

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

STINGRAY GROUP INC. AND STINGRAY MUSIC USA, INC.,
PETITIONER,

v.

EDWIN A. HERNANDEZ-MONDRAGON,
PATENT OWNER.

CASE NO. IPR2025-00351
U.S. PATENT NO. 11,140,441

DECLARATION OF MR. STUART LIPOFF

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Table of Exhibits

EX. NO.	DESCRIPTION
Ex-1001	The '441 Patent.
Ex-1002	This Declaration.
Ex-1003	U.S. Patent No. 7,940,303 to Farber, et al. ("Farber"), which was filed on November 12, 2009.
Ex-1004	U.S. Patent No. 8,954,600 to Avellan, et al. ("Avellan"), which was filed on March 2, 2012.
Ex-1005	U.S. Patent No. 9,009,111 to Vermeulen, et al. ("Vermeulen"), which was filed on May 14, 2012.
Ex-1006	U.S. Patent No. 8,442,110 to Pavlovskaja, et al. ("Pavlovskaja"), which was filed on October 9, 2008.
Ex-1007	WIPO International Publication Number WO 2010/044926 to Pavlovskaja, et al. ("Pavlovskaja-PCT"), which was published on April 22, 2010.
Ex-1008	U.S. Patent No. 8,676,822 to Davis ("Davis"), which was filed on February 6, 2009.
Ex-1009	U.S. Patent Application Publication No. 2012/0117569 to Fogel, et al. ("Fogel"), which was published on May 10, 2012.
Ex-1010	U.S. Patent No. 8,819,043 to Durante, et al. ("Durante"), which was filed on November 9, 2010.
Ex-1011	U.S. Patent No. 9,635,075 to Ma, et al. ("Ma"), which was filed on March 8, 2010.
Ex-1012	U.S. Patent No. 6,463,445 to Suzuki, et al. ("Suzuki"), which was filed on September 30, 1999.
Ex-1013	U.S. Patent Application Publication No. 2004/0031052 to Wannamaker, et al. ("Wannamaker"), which was published on February 12, 2004.
Ex-1014	U.S. Patent No. 9,331,967 to Gangadharan, et al. ("Gangadharan"), which was filed on October 31, 2013.
Ex-1015	Prosecution History of Application No. 15/538,911, which is now U.S. Patent No. 10,123,074.
Ex-1016	Prosecution History of the '441 Patent.

List of Appendices

Appendix A. *Curriculum Vitae* of Mr. Stuart Lipoff

LIST OF CHALLENGED CLAIMS

Element	Claim Language
Claim 1	
Preamble 1	A computer-implemented method comprising:
Element 1a	creating a plurality of multimedia assets at a caching unit, for each one of the plurality of multimedia assets;
Element 1b	determining that there is sufficient storage space for the multimedia asset at the caching unit;
Element 1c	generating a channel identifier for the multimedia asset;
Element 1d	retrieving from a cloud service a plurality of media files to be included in the multimedia asset including a media identifier for each one of the media files;
Element 1e	for each one of the media files, creating a custom hypertext transfer markup language (HTML) user interface that includes video;
Element 1f	encoding each of the media files and encapsulating them together using an MPEG transport stream format;
Element 1g	storing each one of the multimedia assets at the caching unit;
Element 1h	receiving a request at the caching unit for one of the multimedia assets from a broadcasting unit; and
Element 1i	responsive to receiving the request, the caching unit providing the multimedia asset to the broadcasting unit in the MPEG transport stream format.
Claim 2	
Element 2a	The method of claim 1, wherein receiving the requests for the multimedia assets comprising receiving the requests over a REST API, or wherein retrieving the plurality of media files is performed using a REST API.
Claim 3	
Element 3a	The method of claim 1, wherein creating the custom HTML user interface for each media file is performed using Javascript.
Claim 4	
Element 4a	The method of claim 1, wherein encoding each of the media files include encoding each of the media files at a specified bit rate.
Claim 5	
Element 5a	The method of claim 1, wherein encoding each of the media files include encoding each of the media files using a H.264 encoder.
Claim 6	
Element 6a	The method of claim 1, wherein the custom HTML user interfaces

Element	Claim Language
	are configured to be rendered using a Webkit browser.
Claim 7	
Element 7a	The method of claim 1, wherein the video for the custom HTML interfaces includes video taken from the media file.
Claim 8	
Element 8a	The method of claim 1, wherein encoding the media file is performed using an AC-3 file format for audio content in the media file.
Claim 9	
Element 9a	The method of claim 1, wherein the custom HTML user interfaces are configured so that multiple custom HTML user interfaces of the multimedia asset can be retrieved using a web rendering engine.
Claim 10	
Preamble 10	A computer-implemented method comprising:
Element 10a	virtualizing a system including a virtualized caching server, wherein the virtualized caching server performs:
Element 10b	receiving, from a content provider, a request for at least one media stream for playback on a broadcast media channel, wherein the at least one media stream includes a plurality of multimedia items of different types;
Element 10c	obtaining content corresponding to the plurality of multimedia items from at least one source offering the content in at least one first format;
Element 10d	rendering a web page by a browser using the content;
Element 10e	generating a temporal sequence of screen captures of the rendered web page, where each screen capture defines all the content of the web page at a given time, and at least two adjacent screen captures illustrate a dynamic change of at least a portion of the content over time;
Element 10f	assembling the at least one media stream using the temporal sequence of screen captures; and
Element 10g	providing the at least one media stream to the content provider for broadcast on the broadcast media channel.
Claim 11	
Element 11a	The method of claim 10, wherein the obtaining comprises: retrieving, for each of the plurality of multimedia items, at least one audio file corresponding to an audio component of the

Element	Claim Language
	multimedia item and a plurality of screen captures corresponding to a video component of the multimedia item.
Claim 12	
Element 12a	The method of claim 11, wherein the generating comprises: combining the plurality of screen captures and the at least one audio file to create each of the plurality of multimedia items.
Claim 13	
Element 13a	The method of claim 12, further comprising: the virtualized caching server detecting a change at the at least one webpage corresponding to at least one of the plurality of multimedia items;
Element 13b	in response to detecting the change, retrieving a new plurality of screen captures from the at least one webpage for the at least one of the plurality of multimedia items; and
Element 13c	reassembling the at least one of the plurality of multimedia items using the new plurality of screen captures to yield an updated multimedia item.
Claim 14	
Element 14a	The method of claim 11, wherein the retrieving of the plurality of screen captures comprises obtaining the plurality of screen captures from a playback of a video on the at least one webpage.
Claim 15	
Element 15a	The method of claim 14, wherein the combining of the plurality of screen captures comprises metadata corresponding to at least one of a song title, an artist, and a music genre.
Claim 16	
Element 16a	The method of claim 10, further comprising: the virtualized caching server identifying the at least one webpage based on a channel identifier associated with the broadcast media channel.
Claim 17	
Element 17a	The method of claim 10, further comprising: the virtualized server querying the content provider to determine the second format, wherein the second format corresponds to a Moving Picture Experts Group (MPEG) format.
Claim 18	
Element 18a	The method of claim 10, wherein the content provider is a cable television operator or a satellite television operator.
Claim 19	
Element 19a	The method of claim 10, wherein providing the at least one media

Element	Claim Language
	stream to the content provider comprises streaming the at least one media stream to an MPEG multiplexer associated with the content provider.
Claim 20	
Element 20a	The method of claim 10, further comprising: the virtualized caching server provisioning, on at least one server, at least one virtual machine for performing the receiving, obtaining, generating, assembling, and providing.
Claim 21	
Element 21a	The method of claim 10, wherein virtualizing the system is performed using one of Docket, Xenserver, or a virtual machine.
Claim 22	
Element 22a	The method of claim 10, wherein virtualizing the system includes virtualizing the system to include at least one virtualized multicasting server that perform the providing the at least one media stream to the content provider.
Claim 23	
Element 23a	The method of claim 10, wherein virtualizing the system is performed for one channel, wherein the virtualized caching server is operable for one channel, wherein virtualizing the system is repeated for each one of a plurality of other channels.
Claim 24	
Element 24a	The method of claim 10, wherein receiving the request is performed using a JSON API.
Claim 25	
Preamble 25	A computer-implemented method comprising:
Element 25a	receiving, from a content provider, a request for at least one media stream for playback on a broadcast media channel, wherein the at least one media stream includes a plurality of multimedia items of different types;
Element 25b	obtaining content corresponding to the plurality of multimedia items from at least one source offering the content in at least one first format, performed over a first TCP-IP socket of a caching unit;
Element 25c	rendering a web page by a browser using the content;
Element 25d	generating a temporal sequence of screen captures of the rendered web page, where each screen capture defines all the content of the web page at a given time, and at least two adjacent screen captures illustrate a dynamic change of at least a portion of the content over

Element	Claim Language
	time;
Element 25e	assembling the at least one media stream using the temporal sequence of screen captures;
Element 25f	providing the at least one media stream to the content provider for broadcast on the broadcast media channel; and
Element 25g	providing, at a second TCP/IP socket of the caching unit, a status of the obtaining, generating, and assembling.
Claim 26	
Preamble 26	A computer-implemented method comprising at a caching unit:
Element 26a	receiving, from a content provider, a request for at least one media stream for playback on a broadcast media channel, wherein the at least one media stream includes a plurality of multimedia items of different types;
Element 26b	obtaining content corresponding to the plurality of multimedia items from at least one source offering the content in at least one first format;
Element 26c	rendering a web page by a browser using the content;
Element 26d	generating a temporal sequence of screen captures of the rendered web page, where each screen capture defines all the content of the web page at a given time, and at least two adjacent screen captures illustrate a dynamic change of at least a portion of the content over time;
Element 26e	assembling the at least one media stream using the temporal sequence of screen captures;
Element 26f	at a multicasting unit that is operable connected to the caching unit: providing the at least one media stream to the content provider for broadcast on the broadcast media channel;
Element 26g	recording the media stream from the caching unit to produce a recorded media stream; and
Element 26h	upon a fault being detected at the caching unit, providing at least a portion of the recorded media stream to the content provider.

I, Mr. Stuart Lipoff, declare as follows:

I. Introduction

1. My name is Mr. Stuart Lipoff. I have been retained by Stingray Group Inc. and Stingray Music USA, Inc. (collectively, “Petitioner” or “Stingray”), to provide my expert assessment and technical opinions in connection with the above captioned inter partes review (“IPR”) of U.S. Patent No. 11,140,441 (“the ’441 Patent” or “Patent-at-Issue”), Ex. 1001.¹

2. I understand that the Petition for *Inter Partes Review* involves the ’441 Patent (Ex-1001) and I will provide my opinion regarding Claims 1–26 (“Challenged Claims”).

