1995 Head TA)

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- 1988 - 1989: Head laboratory teaching assistant for Computation Structures. Responsibilities included writing and revising lab assignments, and maintaining the lab.
- 1987: Laboratory teaching assistant for Computation Structures.
- 1987: Design, construction, and programming of 16-bit computer.

Agora Technology Group, Incorporated

- 1994 - 1996: Founder and CEO. Conceived and oversaw development of targeted advertising-supported Web sites. Responsible for company's vision and direction. Attended the first two WWW Conferences, presenting a workshop and paper at the first, and appearing on the "Commercialization and Economics of the Web" panel and chairing the "Where Commercial Services and the Web Are Headed" panel at the second. Sold company intact; is currently an operating stand-alone company.

AT&T Bell Laboratories, Holmdel, NJ

- 1989 - 1990: Implementation of cascadable all-optical fiber logic gate. Modelocking of all-fiber erbium laser. Construction of modelocked laser repetition rate booster. Strong optics laboratory and fiber optic experience.
- Summer 1988, 1987: Research in integrated optics. Analysis of rectangular waveguides using microwave modeling. Fabrication of integrated optical components.

Honors

- MIT Alumni Association Great Dome Award, 2010, Baker 60th Anniversary Reunion Co-Chair (highest group award given by MIT Alumni Association)
- MIT Alumni Association Presidential Citation Award (now known as Great Dome), 2008, Member of MIT Chairman's Salon committee
- MIT Alumni Association Bronze Beaver Award, 2007 (highest individual award given by MIT Alumni Association)
- MIT Alumni Association Volunteer Honor Roll, February 2004
- MIT Alumni Association Lobdell Award, 1999
- Boston Museum of Science Gold Pin for 1000 hours of Volunteer Service, April 1999
- MIT Alumni Association Presidential Citation Award (now known as Great Dome), 1997, Member of Alumni Online Communications Committee

Patents and Patent Publications

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- U.S. Patent #9,697,231, H. Houh, J. Stern, R. Spina, M. Meteer, "Methods and apparatus for providing virtual media channels based on media search," July 4, 2017.
- U.S. Patent #9,697,230, H. Houh, J. Stern, "Methods and apparatus for dynamic presentation of advertising, factual, and informational content using enhanced metadata in search-driven media applications," July 4, 2017. See also WO2007056485.
- U.S. Patent #7,975,296, L. Apfelbaum, H. Houh, T. Mayberry and G. Friedman, "Automated security threat testing of web pages," July 5, 2011. See also US20030159063, WO2003067405.
- U.S. Patent #7,877,736, H. Houh and J. N. Stern, "Computer language interpretation and optimization for server testing," January 25, 2011. See also US20050138104, WO2005043300.
- U.S. Patent #7,801,910, H. Houh and J. N. Stern, "Method and apparatus for timed tagging of media content," September 21, 2010. See also US20070112837, US20090222442, WO2007056535.
- U.S. Patent #7,590,542, D. C. Williams, W. C. Hand, H. Houh, A. R. Seeley, "Method of Generating Test Scripts Using a Voice-Capable Markup Language," September 15, 2009. See also EP1530869, US20030212561, WO2003096663.
- U.S. Patent #6,967,963, H. H. Houh, P. Anderson, C. Gadda, "Telecommunication method for ensuring on-time delivery of packets containing time-sensitive data," November 22, 2005. See also EP1060400, WO2000033092, CA2318774.
- U.S. Patent #5,144,375, M. C. Gabriel, H. H. Houh, N. A. Whitaker, "Sagnac Optical Logic Gate," September 1, 1992. Also issued as European Patent # EP0456422, July 23, 1997, German Patent #DE69126913, August 28, 1997
- U.S. Patent Application Publication No. 20020015387, "Voice Traffic Packet Capture and Analysis Tool for a Data Network" (Abandoned in 2007)
- U.S. Patent Application Publication No. 20020016708, "Method and Apparatus for Utilizing a Network Processor as Part of a Test System" (Abandoned in 2007)
- U.S. Patent Application Publication No. 20020016937, "Method and Apparatus for Utilizing a Network Processor as Part of a Test System." (Abandoned in 2007) See also WO2002011413.
- U.S. Patent Application Publication No. 20070106646, "User-directed navigation of multimedia search results" (Abandoned in 2009)
- U.S. Patent Application Publication No. 20070106660, "Method and apparatus for using confidence scores of enhanced metadata in search-driven media applications" (Abandoned in 2009)
- U.S. Patent Application Publication No. 20070106685, "Method and apparatus for updating speech recognition databases and reindexing audio and video content using the same" (Abandoned in 2015)
- U.S. Patent Application Publication No. 20070118873, "Methods and apparatus for merging media content" (Abandoned in 2015)