3. My opinions are based on my years of education, research, and experience, as well as my investigation and study of relevant materials. The materials that I have studied for this declaration include the documents identified in the table of exhibits.

4. I may rely upon these materials, my knowledge and experience, and/or additional materials to rebut arguments raised by the patent owner. Further, I may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me.

¹ All references to “Ex.” in this declaration refer to the Stingray Exhibits concurrently filed with its petition.

5. This declaration is based on information currently available to me. I reserve the right to expand, modify, or supplement my opinions if I become aware of evidence or information that was not available for review at the time I drafted this declaration.

6. I am not, and never have been, an employee of any party to this IPR. I am not receiving compensation for this Declaration beyond my normal hourly fees based on my time actually spent analyzing and documenting my opinions herein on the Patent-at-Issue, the asserted prior art cited in this Declaration and in the Petition, and the issues related thereto. My compensation is not related to the outcome of this proceeding, and I will not receive any additional compensation based on the outcome of any IPR or other proceeding involving the Patent-at-Issue.

7. I have personal knowledge of the facts and opinions stated herein and, if called as a witness, could and would testify competently to them under oath.

8. Unless otherwise noted, all emphasis in any quoted material has been added.

II. Education and Work Experience

9. I have attached my resume as Appendix A to this declaration. While my resume summarizes my educational background and work history, I will now expound upon my qualifications and professional background related to the field of multimedia processing or delivery using internet protocols.

10. I have bachelor's degrees in electrical engineering and in engineering physics, both from Lehigh University. I also have a master's degree in electrical engineering from Northeastern University, and an MBA degree from Suffolk University.

11. I was employed for 25 years by Arthur D Little, Inc. as VP and Director of Communications, Information Technology, and Electronics ("CIE"), where I was responsible for the firm's global CIE practice in laboratory-based contract engineering, product development, and technology-based consulting.

12. I was employed by Bell & Howell Communications Company for four years as a Section Manager.

13. I was employed by Motorola's Communications Division for three years as a Project Engineer.

14. At both Bell & Howell and Motorola, I had project-design responsibility for wireless communications devices with graphical user interfaces controlled by remote terminal servers.

15. I have extensive experience—over a 50-year period—working on legacy and modern applications that relate to the subject matter of the challenged patents involving processing multimedia delivery using internet protocols to deliver content to be rendered on intelligent devices.

16. For the Multimedia Cable Network System (MCNS) consortium of the

majority of USA cable TV system operators, I led the project that developed the standards and specifications for modern cable modems used to deliver IP based high speed internet services and multimedia content. These standards are known today as DOCSIS (data over cable interface specifications) and have been adopted globally as international standards. Development of DOCIS specifications involved considerations that went beyond providing best efforts residential internet web surfing to include support using MPEG convergence layers and service flows to enable quality of service delivery of delay sensitive multimedia such as video, music, and telephony services.

17. For Securus, a provider of pay per call alternate operator services to prison inmates, I evaluated their technology and assets with an emphasis on their ability to associate calling and calling party phone numbers with databases combined with their employees with multiple language skills. Following this evaluation, I worked with the client to identify and plan for offering services to clients other than prison inmates. Examples of such clients included government operated call centers, hospitals, police departments, and telephone catalog sales call centers making use of intelligent rendering engines in cellphones.

18. For International Mobile Machines (“IMM”), a firm that licenses patents to cellphone OEMs, I developed a roadmap of future services, architectures, and technology to support alternative visions of the development of cellular. I then

worked with the firm to generate R&D projects designed to increase the base of patents for IMM to license in the future. The service concepts I generated employed technologies that supported distributed software applications that have a graphical user interface.

19. For International Finance Corporation (the venture capital group of The UN's World Bank), I evaluated an investment opportunity in Cellon Inc, a PRC based cellphone design house. This project included inspection of Cellon's facilities in the PRC and France as well as detailed review of Cellon's facility assets, technology strengths, and intellectual property. Of particular focus was Cellon's technology to support enhanced services with graphic user interfaces.

20. For a consortium of cable TV system operators called Next Generation Network Services (NGNS) I led the project that developed recommendations to modify legacy cable systems architectures to support the delivery of next generation digital multimedia content to residential subscribers. The scope of this project involved enhancements to all aspects of cable system infrastructure including: backbone interconnects, head end systems, outside plant, in home distribution networks, and set-top television terminals. A particular focus was migrating set-top terminals from legacy analog to support digital video and add interactivity.

21. For Tele2 (a pan European cellular and wireline telephone company), I supported Tele2's efforts to procure an advanced cordless telephone from contract

manufacturers in China (“PRC”). This involved development of detailed technical specifications, coordination of a request for information, (“RFI”), and evaluation of the responses. The devices were all enhanced to provide non-voice services.

22. For Millicom International (a cellular provider in several developing nations), I studied capital spending and developed best practice benchmarks. The work products were then employed in forward planning and to develop strategies for improvement of their financial performance. The project involved the collection of data from over 25 systems in 12 countries and developing capital efficiency metrics that were normalized to the specific geographic and demographic specifics of each system. The project not only provided a measure of present and historical capital efficiency but also provided a management system for future deployment.

23. For the banks providing financing to The Iridium Mobile Satellite Service, I served as a technical advisor and assisted in developing the contracts between the banks and Motorola in which Motorola secured the loan. As a technical advisor, I had extensive day-to-day interactions with Motorola’s manufacturing and product design organizations. The interactions included examination of the manufacturing cost, methods, and processes of Motorola’s Subscriber Products Group including voice and data applications of cellphones, pagers, and related portable wireless data communications devices.

24. For Sony USA, I supported a feasibility analysis of a planned

investment by Sony into a wireless PCS carrier in the USA. This involved the development of advanced concepts employing distributed software applications that have a graphical user interface and exploring alternative business models, financial analysis, and technical analysis in order to determine financial attractiveness and risk of proceeding with the venture.

25. For Samsung Electronics Global Marketing, I developed a strategic framework for a line of portable and personal multimedia products to be introduced in the USA. The project included developing a common theme for a set of products that ranged from cellphones, MP3 music players, electronic books, PDAs, to hand-held games. One common theme was developed, product features and capabilities were detailed, and market adoption models were developed to forecast demand.

26. For Korea Mobile Telephone (“KMT”), I supported the project that developed a strategic plan to position KMT relative to Korea Telecom by enhancing their service offerings to support distributed software applications that have a graphical user interface.

27. For Symbol Technology, a manufacturer of hand-held industrial computing products, I co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Later I worked with this same client to select voice over internet protocol (“VoIP”) codecs and algorithms that support the client’s current product offering including cordless

industrial voice telephony over a quality of service (“QoS”) managed wireless IP network.

28. I helped lead the project for CableLabs that studied the technology and economics of wireless personal communications technology. This project is highlighted in the history of CableLabs in their website as one of the significant accomplishments of “The Labs.” The project included the selection of CDMA technologies and the development of strategies to compete with incumbent cellular carriers including the offering of non-voice multimedia services. This effort led to the formation of a consortium between Sprint and the cable MSOs that has evolved into the present Sprint PCS business.

29. For Cambridge Silicon Radio (UK) (“CSR”), I worked with the client to develop a prioritized list of applications for their Bluetooth component offerings. The project mapped applications into specific target customers and was based upon an analysis that considered the market needs with CSR’s capabilities, a prioritized roadmap of products was developed to steer the R&D portfolio. A major focus of this effort was to identify Bluetooth applications for data transfer for multimedia display applications.

30. For the investors in Mitel Semiconductor (Canada), I assisted the client in valuing their telephone and business phone system telecommunications semiconductor device products and know-how in the firm. The project required a

competitive review of Mitel Products and technology, and an evaluation of the future likely needs of the marketplace. The scope of the project included supporting graphics displays on the desktop phone for delivery of multimedia information such as weather and stock prices. My recommendations indicated which products should be the basis of further investment and most likely to be valued in a sale or licensing.

31. For TRW, I participated in an assignment which reviewed all their non-classified military and defense technology to identify commercial applications. A number of systems I reviewed included applications in security for wireless communications and antifraud that were developed and which became the basis for successful spin-off operations.

32. For a corporate cross-sector event organized by Motorola Corporate for all their divisions, I prepared presentations on the visions of the future in each of the major sectors in which Motorola has an interest. The presentations included: consumer electronics, medical, automotive, industrial electronics, and communications. The presentations provided a basis for the cross-sector teams to engage in long term planning for each division.

33. For Bell South, I contributed to a major operations improvement project involving developing forecasts for the future competitive environment, customer needs, a strategy to compete, and new business models. The scope of this project included planning for videotex delivery from Bell South servers to consumer

desktop videotex terminals. These forecasts were then applied to develop business redesign recommendations and a list of new service offerings.

34. I am a registered professional engineer (by examination) in The Commonwealth of Massachusetts and the State of Nevada. I also hold an FCC General Radiotelephone License and a Certificate in Data Processing from the Association of Computing Machinery (“ACM”)-supported Institute for the Certification of Computing Professionals.

35. I am a fellow of the Institute of Electrical and Electronics Engineers (“IEEE”) Consumer Electronics, Communications, Computer, Circuits, and Vehicular Technology groups. I am also a member of the IEEE Consumer Electronics Society Board of Governors (i.e., board of directors), and was the Boston Chapter Chairman of the IEEE Vehicular Technology Society. I served as President of the IEEE Consumer Electronics Society from 1996 to 1997 and as Chairman of the Consumer Electronics Society Technical Activities and Standards Committee, as VP of Publications, and most recently at VP of Industry Activities and Standards for The IEEE Consumer Technology Society (formerly Consumer Electronics Society). I am currently the historian for The Society. I have also chaired the search committee for the Sony-supported Mazura Ibuka Award in consumer electronics.

36. In my capacity as a fellow of the IEEE Consumer Technology Society, I have chaired conference panels sessions and reviewed papers submitted for

publication dealing with all manner of advanced business and consumer multimedia systems involving distributed software applications that have a graphical user interface.

37. As Vice President and Standards Group Chairman of the Association of Computer Users (“ACU”), I served as the ACU representative to the ANSI X3 Standards group. For the Federal Communications Commission’s Citizens advisory committee on CB radio (“PURAC”), I served as Chairman of the task group on user rule compliance. I have also been elected to membership in the Society of Cable Television Engineers, ACM, and the Society of Motion Picture and Television Engineers.