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- U.S. Patent Application Publication No. 20090222442, "User-directed navigation of multimedia search results" (Abandoned in 2016)
- U.S. Patent Application 11/395,732, "Search snippet creation for audio and video data" (Abandoned in 2009)
- U.S. Patent Application 11/774,931, "Methods and apparatus for managing a social networking web site"
- U.S. Patent Application 11/774,947, "Methods and apparatus for organizing media files"
- U.S. Patent Application 11/774,956, "Methods and apparatus for managing an online event"
- U.S. Provisional Patent Application 61/086,909, "Measuring and ranking relationship activity"
- U.S. Provisional Patent Application 61/086,914, "Detecting media object commonality"
- U.S. Provisional Patent Application 61/086,904, "Message categorization based on message characteristics"
- U.S. Provisional Patent Application 61/086,905, "Photo tagging to request action"

Trials, Testimony and Depositions

- Case No. 1:06CV682 (CMH/BRP), Verizon vs. Vonage, U.S. District Court for the Eastern District of Virginia, filed expert report, was deposed and testified at trial.
- Case No. 1:08CV157 (CMH/TRJ), Verizon vs. Cox, U.S. District Court for the Eastern District of Virginia, was deposed and testified at trial.
- Case No. 5:09-cv-476, Two-Way Media vs. AT&T, U.S. District Court for the Western District of Texas, filed expert report, testified at trial.
- Case No. 2:10-cv-248 (RAJ/FBS), ActiveVideo Networks vs. Verizon, U.S. District Court for the Eastern District of Virginia, filed expert report and was deposed as an expert witness.
- Case No. 1:11-cv-00880-TSE-JFA, Bear Creek Technologies, Inc. vs. Verizon Services Corp., et al, U.S. District Court for the Eastern District of Virginia, was deposed as an expert witness.
- Case No. 3:10-CV-298-BBC, AlmondNet, Inc. vs. Microsoft Corp., U.S. District Court for the Western District of Wisconsin, filed expert report.
- Case No. 6:10-cv-00597, Guardian Media Technologies, Ltd. Vs. AT&T Operations, Inc. et al., U.S. District Court for the Eastern District of Texas, Tyler Division, filed expert report.
- Case No. ESCV2010-02282C, The Octopus Solution LLC v. Gary Brown et al., Essex, MA Superior Court, testified at trial.
- Investigation No. 337-TA-882, In the matter of Certain digital media devices, including televisions, Blu-ray disc players, home theater systems, tablets and mobile phones, components thereof and associated software, U.S. International Trade Commission, filed expert reports, was deposed and testified at hearing.