38. I am listed as an inventor/co-inventor on the following U.S. patents:

ID	Title	Filing Date
US-8200291-B2	Vehicle safety device for reducing driver distractions	7/23/2008
US-RE44274-E	Ubiquitous imaging device based check image capture	3/14/2012
US-2005108096- A1	Portable electronic authorization system and method	10/20/2004
US-2005116026- A1	Portable electronic authorization system and method	11/12/2004
US-2012252350- A1	Vehicle safety device for reducing driver distractions	6/11/2012
US-2009212110- A1	Virtual barcodes	9/15/2008
WO-2005043438- A1	Portable electronic authorization system and method	10/20/2004
US-5692093-A	Method and apparatus for eliminating television commercial messages	1/4/1994
US-5455630-A	Method and apparatus for inserting digital	8/6/1993

	data in a blanking interval of an RF modulated video signal	
EP-0693215-B1	Method and apparatus for eliminating television commercial messages	1/6/1994
US-4529941-A	FSK Demodulator utilizing multiple-phase reference frequencies	11/29/1982

III. Compensation

39. I am being compensated at a rate of \$375 per hour plus expenses for my expert services in connection with this proceeding. This compensation is not contingent upon my performance, the outcome of this IPR, or any issues involved in or related to this IPR.

IV. Legal Principles

40. As a technical expert, I am not offering any legal opinions. Rather, I am offering technical assessments and opinions. In rendering my analysis, I have been informed by counsel regarding various legal standards for determining patentability. I have applied those standards in forming my technical opinions expressed in this declaration.

41. I understand that for an invention claimed in a patent to be found patentable, it must be (among other things) new and not obvious based on what was known before the invention was made.

42. I understand that the information that is used to evaluate whether an invention was new and not obvious when made is generally referred to as “prior art.”

43. I understand that, in this proceeding, Petitioners have the burden of

proving that the challenged claims are invalid by a preponderance of the evidence.

44. I understand that in this *inter partes review* proceeding, the information that may be evaluated is limited to patents and printed publications. My analysis, which is set out in detail below, compares the claims to printed publications that I understand are prior art to the claims.

A. Level of Ordinary Skill in the Art

45. When interpreting a patent, I understand that it is important to identify the relevant art pertaining to the patent-in-suit as well as the level of ordinary skill in that art at the time of the claimed invention. The “art” is the field of technology to which the patent is related.

46. I have been instructed by counsel that the person of ordinary skill in the art (“POSITA”) is a hypothetical person who is presumed to know the relevant prior art. I understand that the actual inventor’s skill is not determinative of the level of ordinary skill. I further understand that the factors that may be considered in determining the level of skill include: the types of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field. I understand that not all such factors may be present in every case, and one or more of them may predominate.

B. Legal Standard for Claim Construction

47. I understand that the first step in determining whether a patent claim would have been anticipated or obvious is to ascertain how a POSITA would have understood the claim terms.

48. I have been instructed by counsel on the law regarding claim construction and patent claims, and I understand that a patent may include two types of claims: independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend from an independent claim, or it can further depend from another dependent claim. I understand that a dependent claim includes all the limitations that it recites, in addition to all the limitations recited in the claim(s) from which it depends.

49. It is my understanding that in proceedings before the USPTO, the claims of a patent are to be construed under what is referred to as the “*Phillips* standard.” I understand that this means that claim terms of a patent are given the meaning the terms would have to a POSITA, in view of the description provided in the patent itself and the patent’s file history.

50. I understand that to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood the disputed claim language to mean. I understand that, in construing a claim term, one looks primarily to the

intrinsic patent evidence, including the words of the claims themselves, the remainder of the patent, and the patent's prosecution history. I understand that extrinsic evidence, which is evidence external to the patent and the prosecution history, may also be useful in interpreting patent claims when the intrinsic evidence itself is insufficient.

51. I understand that words or terms should be given their ordinary and accepted meaning unless it appears that the inventors were using them to mean something else. In making this determination, the claims, the remainder of the patent, and the prosecution history are of paramount importance. Additionally, the patent and its prosecution history must be consulted to confirm whether the patentee has acted as its own lexicographer (i.e., provided its own special meaning to any disputed terms), or intentionally disclaimed, disavowed, or surrendered any claim scope.

52. In comparing the claims of the Challenged Patent to the prior art, I have considered the Challenged Patent and its file history in light of the understanding of a person of skill at the time of the alleged invention.

C. Anticipation under 35 U.S.C. § 102

53. It is my understanding that the claims of a patent are anticipated by a prior art reference if each and every element of the claim is found either explicitly or inherently in a single prior art reference or system. I understand that inherency requires a showing that the missing descriptive matter in the claim is necessarily or

implicitly present in the allegedly anticipating reference, and that it would have been so recognized by a POSITA. In addition, I understand that an enabling disclosure is a disclosure that allows a POSITA to make the invention without undue experimentation. Although anticipation typically involves the analysis of a single prior art reference, I understand that additional references may be used to show that the primary reference has enabling disclosure, to explain the meaning of a term used in the primary reference, and/or to show that a characteristic is inherent in the primary reference.

D. Obviousness under 35 U.S.C. § 103

54. It is my understanding that a claim is unpatentable if the claimed subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time of the alleged invention. I also understand that an obviousness analysis takes into account the scope and content of the prior art, the differences between the claimed subject matter and the prior art, and the level of ordinary skill in the art at the time of the invention.

55. I understand that a claimed invention is not patentable if it would have been “obvious” to a person of ordinary skill in the field of the invention at the time the invention was made. This means that even if all the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would

have been obvious to a person of ordinary skill in the art at the time the application was filed.

56. In determining the scope and content of the prior art, it is my understanding that a reference is considered relevant prior art to the Patent-at-Issue if it falls within the field of the inventor's endeavor. In addition, a reference is prior art if it is reasonably pertinent to the particular problem with which the inventor was involved. A reference is reasonably pertinent if it logically would have commended itself to an inventor's attention in considering his problem. Thus, if a reference relates to the same problem as the claimed invention, that supports the use of the reference as prior art in an obviousness analysis.

57. In my opinion, the prior art references identified herein seek to solve the same types of problems as the Patent-at-Issue and logically would have commended themselves to an inventor's attention considering the problems of the Patent-at-Issue.

58. I understand that a determination as to whether a claim would have been obvious should be based on four factors (though not necessarily in the following order): (i) the level of ordinary skill in the art at the time the application was filed; (ii) the scope and content of the prior art; (iii) the differences between the claimed invention and the prior art; and (iv) any objective factors indicating obviousness or non-obviousness that may exist in a particular case.

59. It is my understanding that an obviousness analysis cannot be based on hindsight, but it must be done using the perspective of a person of ordinary skill in the relevant art as of the effective filing date of the patent claim.

60. I understand the objective factors indicating obviousness or non-obviousness may include: commercial success of products covered by the patent claims; a long-felt but unaddressed need for the invention; failed attempts by others to make the invention; copying of the invention by others in the field; expressions of surprise by experts and those skilled in the art at the making of the invention; and the patentee having proceeded contrary to the accepted wisdom of the prior art. I also understand that any of this evidence must be specifically connected to the invention rather than associated with the prior art or with marketing or other efforts to promote an invention.

61. I am not aware of such objective indicia of non-obviousness in this case. However, I reserve the right to address them should any be identified or relied upon.

62. I understand that the teachings of two or more prior art references may be combined in the manner disclosed in the claim if such a combination would have been obvious to one having ordinary skill in the art at the effective filing date. In determining whether a combination would have been obvious, I understand that the following exemplary rationales may support a conclusion of obviousness:

- Combining prior art elements according to known methods to yield predictable results;

- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices (methods, or products) in the same way;
- Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- “Obvious to try”—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to a person of ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led a person of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

63. I understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can take account of the ordinary innovation and experimentation in the relevant field that does no more than yield predictable results.

64. I understand that, in assessing whether there was an apparent reason to modify or combine known elements as claimed, it may be necessary to look to interrelated teachings of multiple patents or prior art references, the effects of commercial demands, and the background knowledge of a person of ordinary skill in the art. I further understand that any motivation that would have applied to a person of ordinary skill in the art, including motivation from common sense or derived from the problem to be solved, is sufficient to explain why references would

have been combined.

65. I understand that a person of ordinary skill in the art is also a person of ordinary creativity. In many fields, it may be that there is little discussion of obvious techniques, modifications, and combinations, and it may be the case that market demand will drive a new design, rather than scientific research or literature. When there is market pressure or design need to solve a particular problem, and there are a finite number of identified, predictable solutions, a person of ordinary skill has a good reason to employ the known options. If this leads to the expected success, then it is likely the product of ordinary skill and common sense as opposed to patentable innovation. I understand that if a combination was obvious to try, that may show that it was obvious and therefore unpatentable. That a particular combination of prior art elements was obvious to try suggests that the combination was obvious even if no one made the combination.

E. Priority Date

66. I have been asked to assume that the priority date of the Patent-at-Issue is December 22, 2014. *See* Ex. 1001 at (60).

V. Level of Ordinary Skill

67. Assuming that the priority date of the Patent-at-Issue is December 22, 2014, based on my knowledge and skills, I was as POSITA as of December 22, 2014, and can provide opinions regarding the knowledge of POSITA as of that time. My

opinions herein are, where appropriate, based on my understanding of the perspective of a POSITA at that time.

68. Based on the materials and information I have reviewed and based on my experience in the technical areas relevant to the Patent-at-Issue, a person of ordinary skill in the art at the time of the alleged invention of the Patent-at-Issue would have a bachelor's or equivalent degree in computer science or a related field and at least 2 year's of experience in multimedia processing or delivery using internet protocols. A person with less formal education but more experience, or more formal education but less experience, could have also met the relevant standard for a POSITA.

VI. Overview of the '441 Patent

A. Summary of the Patent

69. The '441 Patent has 26 claims. Claims 1, 10, 25 and 26 are independent claims.

70. The '441 Patent is generally directed to “a mechanism for delivering multimedia content from a cloud-based system to cable or satellite content providers.” Ex. 1001, 1:21-23.