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- Investigation No. 337-TA-995, In the matter of Certain communications or computing devices, and components thereof, U.S. International Trade Commission, filed expert reports, and was deposed.
- Case No. 8:12-cv-122-LES-TDT, Prism Technologies LLC v. AT&T Mobility LLC, U.S. District Court for the District of Nebraska, filed expert report, was deposed and testified at trial.
- Case No. 11-2684 (JWL), Sprint Communications Co., L.P., v. Comcast Cable Communications, LLC, et al., U.S. District Court for the District of Kansas, filed expert report and was deposed.
- Case No. 11-2686 (JWL), Sprint Communications Co., L.P., v. Time Warner Cable, Inc., et al., LLC, et al., U.S. District Court for the District of Kansas, filed expert report, was deposed, and testified at trial.
- Case No. 12-487 (SLR), Cox Communications, Inc., et al., v. Sprint Communications Company L.P., et al., U.S. District Court for the District of Delaware, filed expert report and was deposed.
- Case IPR 2014-00039, Microsoft Corporation v. B.E. Technology LLC, U.S. Patent No. 6,628,314. Submitted declaration and cross-examined in deposition.
- Case IPR 2014-00086, Apple, Inc. v. Evolutionary Intelligence, LLC, U.S. Patent No. 7,010,536. Submitted declaration and cross-examined in deposition.
- Case No. 6:11-CV-421, Stragent, LLC v. Intel Corporation, U.S. District Court for the Eastern District of Texas, Tyler Division, deposed and testified at trial as a fact witness.
- IPR2014-01366, IPR2014-01367, IPR2014-01368, Samsung et al. v. Straight Path, submitted IPR declarations and was deposed.
- IPR2015-1006, IPR2015-1007, Cisco v. Straight Path, submitted IPR declarations.
- IPR2014-01457, IPR2014-01459, Microsoft v. Biscotti, submitted IPR declaration and was deposed.
- IPR2016-00302, Apple v. Nonend, submitted IPR declaration.
- IPR2014-00812, Yelp and Twitter v. Evolutionary Intelligence, submitted IPR declaration.
- IPR2015-00307, Cisco v. AIP, submitted IPR declaration.
- Microsoft v. Acacia, submitted IPR declaration.
- IPR2015-00342, AT&T Mobility LLC and Cellco Partnership d/b/a Verizon Wireless v. Solocron, submitted IPR declaration.
- Mediatube v. Bell Canada, Canadian Federal Court, submitted expert report and testified at trial.
- CBM2016-00036, Google v. At Home Bondholder's Liquidating Trust, submitted CBM declaration.
- IPR2016-01198, IPR2016-01201, Apple, Inc. v. VoIP-Pal.com, Inc., submitted IPR declaration and was deposed.
- Case No. 3:14-cv-2824-VC, Trend Micro Incorporated v. Rpost Holdings, Inc., et al, submitted expert report and was deposed

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- Akamai v. Limelight Networks, IPR2016-01631, IPR2016-01711, IPR2017-00249, IPR2017-00349, submitted IPR declarations and was deposed
- Hyperlinc Technologies v. Verizon Sourcing, No. 650151/2015 New York Supreme Court, submitted declaration and was deposed
- Cascades Streaming Technologies v. Big Ten Networks, submitted expert reports and was deposed
- Klaustech, Inc. v. Google LLC., Case No. 4:10-CV-05899-JSW (N.D. Cal.), submitted expert report and was deposed
- Cisco v. Uniloc, IPR2017-00198, IPR2017-00058, submitted IPR declarations and was deposed.
- Cisco v. Uniloc, IPR2017-00597, submitted IPR declaration and was deposed
- Twitter v. Youtoo Technologies, LLC, IPR2017-01133, IPR2017-01131, submitted IPR declarations and was deposed
- Taser International Inc. (now Axon Enterprise, Inc.) v. Digital Ally Inc., IPR2017-00375, submitted IPR declaration and was deposed
- Taser International Inc. (now Axon Enterprise, Inc.) v. Digital Ally Inc., IPR2017-00376, IPR2017-00515, IPR2017-00775, submitted IPR declarations
- HTC Corporation v. IPA Technologies, IPR2018-00306, IPR2018-00307, submitted IPR declaration
- Hulu v. Soundview, IPR2018-00864, IPR2018-01023, submitted IPR declarations and was deposed
- XpertUniverse v. Cisco, 3:17-cv-3848, U.S. District Court for Northern District of California, submitted declaration in support of claim construction and was deposed
- Improved Search v. Microsoft, C.A. No. 16-cv-650-JFB-SRF (Del.), submitted declaration in support of claim construction
- Apple v. Uniloc, IPR2018-00361, IPR2018-00394, IPR2018-00395, IPR2019-00700, IPR2019-00701, IPR2019-01667, submitted IPR declarations
- LG Electronics v. Uniloc, submitted IPR declaration
- SRC Labs and Saint Regis Mohawk Tribe v. Microsoft, 2:18-cv-00321-JLR, U.S. District Court for Western District of Washington at Seattle, submitted declaration in support of claim construction and was deposed
- Verizon Wireless v. Barkan Wireless IP Holdings LP, submitted IPR declarations
- Verizon Wireless and Samsung Electronics America Inc. v. Barkan Wireless IP Holdings LP, IPR2019-199, IPR2019-200, IPR2019-234, IPR2019-631, IPR2019-632, submitted IPR declarations
- Samsung Electronics America Inc. v. Barkan Wireless IP Holdings LP, IPR2019-100, submitted IPR declaration
- Cisco Systems Inc. v. Meetrix IP LLC, IPR2019-539, IPR2019-540, IPR2019-541, IPR2019-542, IPR2019-543, IPR2019-544, submitted IPR declarations
- GMG Products LLC v. Traeger Pellet Grills LLC, PGR2019-24, PGR2019-34, PGR2019-35, PGR2019-36, submitted PGR declaration and was deposed