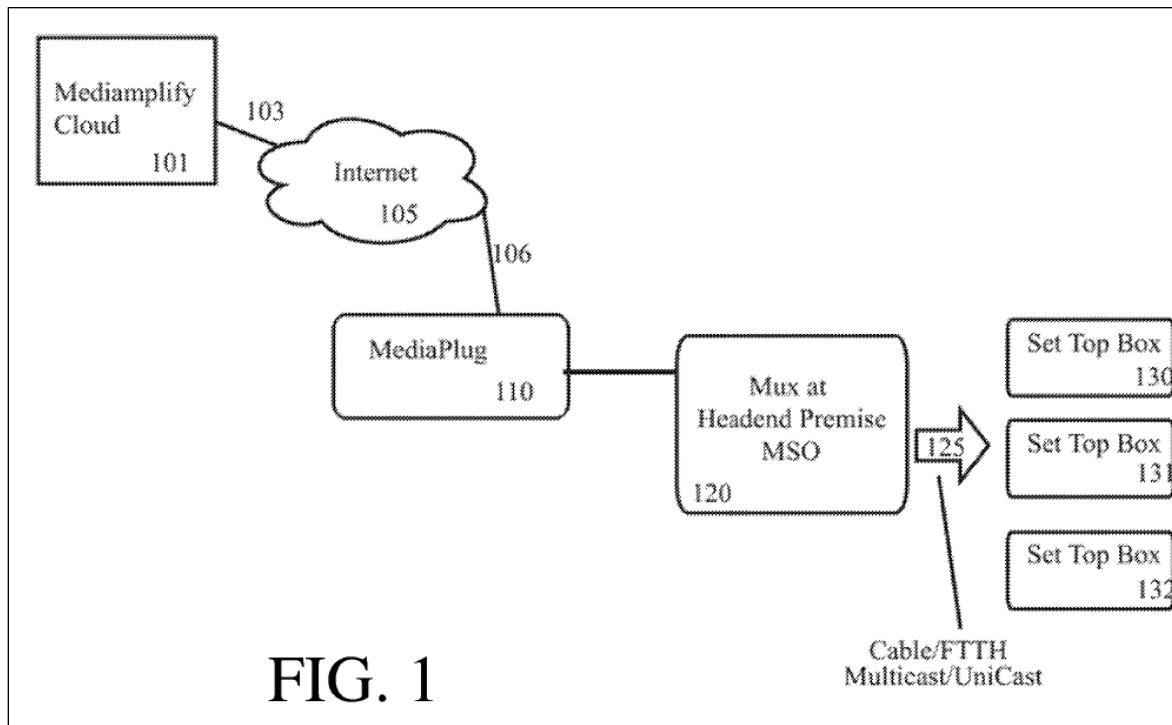
71. At a high level, the '441 Patent describes:

An example computer-implemented method can receive, from a content provider such as a cable or satellite operator, a request for at least one media stream for playback on a broadcast media channel.

The request for the at least one media stream can include a request for a plurality of multimedia items. Content corresponding to the plurality of multimedia items can be obtained from at least one website or cloud service that offers the content in at least one first format. Based on the obtained content, the plurality of multimedia files can be generated in a second format that is compatible with the content provider. The media stream can [be] assembled using each of the multimedia items generated in the second format. The media stream can be provided to the content provider for broadcast on the broadcast media channel.

Ex. 1001, 2:56-3:3.

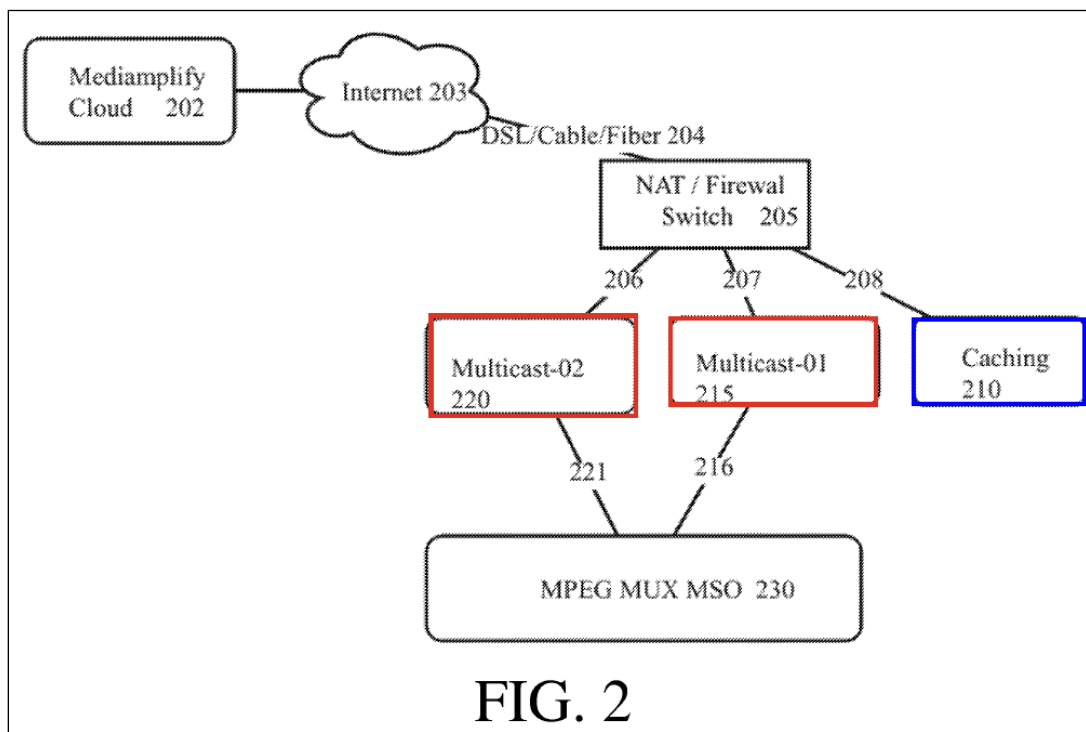
72. Figure 1 of the '441 Patent is reproduced below.



73. As shown in Figure 1, the Patent-at-Issue discloses a Mediaplug 110 unit that is in communication with the cloud 101 through the internet 105. Ex-1001, 3:66-4:22. The Mediaplug 110 can reside at an “MSO” facility “used by a cable operator to receive all TV and Radio programming that the cable operator will then

multiplex, re-encode, and distribute from the MSP to a set of subscriber units with set top boxes....” *Id.*, 4:22-27. The Mediaplug 110 provides multimedia content (e.g., video and audio) to an MPEG multiplexer which delivers content to subscriber set top boxes 130, 131, 132 via coaxial cable 125. *Id.*, 4:27-40.

74. Figure 2 of the Patent-at-Issue is reproduced below (coloring has been added).



75. As shown in Figure 2, the hardware components of the Mediaplug 110 includes three servers. Ex-1001, 4:52-55. Specifically, the Mediaplug 110 includes a caching unit 210 (blue) which is the storage component of the system and can contain the multimedia files in the format required by the cable operators. *Id.*, 4:64-67. The caching unit can encode and transcode the multimedia files it downloads

from the cloud and communicates with the two multicast units 215, 220 (red) allowing the multicast units 215, 220 to pull or obtain information from it. *Id.*, 5:6-12.

B. Prosecution History of the Patent

76. During prosecution of the Patent-at-Issue's parent application, Application No. 15/538,911, the Examiner rejected the original independent claims as anticipated by the cited prior art. Ex. 1015, 74-92. In response, the Patent Owner amended the pending claims in that parent application to require: (1) "render[ing] a web page by a browser using the content," and (2) "generat[ing] a temporal sequence of screen captures of the rendered webpage, where each screen capture defines all the content of the web page at a given time, and at least two adjacent screen captures illustrate a dynamic change of at least a portion of the content over time." Ex-1015, 62. Based on the Patent Owner's amendment and his representation that this addition was "an important distinction" over the cited prior art (Ex-1015, 69), the Examiner allowed the claims of the parent application—which became U.S. Patent No. 10,123,074—without further rejection. Ex-1015, 21-23. Those elements also were included in the application for the '441 Patent and are found in Independent Claims 10, 25 and 26. Ex-1001.

77. With respect to the added "rendering" language, the '441 Patent explains that a web service "can include JavaScript, CSS, and HTML content files

that can be rendered using a browser using WebKit (e.g. PhantomJS or Safari) or any other browser-rendering engine compatible with HTML4/5 or any future HTML version.” Ex-1001 at 7:5-7:9.

78. With respect to the added “screen capture” language, the ’441 Patent states that “rendered images from a web service can be used to create overlapping video or replace any video in the video feed file.” Ex-1001 at 7:10-12. Specifically, “one or more screens will be retrieved from the rendering engine” and captured “using a tool similar to PhantomJS (Webkit-based headless engine for rendering images) or QtCapture, or simply capturing screen frame buffers from a machine running any software tool.” Ex-1001 at 7:19-26.

79. PhantomJS is a headless web browser that was first released on or about 2011. Similarly, QtCapture is a tool that has been around since at least 2011 and is used to capture media (e.g., video, images, or screen recordings). Accordingly, both were commonly-known and readily-available third-party software tools. In fact, the Patent-at-Issue acknowledges the availability of these tools to POSITAs. Ex. 1001, 7:19-26.

80. The specification further provides that “[o]nce all screens and video are captured, 530 the resulting output created can be a video file that then is either replaced or merged (multiplexed) with the original file.” *Id.*, 7:24-27. “The multiplexing can be done using tools such as FFMPEG or VLC or any proprietary

tool that can multiplex audio and video files into a resulting MPEG Transport Stream (or MPEG-4 output, or any similar output).” *Id.*, 7:44-50; *see also* 7:37-41.

81. FFMPEG is an open-source software that has been around since on or about 2000 and allows users to process multimedia files including audio and video. Similarly, VLC was released on or about 2001 and is another open source media player available to play digital media including audio and video. Accordingly, both FFMPEG and VLC were well-known tools that were readily available to POSITAs.

82. Similarly, MPEG and its features were well known to POSITAs. MPEG refers to the “Moving Picture Experts Group” which is a family of international standards used for coding audio-visual information in a digital compressed format. MPEG standards compress video into a series of video frames, such as I-frames, P-frames and B-frames, that can be decoded to reproduce the encoded video. Similarly, the MPEG Transport Stream or MPEG-TS format is a digital container format for transmitting video, audio and metadata, and is commonly used in broadcast systems. Both MPEG and the MPEG Transport Stream output format were commonly known to POSITAs and widely used in multimedia delivery prior to the filing date of the ’441 Patent.

83. As a result, the Challenged Claims are all directed to the combined use of commonly-known processes, software tools and transport formats that pre-existed the ’441 Patent’s priority date.

VII. Overview of the Prior Art

A. Farber

84. Farber is U.S. Patent No. 7,940,303 to Farber, et al. (“Farber”), which was filed on November 12, 2009. It is my understanding that Farber is prior art to the Patent-at-Issue.