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- Uniloc 2017 LLC v. Google LLC, 2:18-cv-00502-JRG-RSP, U.S. District Court for the Eastern District of Texas, Marshall Division, submitted declaration in support of claim construction
- Microsoft Corporation v. Uniloc 2017 LLC, IPR2020-00102, IPR2020-00103, submitted IPR declarations
- Microsoft Corporation and HP Inc. v. Syncloud Technologies, LLC, IPR2020-00316, IPR2020-01031, IPR2020-01032, IPR2020-01269, IPR2020-01270, IPR2020-01271, submitted IPR declarations
- Seven Networks, LLC v. Apple Inc, 2:19-cv-115-JRG, U.S. District Court for the Eastern District of Texas, Marshall Division, submitted declaration in support of claim construction
- Unified Patents Inc. v. Ortiz & Associates Consulting, LLC, IPR2019-00743, submitted IPR declaration
- Uniloc 2017 LLC v. Apple Inc., 3:19-cv-01905-JD, U.S. District Court for the Northern District of California, San Francisco Division, submitted declaration in support of claim construction and was deposed
- ClearPlay Inc. v. Dish Network LLC et al.; 2:14-cv-00191, U.S. District Court for the District of Utah, Central Division, submitted expert report and re-examination declarations, was deposed, and testified at trial
- AMC Networks, Inc. et al v. Sound View Innovations, LLC, IPR2020-00482, submitted IPR declaration
- Case No. 1:17-cv-01734-RGA, Sprint Communications Co., L.P., v. Charter Communications, Inc., et al., U.S. District Court for the District of Delaware, filed expert report and was deposed.
- CommScope Technologies LLC et al. v. Barkan Wireless IP Holdings LP et al., IPR2020-00827, IPR2020-00829, IPR2020-00831, IPR2020-00833, IPR2020-00835, IPR2020-00838, submitted IPR declarations
- Cisco Systems Inc. v. Monarch Networking Solutions LLC, IPR2020-01226, submitted IPR declaration
- CoolTV Network.com v. Blackboard, Inc., Facebook, Inc., International Business Machines Corporation, Kaltura, Inc., Limelight Networks, Inc., Microsoft Corporation, Ooyala, Inc., Snap, Inc., and Trapelo Corp., submitted declaration in support of claim construction and was deposed
- Facebook, Inc. v. Onstream Media Corporation, IPR2020-01507, IPR2020-01508, IPR2020-01525, IPR2020-01527, IPR2020-01528, submitted IPR declarations
- Hisense Co LTD. v. Maxell, LTD, IPR2020-01598, IPR2020-01600, submitted IPR declarations
- Microsoft Corp. v. O'Brien, IPR2021-00015, submitted IPR declaration and was deposed
- Sable Networks Inc. v. Cisco Systems, Inc., WA:20-CV-00288-ADA, U.S. District Court for the Western District of Texas, Waco Division, submitted declaration in support of claim construction

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- Peloton Interactive, Inc. v. Icon Health and Fitness Inc et al., IPR2021-00342, submitted IPR declaration
- Hulu, LLC v. SITO Mobile R&D IP, LLC et al., CBM2020-00028, IPR2020-00158, IPR2020-00206 , IPR2020-00219 , IPR2020-00265 , IPR2020-00298 , IPR2020-00304 , IPR2020-00308 , submitted CMB and IPR declarations and was deposited
- Twitter, Inc. and Google LLC v. B.E. Technology, LLC, IPR2021-00482, IPR2021-00483, IPR2021-00484, IPR2021-00485, submitted IPR declarations
- MG Freesites LTD v. ScorpCast, LLC, IPR2021-00511, submitted IPR declaration
- Avionte, LLC v. Sandeep Acharya, Samar Basnet, and Aqore LLC, Arbitration, Hon. Jeffrey Keyes (Ret.)
- Microsoft Corporation v. WSOU Investments, LLC d/b/a Brazos Licensing and Development, IPR2021-00751, submitted IPR declaration
- SAP America, Inc. v. Express Mobile, Inc., IPR2021-01144, IPR2021-01145, IPR2021-01146, submitted IPR declarations
- StratosAudio Inc. v. Hyundai Motor America, 6:20-cv-01125-ADA, U.S. District Court for the Western District of Texas, Waco Division, submitted claim construction declaration and was deposited Peloton Interactive, Inc. v. Ifit Health and Fitness Inc, IPR2022-00029, IPR2022-00030, submitted IPR declarations and was deposited
- Investigation No. 337-TA-1263, In the matter of Certain televisions, remote controls, and components thereof, U.S. International Trade Commission, filed expert reports, was deposited, and testified at hearing
- Alexander Stross v. Netease, Inc., et al., U.S. District Court (Central District of California), Case 2:20-cv-00861-AB(JC), filed expert reports, and was deposited
- Ralph Ledergerber v. Netease, Inc., et al., U.S. District Court (Central District of California), Case 2:20-cv-00862-AB(JC), filed expert reports and was deposited
- John Walmsley v. Netease, Inc., et al., U.S. District Court (Central District of California), Case 2:20-cv-00863-AB(JC), filed expert reports and was deposited
- Bernhard Kuhmstedt v. Netease, Inc., et al., U.S. District Court (Central District of California), Case 2:20-cv-02044-AB(JC), filed expert reports and was deposited
- Netflix, Inc. v. CA, Inc., IPR2021-01319, submitted IPR declaration and was deposited
- F45 Training Pty Ltd. v. Body Fit Training USA Inc., C.A. No. 20-1194 (LPS) (D. Del.), filed expert report
- Apple v. Fintiv, IPR2022-00976, IPR2022-01149, IPR2022-01150, IPR2023-00399, submitted IPR declarations and was deposited
- Estech Systems, Inc. v. Howard Midstream Energy Partners d/b/a Howard Energy Partners, C.A. No. 6:20-cv-777-ADA (Western District of Texas, Waco Division), filed expert reports and was deposited
- Echelon Fitness Multimedia, LLC. v. Peloton Interactive, Inc., IPR2020-01187, submitted IPR declaration and was deposited
- VIZIO. V. Maxell Ltd., IPR2022-01458, submitted IPR declaration