85. Farber is in the same field of endeavor as the Patent-at-Issue.

86. Farber discloses “transmitting various music channel broadcasts over a network such as a cable television network or a satellite network for distribution to a plurality of subscribers.” Ex-1003 at 5:2-12. Like the ’441 Patent, Farber generates a visual user interface (see Figure 1 below) for each channel that includes information for the song currently playing.

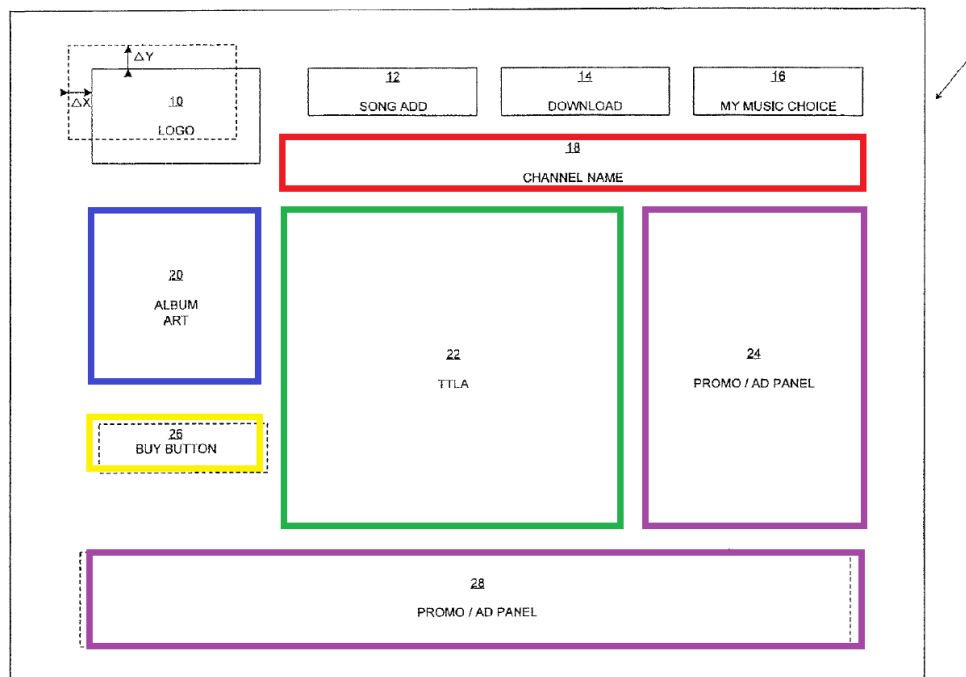


Fig. 1

87. This user interface displays information such as the “channel name 18 [red box], album art 20 [blue box], title track label and artist information 22 [green box], promotional/advertising panels 24 [purple boxes] and a buy button 26 [yellow box].” Ex-1003 at 3:38-44 and 3:30-31 (stating that these assets may include “textual information, motion picture video, [or] graphics”).

88. Figure 6 of Farber shows example markup language for an interface that would accompany playback of Elton John’s song “Are You Ready for Love” from his “Greatest Hits 1970-2002” album on the “Soft Rock” channel.

600

```
<?xml version="1.0"?>
<!DOCTYPE Scrn SYSTEM "file:///data/mc/MusicChoice.dtd">
<Scrn hgt="480" wid="704"
  chan="001" chName="Soft Rock" Seq="02262">
  <IntWin xPos="200" yPos="90" xSz="390" ySz="236"
    BgCl="0x1E1E1E" FgCl="0xC4C3C8" InCl="0xB71E16"
    BgSl="0xB71E16" BtSl="0xB71E16" BdSl="0xC8C800" />
  <Grobj
    xPos="214" yPos="92" xSz="214" ySz="251" wid="214" hgt="251"
    pos="1" >
    <SongTitle value="Are You Ready For Love (2003)"/>
    <Artist value="Elton John"/>
    <RecordLabel value="ULTRA"/>
    <CD value="Elton John's Greatest Hits 1970-2002"/>
    <UniqID value="3310722"/>
  </Grobj>
  <Grobj src="mcBt_BuyPrevious_1.jpg" desc="Buy Previous Button"
    xPos="209" yPos="314" xSz="129" ySz="37" wid="129" hgt="37"
    pos="2" />
  <Grobj src="mcAA1730327.jpg" desc="Elton John's Greatest
    Hits 1970-2002"
    xPos="501" yPos="338" xSz="100" ySz="100" wid="100" hgt="100"
    pos="3" />
```

89. This markup language—which Farber states “may be coded utilizing HTML”—is then encoded into an MPEG video frame and multiplexed together with the corresponding audio data into an MPEG transport stream for delivery to a content provider. Ex-1003 at 5:50-54 and 6:2-25.

B. Avellan

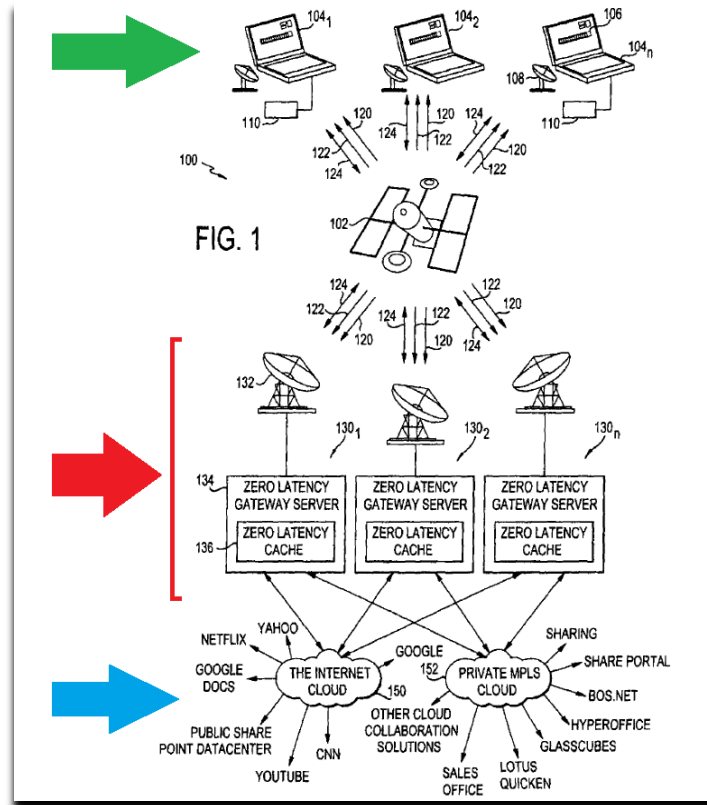
90. Avellan is U.S. Patent No. 8,954,600 to Avellan, et al., which was filed on March 2, 2012 and issued on February 10, 2015. It is my understanding that Avellan is prior art to the Patent-at-Issue.

91. Avellan is in the same field of endeavor as the Patent-at-Issue.

92. Avellan is directed to a communication system that can “broadcast information from a web server over a broadcast device to a multitude of user computers.” Ex-1003, 2:9-10. Specifically, “system 100 provides for the user computers 104₁-104_n to access the Internet 150 and/or private network cloud 152 through a virtual browser 106 of the gateway 130.” Ex-1003, 4:18-21. “[T]he browser software 106 resides at the gateway 134, and is configured to run as a virtual browser as a remote client of the gateway server 134.” Ex-1003, 4:56-58. Because the browser software resides at the gateway, “the remote browser 106 may rely upon the computing power and very high-speed connection of the gateway server 134 to resolve and render pages, images, and documents from the networks 150, 152.” Ex-1003, 4:62-65.

93. Referring to Avellan’s Figure 1 (below), a user at computer 104 (green arrow) can request media streams from either the Internet or a private network cloud (collectively, blue arrow) for playback. That gateway platform 130 (red arrow) receives the request, obtains the content from the networks, processes it using the

disclosed browser software, and then broadcasts the requested media on a broadcast media channel.



Ex. 1003, Fig. 1.

94. Avellan further discloses that “web pages often have information which is rendered over a period of time, *such as a video*, streaming information, or an animated display. Accordingly, the gateway server 134 *continuously captures images of the web page* until it detects a repeating pattern of the information in the web page.” Ex-1003, 5:5-5:10. “Thus, gateway server 134 will be certain to capture all the information on the web page even if that information continues over a period of time.” Ex-1003, 5:10-5:12. Avellan explicitly adds that “suitable sites for the

broadcast mode are news sites like CNN, BBC, newspaper, live streaming television feeds, movies, music downloads, or ESPN.” Ex-1003, 8:18-21.

C. Vermeulen

95. Vermeulen is U.S. Patent No. 9,009,111 to Vermeulen, et al. (“Vermeulen”), which was filed on May 14, 2012. It is my understanding that Vermeulen is prior art to the Patent-at-Issue.

96. Vermeulen is in the same field of endeavor as the Patent-at-Issue.

97. Vermeulen generally discloses a web-services based storage system that receives client requests for access to data, and can be used in “multimedia applications” to deliver multimedia content to clients.

D. Pavlovskaia

98. Pavlovskaia is U.S. Patent No. 8,442,110 to Pavlovskaia, et al. (“Pavlovskaia”), which was filed on October 9, 2008. It is my understanding that Pavlovskaia is prior art to the Patent-at-Issue.

99. Pavlovskaia is in the same field of endeavor as the Patent-at-Issue.

100. Pavlovskaia is directed toward a system for outputting data streams for broadcast that includes obtaining content from web sites, generating an HTML user interface for rendering, and encoding each interface into a broadcast channel for delivery to a user.

E. Pavlovskaia-PCT

101. Pavlovskaia-PCT is WIPO International Publication Number WO 2010/044926 to Pavlovskaia, et al. (“Pavlovskaia-PCT”), which was published on April 22, 2010. It is my understanding that Pavlovskaia-PCT is prior art to the Patent-at-Issue.

102. Pavlovskaia-PCT is in the same field of endeavor as the Patent-at-Issue.

103. Pavlovskaia-PCT is directed toward a system for obtaining content from the web, rendering the content into a MPEG stream, and broadcasting it downstream to user devices.

F. Davis

104. Davis is U.S. Patent No. 8,676,822 to Davis (“Davis”), which was filed on February 6, 2009. It is my understanding that Davis is prior art to the Patent-at-Issue.

105. Davis is in the same field of endeavor as the Patent-at-Issue.

106. Davis is directed toward a system for “quality assured media storage” that can be used for video distribution and internet-based video streaming.

G. Fogel

107. Fogel is U.S. Patent Application Publication No. 2012/0117569 to Fogel, et al. (“Fogel”), which was published on May 10, 2012. It is my understanding that Fogel is prior art to the Patent-at-Issue.