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- Maxell, Ltd. et al. v. VIZIO, Inc., Case No. 2-21-cv-06758 (C.D. Cal.). filed declaration and was deposed
- Microsoft Corporation v. SurfCast, Inc., submitted IPR declarations
- The Walt Disney Company et al. v. WAG Acquisition LLC, IPR2022-01227, IPR2022-01228, IPR2022-01346, submitted IPR declarations and was deposed
- Rakuten Rewards et al. v. IBM, submitted IPR declarations and was deposed
- Fubotv Media Inc. v. Sito Mobile R&D IP, LLC et al., submitted IPR declarations
- Unified Patents, LLC v. Noblewood IP LLC, IPR2022-01111, submitted IPR declaration
- Unified Patents, LLC. v. Pedersen, Peter Henrik, IPR2023-00029, submitted IPR declaration
- Ericsson Inc v. Dali Wireless Inc., submitted IPR declarations
- Universal Electronics, Inc. et al. v. Roku, Inc., IPR2022-00818, submitted declarations and was deposed
- Google LLC. v. Wildseed Mobile LLC et al., IPR2023-00244, IPR2023-00245, IPR2023-00246, IPR2023-00247, IPR2023-00248, submitted declarations
- Lululemon Athletica Canada Inc. et al. v. Nike, Inc., IPR2023-00180, IPR2023-00424, submitted declarations
- Zoho Corporation, et al. v. Meetrix IP, LLC, IPR2023-00371, IPR2023-00377, IPR2023-00379, IPR2023-00380, IPR2023-00382, submitted declarations
- WSOU Investments, LLC d/b/a/ Brazos Licensing and Development v. Google LLC, 6:20-cv-572, U.S. District Court for the Western District of Texas, Waco Division, submitted reports and was deposed
- Google LLC v. Safecast Limited LLC, IPR2023-00652, submitted declaration
- Investigation No. 337-TA-1338, In the matter of Certain smart televisions, U.S. International Trade Commission, filed reports and was deposed
- Cisco Systems, Inc. v. Orckit IP LLC, IPR2023-00714, submitted declaration
- SupplyPro, Inc. v. Sandvik Machining Solutions AB, et al., AAA Case No. 01-22-000-7897. submitted declaration
- TrackThings LLC v. NETGEAR, Inc., Case No. 22-00981-RGA-JLH, U.S. District Court for the District of Delaware, submitted declaration
- Walt Disney Parks & Resorts US Inc. v. Agile Journeys LLC; IPR2024-00029, submitted declaration
- Aylo Freesites Ltd v. Dish Technologies LLC; IPR2024-00043, IPR2024-00044, IPR2024-00045, IPR2024-00046, IPR2024-00047, IPR2024-00048, IPR2024-00146, IPR2024-00147; submitted declarations
- Arm Inc. et al. v. Icpillar LLC; IPR2024-00476, IPR2024-00566; Retained by Arm; submitted declarations
- Microsoft Corp et al. v. Litl LLC, IPR2024-00454, IPR2024-00455, IPR2024-00456, IPR2024-00457, IPR2024-00458; submitted declarations
- Cisco Systems Inc et al. v. InfoExpress Inc, IPR2024-00539, IPR2024-00540, IPR2024-00677, IPR2024-00678; submitted declarations

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- Vizio Inc v. Multimedia Technologies Pte Ltd; IPR2024-00722, IPR2024-00723; Retained by Vizio; submitted declarations
- Sap America Inc v. Isix IP LLC; IPR2024-00615; Retained by SAP; submitted declarations
- Cisco Systems Inc et al. v. Portsmouth Network Corp; IPR2024-00505, IPR2024-00506; submitted declarations

Publications

- "IP switching: server driven flow classification," H. H. Houh, *Proceedings of the Washington University Workshop on Integration of IP and ATM*, November 1996.
- "Aurora at MIT," D. D. Clark, H. H. Houh, and D. L. Tennenhouse, Editors, *MIT Laboratory for Computer Science Technical Report 673*, December 1995.
- "ViewStation Applications: Implications for Network Traffic," C. J. Lindblad, D. Wetherall, W. Stasior, J. F. Adam, H. H. Houh, M. Ismert, D. Bacher, B. Phillips, and D. L. Tennenhouse, *IEEE Journal of Selected Areas in Communications*, 1995.
- "The VuNet Desk Area Network: Architecture, Implementation, and Experience," H. H. Houh, J. F. Adam, M. Ismert, C. J. Lindblad, and D. L. Tennenhouse, *IEEE Journal of Selected Areas in Communications*, 13 (4), May, 1995.
- "Reducing the Complexity of ATM Host Interfaces," H. H. Houh and D. L. Tennenhouse, *Hot Interconnects II Symposium Proceedings*, Stanford, August 11-12, 1994.
- "Media-intensive data communications in a 'desk-area' network," J. F. Adam, H. H. Houh, M. Ismert, and D. L. Tennenhouse, *IEEE Communications*, August 1994.
- "ViewStation Applications: Intelligent Video Processing Over A Broadband Local Area Network," C. J. Lindblad, D. J. Wetherall, W. Stasior, B. Phillips, D. Bacher, J. Adam, H. Houh, M. Ismert, and D. L. Tennenhouse, *Proceedings of the 1994 USENIX Symposium on High-Speed Networking*, Oakland, CA, August 1994.
- "The Media Gateway: Live Video on the World Wide Web," H. H. Houh, C. J. Lindblad, J. Soo, D. L. Tennenhouse, and D. J. Wetherall, *Workshop at the 1994 World Wide Web Conference*, Geneva, Switzerland, May 1994.
- "Active Pages: Intelligent Nodes on the World Wide Web," H. H. Houh, C. J. Lindblad, and D. J. Wetherall, *Proceedings of the 1994 World Wide Web Conference*, Geneva, Switzerland, May 1994.
- "Wavelength Division vs. Code Division Access Methods for Optical Networks," H. H. Houh, *Area Exam Paper*, May 1993.
- "Experience with the VuNet: A Network Architecture for a Distributed Multimedia System," J. F. Adam, H. H. Houh, D. L. Tennenhouse, *Proceedings of the 18th Conference on Local Computer Networks*, pp. 70-76, September 1993

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- "The VudBoard: A Simple DMA Interface," H. H. Houh, Proceedings of the 4th Gigabit Minijam, January 1994.
- "A Software-Oriented Approach to the Design of Media Processing Environments," D. L. Tennenhouse, J. Adam, D. Carver, H. Houh, M. Ismert, C. Lindblad, W. Stasior, D. Weatherall, D. Bacher, and T. Chang., submitted to the International Conference on Multimedia Computing and Systems, May 1994.
- "A Network Architecture for Distributed Multimedia Systems," J. F. Adam, H. H. Houh, M. Ismert, and D. L. Tennenhouse, submitted to the International Conference on Multimedia Computing and Systems, May 1994.
- "The Viewstation Collected Papers," D. L. Tennenhouse, J. Adam, C. Compton, A. Duda, D. Gifford, H. Houh, M. Ismert, C. Lindblad, W. Stasior, R. Weiss, D. Wetherall, D. Bacher, D. Carver, and T. Chang, MIT Laboratory for Computer Science Technical Report, MIT/LCS/TR-590, November 1993.
- "The Viewstation Collected Papers II," W. F. Stasior, D. L. Tennenhouse, J. F. Adam, D. R. Bacher, H. H. Houh, M. Ismert, C. J. Lindblad, B. M. Phillips, D. J. Wetherall, MIT Laboratory for Computer Science Technical Report, MIT/LCS/TR-696, April 1996.
- "A System's Perspective of the Sagnac Fiber Logic Gates and Their Possible Applications," A. Huang, N. Whitaker, C. Gabriel, H. Avramopoulos, P. M. W. French, H. H. Houh, and I. Chuang, Applied Optics, September 10, 1994
- "Complete Switching in a Three-Terminal Sagnac Switch," H. Avramopoulos, P. M. W. French, M. C. Gabriel, H. H. Houh, N. A. Whitaker, T. Morse, IEEE Phot. Tech. Lett. **3** (3), 235
- "Complete Switching in a Three-Terminal Sagnac Switch," H. Avramopoulos, P. M. W. French, M. C. Gabriel, H. H. Houh, N. A. Whitaker, IEEE/LEOS Annual Meeting, Paper PDP-13, November 1990
- "All-optical phase-locked oscillator," N. A. Whitaker, Jr., H. H. Houh, H. Avramopoulos, T. F. Morse, IEEE/LEOS Annual Meeting, Paper ELT2.4/MOO3, November 1990
- "Passive modelocking of an all-fiber erbium laser," H. Avramopoulos, H. H. Houh, N. A. Whitaker, M. C. Gabriel, T. F. Morse, IEEE/LEOS Conference on Optical Amplifiers and their Applications, Paper PDP-8, August 1990
- "Transverse modes, waveguide dispersion, and 30ps recovery in submicron GaAs/AlAs microresonators," J. L. Jewell, S. L. McCall, A. Scherer, H. H. Houh, N. A. Whitaker, A. C. Gossard, and J. H. English, Appl. Phys. Lett. **55** (1), July 3, 1989