108. Fogel is in the same field of endeavor as the Patent-at-Issue.

109. Fogel is directed toward interacting with the content of a webpage, including rendering the page using a web rendering engine.

H. Durante

110. Durante is U.S. Patent No. 8,819,043 to Durante, et al. (“Durante”), which was filed on November 9, 2010. It is my understanding that Durante is prior art to the Patent-at-Issue.

111. Durante is in the same field of endeavor as the Patent-at-Issue.

112. Durante generally relates to the playback of music videos and discloses the use of metadata for the song title and artist name.

I. Ma

113. Ma is U.S. Patent No. 9,635,075 to Ma, et al. (“Ma”), which was filed on March 8, 2010. It is my understanding that Ma is prior art to the Patent-at-Issue.

114. Ma is in the same field of endeavor as the Patent-at-Issue.

115. Ma generally relates to the broadcast of media services and the use of identifiers to identify channel content.

J. Suzuki

116. Suzuki is U.S. Patent No. 6,463,445 to Suzuki, et al. (“Suzuki”), which was filed on September 30, 1999. It is my understanding that Suzuki is prior art to the Patent-at-Issue.

117. Suzuki is in the same field of endeavor as the Patent-at-Issue.

118. Suzuki generally relates to a multimedia retrieval system that includes a process for obtaining information relating to an encoding format that is compatible with the decoding capabilities of a client device.

K. Wannamaker

119. Wannamaker is U.S. Patent Application Publication No. 2004/0031052 to Wannamaker, et al. (“Wannamaker”), which was published on February 12, 2004. It is my understanding that Wannamaker is prior art to the Patent-at-Issue.

120. Wannamaker is in the same field of endeavor as the Patent-at-Issue.

121. Wannamaker generally relates to obtaining web content, rendering it using browser software executing on the server, and imaging the rendered content for encoding into an MPEG video stream for delivery to a client.

L. Gangadharan

122. Gangadharan is U.S. Patent No. 9,331,967 to Gangadharan, et al. (“Gangadharan”), which was filed on October 31, 2013. It is my understanding that Gangadharan is prior art to the Patent-at-Issue.

123. Gangadharan is in the same field of endeavor as the Patent-at-Issue.

124. Gangadharan is directed toward a protocol for real-time communication between a client device and a multimedia subsystem that can deliver multimedia content to a client device.

VIII. Grounds of Invalidity

A. Ground 1: Claims 1 and 7 are anticipated by Farber

125. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Farber anticipates Claims 1 and 7.

126. With respect to Element 1b, a POSITA would recognize that the successful payout of the requested data is a “determin[ation] that there is sufficient storage space” for the multimedia asset at the caching unit. In other words, by virtue of retrieving “at a later time” the stored data, there must have been sufficient storage space for that data. I note that that Element 1b, on its face, does not require this determination to be made before attempting to store the multimedia asset, nor does it require a determination of a specific amount of available storage space. Similarly, Element 1b, on its face, also does not specify the form that this “determination” step takes, such as by requiring an alert or responsive message. Because the act of successfully storing and retrieving the multimedia asset satisfies the plain and ordinary language of Element 1b, a POSITA would recognize that Farber’s discussion of storing and retrieving the multiplexed transport stream for subsequent playback both explicitly and inherently teaches Element 1b.

127. With respect to Element 1d, a POSITA would recognize that Farber discloses that both the audio feed and data source 44—which provide access to digital files with media content stored in them—can be implemented on remote

servers that are not “co-located” with the data carousel and are accessed over a communications network. A POSITA would understand such remote servers to be a cloud-based service.

128. With respect to Element 1h, a POSITA would recognize that being able to playout a “desired” media stream “at a later time” inherently discloses “receiving a request” for that stored multimedia asset. A POSITA would recognize that Farber discloses receiving such a request from a broadcasting unit. For example, Farber teaches “feed[ing] the multiplexed signal out for broadcast in the form of a video transport stream to a distribution system” such as “a cable television network or a satellite network provider.” Ex-1003 at 6:21-25 and 5:9-12 (stating that “audio broadcast system 40 is designed for transmitting various music channel broadcasts over a network such as cable television network”). And in reference to Figure 5, Farber states “system 140 is capable of simultaneously *transmitting*, playing out, or *storing* such content for later playback *utilizing the methods disclosed above.*” Ex-1003 at 8:22-25. Thus, a POSITA would understand that the storage embodiment of Figure 5 would utilize the same methods as discussed with respect to the other figures of Farber, including Figure 4 and the accompanying discussion of communication with a broadcast distribution system.

B. Ground 2: Claims 1 and 2 are obvious in view of Farber and Vermeulen

129. Vermeulen discloses “nodepicker 130” which acts as “storage node

selection logic.” Ex-1005 at 14:59-60. Prior to storing a data object, nodepicker 130 “develop[s] a write plan” and “ensure[s] that the write plan has a reasonable chance of succeeding—for example, that the nodes 160 specified in the write plan are in fact operational *and are expected to have sufficient storage resources available to accept the object 30*—and that the write plan, if completed, would satisfy all storage policies pertinent to write operations.” Ex-1005 at 14:65-15:8 and 7:2-3 (stating that data objects “may be allowed to scale in size subject only to the physical storage resources available to the storage service”).

130. POSITAs would have been motivated to combine Farber and Vermeulen because it is advantageous to check for available space in storage prior to storing data, such as Farber’s transport streams which can be stored in storage device 150 when “playout is desired at a later time.” Ex-1003 at 7:62-8:3. POSITAs would recognize that not checking for sufficient space in a storage device could lead to file system errors and storage failure, negatively impacting the user’s experience when playback is later “desired” by the user.

131. POSITAs would have had a reasonable expectation of success in combining Farber with Vermeulen’s disclosure of checking for available space because the process of checking for space was well-known and commonly implemented in computer systems. Farber also states that its storage can be “any suitable storage medium such as DVD, CD ROM, hard disk, or any other suitable

read only or rewritable storage medium,” which are all forms of memory that POSITAs know how to evaluate for available space, and thus Vermeulen’s nodepicker would be compatible with the system of Farber and not require any alteration to its operation.

132. Vermeulen also teaches that “multimedia applications generate and use application data of various types and formats, such as . . . images, audio and video data, among others.” Ex-1005 at 1:26-28 and 4:8-11 (stating that “multimedia applications, such as authoring, storage and playback applications, require escalating amounts of data storage”). To address this, Vermeulen discloses “a storage model for providing data storage to users as a service, such as a web service” that “may include a web services interface configured to receive, according to a web services protocol, client requests for access to data objects.” Ex-1005 at 4:50-51 and 2:17-19.

133. POSITAs would have been motivated to combine Farber and Vermeulen because receiving a “request” for a stored stream when playback is “desired” is a simple solution for being able to retrieve such data. POSITAs recognize that communicating such requests allow users to select data for delivery, which improves user experience.

134. POSITAs would have had a reasonable expectation of success in combining Farber with Vermeulen’s disclosure of receiving requests because Farber

already discloses a storage device specifically for playing data back “in applications where playout is desired at a later time.” Ex-1003 at 7:62-8:3; Ex-1002, ¶131. Implementing a routine to receive requests for such desired data was commonly-known in the art and is compatible with Farber’s system and would not require any alteration to its operation.

135. As a result, it is my opinion that Farber in view of Vermeulen renders Claim 1 obvious.

136. Vermeulen discloses “a storage model for providing data storage to users as a service, such as a web service.” Ex-1005 at 4:50-51. This system “may include a web services interface configured to receive, according to a web services protocol, client requests for access to data objects.” Ex-1005 at 2:17-19. Vermeulen specifically discloses a REST API and teaches that “in a Representational State Transfer (REST)-style web services architecture, the parameters that are pertinent to a web services call (e.g., specifying the type of service requested, user credentials, user data to be operated on, etc.) may be specified as parameters to the data transport command that invokes the web services call to the web services end-point, such as an HTTP GET or PUT command.” Ex-1005 at 5:9-15.

137. POSITAs would have been motivated to combine Farber and Vermeulen because REST web services and APIs were a reliable method for communicating over a client-server architecture and used the commonly-known

Hypertext Transfer Protocol (HTTP), which is the foundation for data communication over the internet. POSITAs would have also recognized that an advantage to using a REST API is that it allows the implementation of the server and the implementation of the client to be independent, simplifying the process of handling requests for resources.

138. POSITAs also would have a reasonable expectation of success in implementing a REST API in Farber because it was common knowledge of how to implement REST APIs and use, for example, HTTP GET request to communicate resource requests and states between a client and server. Additionally, because a REST API, by definition, does not require a server to store information about a client (and client states and other parameters can be passed with the request), POSITAs recognize that REST APIs are easier to implement than other methods, such as a Simple Object Access Protocol model, and that a REST API could be readily-included in Farber without altering its operation. Indeed, the '441 Patent does not purport to have invented REST APIs and merely states that “[a] web service that matches a REST interface (Representation State Transfer) and uses Javascript Object Notion (JSON) or XML (Extensible Markup Language) to respond to a custom UI request can be used.” Ex-1001 at 7:1-5. The Applicant therefore recognized that REST APIs were common knowledge and that POSITAs readily-understood how to implement them in such systems.

139. As a result, it is my opinion that Farber in view of Vermeulen renders Claim 2 obvious.

C. Ground 3: Claim 3 is obvious in view of Farber and Pavlovskaja

140. Pavlovskaja discloses a “web content server for delivery of a plurality of low bandwidth digital channels to the user.” Ex-1006 at 3:5-7. “The web content server generates a set of browser instances” that cycle through a “set of web pages.” Ex-1006 at 3:63-66. For example, “[b]rowser instance 108 cycles through a carousel of web page(s) which includes web page 100 which displays snow and slope conditions from the homepage of a ski resort selected by the content provider to be part of this channel, e.g., the ‘Snow Report’ channel 150.” Ex-1006 at 4:44-49. “For each new channel a corresponding master HTML page is defined” that controls the interface for the channel. Ex-1006 at 12:7-9 and 12:33-34. For example, a “hypertext markup language (HTML) floating frame element 508 is embedded in the master page.” Ex-1006 at 16:45-46. Figure 5 of Pavlovskaja “shows a master web page 208 for a channel” and “includes three functions 502, 504, 506 written in a script language for cycling the URLs in array 500 within the frame element 508.” Ex-1006 at 16:20-21 and 53-55. “The *script language shown is JavaScript*,” and “the browser instance for the corresponding channel executes the script in the master HTML page 208 when the page is loaded thus cycling the image displayed” in the embedded frame. Ex-1006 at 16:56-62.