Leadership, Activities and Interests

- Leadership

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- Reading Symphony Orchestra
 - Board of Directors (Treasurer), 2022 - present
- Discovery Museums (Acton, MA)
 - Board of Directors, 2023 – present
 - Board of Directors, Development Committee, 2023 – present
 - Science and Technology Advisory Council, 2012 - present
- Tau Beta Pi National Engineering Honor Society
 - Executive Councilor, 2024-2026
 - Advisor, MA B Chapter at MIT, 2003 - present
 - District Director (National Officer), Tau Beta Pi, New England Area, 1991 - 2003
 - President, MA B Chapter at MIT, Fall 1988 - Spring 1989
 - Laureate award, 1989
- MIT Alumni Association Board of Directors
 - MIT Annual Giving Board, 3 year term, 2024 – 2027
 - National Selection Committee, 3 year term, 2020 – 2023
 - K-12 STEM Initiatives Co-chair, 2013 – 2017
 - Awards Committee Chair, 2012 – 2014
 - Awards Committee, 3 year term, 2011 – 2014
 - Vice President, 2 year term, 2004 – 2006
 - Alumni Ad-Hoc Committee, Chair, 2005-2006
 - Board Member, 2 year term, 1997 – 1999
- MIT Club of Boston
 - Board of Directors, 2006 - 2011
 - K-12 Initiatives Chair, 2009 - 2012
 - VP of Communications, MIT Club of Boston, 2003 - 2006
 - Past-President, MIT Club of Boston, 2002 - 2003
 - President, MIT Club of Boston, 2001 - 2002
 - President-Elect, MIT Club of Boston, 2000 - 2001
 - VP of Programs, MIT Club of Boston, 1999 - 2000
 - Activities Super-Chair, MIT Club of Boston, 1998 - 1999
- MIT Enterprise Forum of Cambridge, Inc.
 - Past Chair, 2009 – 2011
 - In-NOW-vation Co-chair, 2010
 - Chair, 2007 - 2009
 - Vice Chair, 2005 - 2007
 - Executive Board Member, 2002 - 2011
 - Winter Workshop Co-Chair, February 2007 - conceived idea for conference, which sold-out and produced largest attendance numbers in recent memory
 - Spring Workshop Co-Chair, Spring 2004

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- Membership Committee Chair, Fall 2003 - 2006
 - 25th Anniversary Dinner Chair, Fall 2003
 - As Membership Chair and Board Member, started Special Interest Groups in 2004; a SIG won the MIT Presidential Citation award, the MIT Alumni Association's highest award for organizations, in 2006
- Estabrook Elementary School PTA
 - Advisory committee to the superintendent on PCB issue, 2010-2011
 - 4th Grade after-school science program co-organizer, 2010-2012
 - 4th and 5th Grade before-school Math Olympiad co-organizer, 2009-2013
 - 5th Grade BBQ and Yearbook Committee, 2011, 2013
 - Family Math Night volunteer, 2008-2012
- MIT Class of 1989
 - Secretary, five consecutive 5 year terms, 1989 - 2014
 - 30-year Reunion Committee, 2019
 - 25-year Reunion Committee, 2014
 - 20-year Reunion Committee and Gift Committee, 2009
 - 15-year Reunion Committee and Gift Committee, 2004
 - 10-year Reunion Committee and Gift Committee, 1999
 - 5-year Reunion Committee, 1994
 - Interim Treasurer, 1993 - 1994
 - Instituted annual senior class career fair, now raising over \$100,000 annually for senior class activities, Fall 1988
- Strong, consistent record of leadership dating to high school
- Acting
 - '21' (Sony Pictures), credited as "Chinatown Dealer," 2007, Kevin Spacey's movie about the MIT Blackjack Team inspired by "Bringing Down the House" by Ben Mezrich, opened nationwide on March 28, 2008. 21 was the number one movie in US for two weeks and number one globally for one week. 21 also topped the DVD sales, Blu-ray sales and DVD rental charts.
 - Spring Lake Theater Company, first New York-area off-broadway production of "A Chorus Line," played role of Mark, Summer 1990
- Former member of the MIT Blackjack team
- Producer for 10,000 Maniacs' 2013 album "Music from the Motion Picture"
- Executive Producer for 10,000 Maniacs' 2015 album "Twice Told Tales"
- Violist, violist, harpist, guitarist, singer, actor: played in many amateur/semi-professional groups including Firebird Pops Orchestra, Reading Symphony Orchestra, MIT Summer Philharmonic Orchestra, Carlisle Chamber Orchestra, Rivers Symphony Orchestra, Opera51 Orchestra, Freisinger Chamber Orchestra, Merrimack Valley Philharmonic, Longwood Symphony, MIT Symphony, and Somerville Community Chorus
- Violist, "Coming Home" album by Karen Phillips, 2014
- Google Scholar citations: 2079, h-index: 21, i10-index: 26 (since 2017: 662/12/14)

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- Erdos-Bacon number of 7
- Erdos-Bacon-Sabbath number of 11