141. POSITAs would have been motivated to combine Farber and Pavlovskaia because it was understood that JavaScript could be used to make a web page more dynamic. For example, POSITAs would have been motivated to combine Farber's "track label and artist information" graphic asset with Pavlovskaia's JavaScript that created a "carousel" of rotating pages for display in order to show a rotating set of artist information graphics (like pictures of the artist/band). Such dynamic content would allow Farber to display more information to users for each song and improve the user experience.

142. POSITAs would have had a reasonable expectation of success in combining Farber with Pavlovskaia's use of JavaScript because JavaScript was well-known in the art and could be readily embedded within HTML. And because Farber states that its interfaces "may be coded utilizing HTML," use of JavaScript like in Pavlovskaia would not require altering Farber's system. Ex-1003 at 5:50-54. Indeed, the '441 Patent does not purport to have invented JavaScript or a novel way of using JavaScript with HTML, and instead merely states that the UI "can include JavaScript, CSS, and HTML content files that can be rendered using a browser." Ex-1001 at 7:5-7. Thus, Applicant recognized that use of JavaScript with HTML was common knowledge.

143. As a result, it is my opinion that Farber in view of Pavlovskaia renders Claim 3 obvious.

D. Ground 4: Claims 4, 5 and 8 are obvious in view of Farber and Davis

144. Davis discloses storing “quality assured” media files that are encoded at specified rates. For example, for “Internet based video streaming,” Davis discloses using “a H.264 and AAC codec, with encoding profile 131b *configured for a 1.5 Mbit/s bit rate video and 128 Kbit/s audio.*” Ex-1008 at 3:21-41.

145. POSITAs would have been motivated to combine Farber and Davis because encoding at a specified bit rate would promote uniformity in the quality of media files, which would improve user experience. Additionally, encoding media at a specified rate that could be used with internet based streaming would ensure that the sound and video quality of the stream is optimized for efficient media delivery. Similarly, encoding at a specified bit rate would allow the receiver to be optimized for decoding that bit rate. Moreover, Claim 4 does not specify any particular rate and, on its face, is satisfied by a “specified rate” for the encoding process. Thus, POSITAs would have been motivated to use rates that Davis had already “quality assured” for internet based streaming applications.

146. POSITAs would have had a reasonable expectation of success in combining Farber with Davis’s disclosure of a specified bit rate because Farber already contemplates use of an MPEG video encoder and an audio encoder and assembling media into streams for delivery and the specified rates of Davis could readily have been used to encode the audio and video data of Farber. Encoding data

and selecting encoding bit rates were commonly-known to POSITAs and would not have required altering Farber's system.

147. As a result, it is my opinion that Farber in view of Davis renders Claim 4 obvious.

148. Davis teaches that "codec 130b could comprise a **H.264** and AAC codec." Ex-1008 at 3:28-41.

149. POSITAs would have been motivated to combine Farber and Davis because the H.264 encoding standard is one of the most commonly used codecs for encoding video data. POSITAs recognize that H.264 encoding provides an impressive balance of quality and compression and can be readily used with a number of container formats, such as MPEG-TS and MP4, to deliver streaming media.

150. POSITAs would have had a reasonable expectation of success in combining Farber with Davis's disclosure of H.264 because Farber already contemplates use of an "MPEG" video encoder and H.264 is an MPEG video encoding standard—i.e., MPEG-4 Part 10. Ex-1003 at 6:2-7.

151. As a result, it is my opinion that Farber in view of Davis renders Claim 5 obvious.

152. Davis discloses that a distribution channel "might require video files in Moving Picture Experts Group (MPEG) 2 format *with Dolby Digital Audio Coding*

3 (AC-3) audio.” Ex-1008 at 3:25-28.

153. POSITAs would have been motivated to combine Farber and Davis because the AC-3 encoding standard is one of the most commonly used codecs for encoding audio data. POSITAs recognize that AC-3 encoding provides an impressive balance of quality and compression and can deliver good sound quality at relatively low bit rates.

154. POSITAs would have had a reasonable expectation of success in combining Farber with Davis’s disclosure of AC-3 because Farber already contemplates use of an audio encoder and the system of Farber is not dependent on any encoding technology. Ex-1003 at 6:2-7. Thus, implementing an AC-3 encoder would not have required altering Farber.

155. As a result, it is my opinion that Farber in view of Davis renders Claim 8 obvious.

E. Ground 5: Claims 6 and 9 are obvious in view of Farber and Fogel

156. Fogel discloses a “web interface module.” Ex-1009 at [0062]. “In one embodiment, the interface module is a web rendering engine, also known as HTML rendering engine. For example, the skilled person *can use the engine Webkit.*” Ex-1009 at [0064].

157. POSITAs would have been motivated to combine Farber and Fogel because the WebKit engine is commonly used, including in Apple’s Safari browser

and all browsers for iOS and iPadOS. Thus, configuring the interfaces to be rendered on a WebKit browser would better ensure compatibility with Apple devices, such as iPhones and iPads, which make up a large percentage of mobile devices. The WebKit engine can also run on Windows, macOS, Android and Linux Operating Systems, increasing flexibility in the implementation of Farber's system.

158. POSITAs would have had a reasonable expectation of success in combining Farber with Fogel because WebKit browsers—such as Safari—are commonly-used, including in Apple devices, to render HTML and Farber already discloses that its interfaces can be coded using HTML. Ex-1003 at 5:50-54. Thus, use of a WebKit browser encoder would not have required altering Farber.

159. As a result, it is my opinion that Farber in view of Fogel renders Claim 6 obvious.

160. Fogel discloses that “the interface module is a *web rendering engine*, also known as HTML rendering engine.” Ex-1009 at [0064].

161. POSITAs would have been motivated to combine Farber and Fogel because using a web rendering engine allows for an HTML file to be converted into a visual image, such as a user interface.

162. POSITAs would have had a reasonable expectation of success in combining Farber with Fogel because Farber already discloses that its interfaces can be coded using HTML and already discloses generating multiple HTML user

interfaces—e.g., screens 1, 2 and 3 with respect to each new song being broadcast. Ex-1003 at 5:50-54 and 4:35-36. Thus, use of a web rendering engine to retrieve and render those HTML interfaces is already contemplated and would not have required altering Farber.

163. As a result, it is my opinion that Farber in view of Fogel renders Claim 9 obvious.

F. Ground 6: Claims 10-16 and 18-23 are obvious in view of Avellan and Pavlovskaja-PCT

164. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Preamble 10 and Elements 10b through 10g.

165. With respect to Element 10a, Pavlovskaja-PCT discloses generating “a plurality of broadcast programs” for delivery to users. Ex-1007 at 3:3-5. Pavlovskaja-PCT discloses a “processing office” that obtains web content from a distribution network and then “renders the graphical element as a bitmap and the renderer passes the bitmap to an MPEG element encoder” for encoding “as an MPEG video sequence” that is delivered to a user. Ex-1007 at 11:12-22 and 15:5-6 (“Once the content and the application are retrieved, the virtual machine processes the content and creates an MPEG video stream.”). “In such a system, the video content material displayed on the television of the user is merely decoded MPEG content and all of the processing for the interactivity occurs at the processing office *and is*

orchestrated by the assigned virtual machine.” Ex-1007 at 13:26-14:2 and 8:1-2 (stating “the processing office runs a virtual machine and accesses and runs the requested application”).

166. It would have been obvious for POSITAs to combine Avellan’s “network of servers, mainframe computer(s) or other high speed and high capacity processing devices,” Ex-1003 at 4:26-29, that “may be positioned at a strategic Internet Exchange Point (IXP),” Ex-1003 at 4:29-31, to use Pavlovskaja-PCT’s virtual machine approach. POSITAs would have recognized that Avellan’s server farm or a server located at an IXP would not require alteration to run on a virtual machine.

167. POSITAs would have been motivated to use such a virtual machine because it was understood that virtual machines were an efficient and effective way to implement a system like Avellan. Virtual Machines were known to be a flexible and scalable solution for content delivery and could reduce hardware costs. Similarly, POSITAs would have been motivated to combine Avellan with the teachings of Pavlovskaja-PCT because of the overlap in both systems. Both Avellan and Pavlovskaja-PCT are directed to server-side software that obtains web-based content, renders it using a browser, and then packages it for delivery in a video frame format. And because of this similarity, POSITAs would have had a reasonable expectation of success in combining Avellan’s system with Pavlovskaja-PCT’s

disclosure of virtual machines. Indeed, the '441 Patent does not purport to have invented a novel way of implementing a virtual machine or purport to have invented a new virtualization environment, and instead simply discloses that a virtual machine can be implemented through known products, like “VMWare or Xen.” Ex-1001 at 12:12-16.

168. With respect to Element 10e, by continuously capturing screen images of information that is rendered over time—such as “video, streaming information, or an animated display”—POSITAs would recognize that two adjacent screen captures in Avellan will illustrate a dynamic change of at least a portion of the content over time. For example, if a streaming hockey game is being rendered, a screen capture at Time 1 followed by a screen capture at Time 2 will illustrate a dynamic change in that game, such as the movement of players on the ice between Time 1 and Time 2—*i.e.*, a dynamic change of at least a portion of the content over time.

169. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 11a.

170. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 12a. Additionally, Avellan explicitly states that “suitable sites for the broadcast mode are news sites like CNN, BBC, newspaper, *live streaming television feeds, movies*, music

downloads, or ESPN,” which a POSITA recognizes would include the combination of audio and visual data.

171. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 13a, 13b and 13c.

172. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 14a. Avellan explicitly states that “suitable sites for the broadcast mode are news sites like CNN, BBC, newspaper, *live streaming television feeds, movies*, music downloads, or ESPN,” which a POSITA recognizes would include the playback of video.

173. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 15a. A POSITA would understand that a music channel “such as country music” would include metadata corresponding at least to either the song title, the country music artist, or the music genre itself. For example, in order to generate a theme-specific channel, such as “country music” there would be associated metadata identifying a given audio file as belonging to the category of country music and identifying the resulting video stream as pertaining to that genre.

174. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 16a. Avellan teaches that “there can be a number of broadcast channels” and that “suitable sites for the

broadcast mode are news sites like CNN, BBC, newspaper, live streaming television feeds, movies, music downloads, or ESPN.” Ex-1004 at 8:25-27 and 8:18-21. “The user can then tune the browser 106 to one of the broadcast channels to receive that content.” Ex-1004 at 8:27-29. A POSITA would understand, as a result, that each broadcast media channel has an associated channel identifier that can be used to identify each channel and allow the user to tune to the channel for the desired site, such as CNN.

175. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan discloses Element 18a.

176. With respect to Element 19a, Pavlovskaia-PCT discloses that “multiplexor 1280 combines the audio and video streams and outputs the composited, encoded output streams 1290 that can be played on any standard encoder.” Ex-1007 at 24:5-6. In one of Pavlovskaia-PCT’s embodiments, “[t]he virtual machine sends the client device an MPEG stream.” Ex-1007 at 30:13 and 13:20-21 (stating that a “frame will then be passed to a multiplexor and sent through the downstream network to the client device” and that “[t]he MPEG encoded video frame is decoded by the client device”).

177. POSITAs would have been motivated to combine Avellan with Pavlovskaia-PCT because use of an MPEG multiplexor is an easy and reliable way of sending a transport stream combining related audio and video data—which would

need to be received at relatively the same time in order to be played back in sync—as compared to sending such streams separately downstream.

178. POSITAs would have had a reasonable expectation of success in combining Avellan’s broadcast system with Pavlovskaia-PCT’s use of an MPEG multiplexor because such a combination would not have required any alteration to the system of Avellan, which as discussed above, already discloses the use of a video frame format, like MPEG, that includes encoded audio. Ex-1004 at 5:13-15. Indeed, the ’441 Patent does not purport to have invented the MPEG multiplexor and specifically notes that such multiplexors—like the “Arris TMX-2010”—were readily and publicly-available prior to the ’441 Patent.

179. With respect to Element 20a, Pavlovskaia-PCT teaches generating “a plurality of broadcast programs” for delivery to users. Ex-1007 at 3:3-5. To generate these programs, Pavlovskaia-PCT discloses a “processing office” that obtains web content from a distribution network and then “renders the graphical element as a bitmap” and encodes the bitmap “as an MPEG video sequence” for delivery to a user. Ex-1007 at 11:12-22 and 15:5-6 (“Once the content and the application are retrieved, the virtual machine processes the content and creates an MPEG video stream.”). “In such a system, the video content material displayed on the television of the user is merely decoded MPEG content and all of the processing for the interactivity occurs at the processing office *and is orchestrated by the*

assigned virtual machine.” Ex-1007 at 13:26-14:2 and 8:1-2 (stating “the processing office runs a virtual machine and accesses and runs the requested application”). As a result, Pavlovskaia-PCT teaches the use of a virtual machine for the processes performed by a server to broadcast media content.

180. POSITAs would have been motivated to combine Avellan with Pavlovskaia-PCT’s use of such a virtual machine because virtual machines are an efficient and effective way to implement a system like Avellan. Virtual Machines are a flexible and scalable solution for content delivery that reduces hardware costs. They are also advantageous for overall system reliability and performance because the virtual machine can be moved to different hardware servers to allow for system maintenance or hardware upgrades.

181. POSITAs would have also been motivated to combine Avellan with Pavlovskaia-PCT because of the overlap in both systems: both Avellan and Pavlovskaia-PCT are directed to server-side software that obtains web-based content, renders it using a browser, and then packages it for delivery in a video frame format. Because of this similarity, POSITAs would have had a reasonable expectation of success in combining Avellan’s system with Pavlovskaia-PCT’s disclosure of virtual machines. Avellan’s “network of servers, mainframe computer(s) or other high speed and high capacity processing devices,” Ex-1003 at 4:26-29, that “may be positioned at a strategic Internet Exchange Point (IXP),” Ex-

1003 at 4:29-31, is compatible with Pavlovskaia-PCT's use of virtual machines and would not require altering Avellan's operation. Indeed, the '441 Patent does not purport to have invented a novel way of implementing a virtual machine or purport to have invented a new virtualization environment, and instead simply discloses that a virtual machine can be implemented through known products, like "VMWare or Xen." Ex-1001 at 12:12-16.

182. With respect to Element 21a, Pavlovskaia-PCT discloses using a virtual machine, as discussed above. For the same reasons as for Element 20a and discussed above, it would have been obvious for a POSITA to combine Pavlovskaia-PCT's disclosure and use of virtual machines with the system of Avellan.

183. With respect to Element 22a, Avellan discloses that, in an alternative embodiment, it can deliver a stream by "multi-casting it to subscribers." Ex-11004 at 12:15-20. For the same reasons as for Element 20a and discussed above, it would have been obvious for a POSITA to combine Pavlovskaia-PCT's disclosure and use of virtual machines with the system of Avellan to virtualize a multicasting server for providing a media stream to a content provider.

184. With respect to Element 23a, Pavlovskaia-PCT discloses "the video content material displayed on the television of the user is merely decoded MPEG content and all of the processing for the interactivity occurs at the processing office *and is orchestrated by the assigned virtual machine.*" Ex-1007 at 13:26-14:2. For

example, “[w]hen a client device sends a request for a mosaic application, the processing office associated with the client device *assigns a processor/virtual machine for the client device for the requested mosaic application.*” Ex-1007 at 30:9-11. “The assigned virtual machine constructs the personalized mosaic by composting the groomed content from the desired channels using a stitcher.” Ex-1007 at 30:11-12. “The virtual machine [then] sends the client device an MPEG stream that has a mosaic of the channels that the client has requested.” Ex-1007 at 3:12-14. Accordingly, POSITAs would understand that a user in Pavlovskaia-PCT receives a desired channel (i.e., a requested mosaic delivering a video stream) that corresponds to an assigned virtual machine. Ex-1007 at Fig. 22 and 29:24-26 (stating that “channels may then be multicast to one or more processing offices 2310, 2320, 2330 and one or more virtual machines within each of the processing offices for use in applications”).

185. For the same reasons as in Element 20a and discussed above, it would have been obvious for a POSITA to combine Pavlovskaia-PCT’s disclosure and use of assigned virtual machines for each channel with the system of Avellan.

186. As a result, it is my opinion that Avellan in view of Pavlovskaia-PCT renders Claims 10-16 and 18-23 obvious.

G. Ground 7: Claim 15 is obvious in view of Avellan, Pavlovskaia and Durante

187. Durante discloses that “metadata associated with a music video can

include a title of the song in the music video [and] the name of an artist that recorded the song in the music video.” Ex-1010 at 4:46-48.

188. It would have been obvious for a POSITA to combine Durante’s song title and artist metadata with Avellan’s music genre broadcast channels, see Ex-1003 at 8:25-27 (describing broadcast channels having a specific theme, such as “country music”) because a POSITA would have been motivated to add Durante’s descriptive information so that viewers could identify the specific song and name of the artist. And POSITAs would have had a reasonable expectation of success in such a combination because Avellan’s system delivers its channels in a “video frame format”—such as the commonly used MPEG format—and the MPEG standard includes provisions for the inclusion of metadata, such as the song and artist information disclosed in Durante. Indeed, the ’441 Patent does not purport to have invented a novel encoding technique that permitted the inclusion of such information, and instead discloses that such data can be “packaged in an MPEG Packet that is part of the MPEG Transport Stream.” Ex-1001 at 4:46-49.

189. As a result, it is my opinion that Avellan and Pavlovskaia-PCT in view of Durante renders Claim 15 obvious.

H. Ground 8: Claim 16 is obvious in view of Avellan, Pavlovskaia-PCT and Ma

190. Pavlovskaia-PCT teaches using a virtual machine to virtualize the process as discussed in Ground 6, [10a]. Ma teaches that “a user can assign different

channel identifiers to various web sites, for example, a first web site (such as “THOMSON.NET”) can be assigned channel identifier 101, a second web site (such as “YAHOO.COM”) can be assigned to channel identifier 102, and a third web site (such as “GAMEFAQS.COM”) can be assigned to a third channel identifier 103.” Ex-1011 at 5:5-11. As a result, “channels 1-100 would provide media services associated with broadcasted television channels, while channel 102 brings up a representation of the content on the homepage YAHOO.COM.” Ex-1011 at 5:13-16.

191. It would have been obvious for a POSITA to combine the channel identifier of Ma with Avellan’s system, which discloses that “[t]he user can then tune the browser 106 to one of the broadcast channels to receive that content.” Ex-1004 at 8:27-29. POSITAs would have been motivated to combine Avellan’s disclosure of tuning to broadcast channel with Ma’s teachings of channel identifiers so that a user could select between channels based upon identifiers.

192. POSITAs would have had a reasonable expectation of success in combining Avellan with Ma because Avellan’s system describes being able to obtain content from websites, such as CNN, ESPN, YouTube or from web services like Netflix. Ex-1004 at Fig. 1. Similarly, Ma teaches assigning “different channel identifiers to various web sites,” such as Yahoo.com. Ex-1011 at 5:5-11. POSITAs would have recognized that assigning Ma’s alphanumeric channel identifier to

Avellan’s channels—for example, a request for the “ESPN” channel would be implemented in the same manner as a request for channel “008”, where “008” is assigned to ESPN—was a trivial task and would not have required alteration of the system in Avellan. Indeed, the ’441 Patent does not purport to have invented a novel identification technique, and instead discloses that such identifiers can simply be “an integer value from 1 to the maximum number of channels.” Ex-1001 at 6:52-54.

193. As a result, it is my opinion that Avellan and Pavlovskaja-PCT in view of Ma renders Claim 16 obvious.

I. Ground 9: Claim 17 is obvious in view of Avellan, Pavlovskaja-PCT and Suzuki

194. Suzuki discloses “an automatic format conversion process then *queries information from the client system* (requester) and also received the data structure identifying the encoding format. The *client information identifies the decoding format* compatible with the client.” Ex-1012 at 3:44-49. Suzuki further discloses that the data “can be formatted under any number of the well known formatting standards *such as, for example, MPEG.*” Ex-1012 at 6:37-40.

195. POSITAs would have been motivated to combine Avellan with Suzuki because it is advantageous to query the downstream content provider to determine what output “video frame format” was able to be decompressed and displayed at the user devices—*i.e.*, to determine what format was “suitable” for a given device. And POSITAs would have had a reasonable expectation of success, given that Avellan

converts web content into a compressed “video frame format” that is “suitable for broadcasting to a large number of user computers” and “any suitable format(s)” can be used. Ex-1004 at 5:12-32, 8:52-53. In the same manner, the ’441 Patent describes “a second format” as “a format that is suitable for the cable operator.” Ex-1001 at 8:8-13. Avellan also states that the user computers 104 “can be any suitable device . . . such as a laptop computer, desktop computer, smartphone, tablet PC, laptop, and Internet equipped television.” Ex-1004 at 3:53-56. As a result, it would have been obvious to include Suzuki’s query-answer exchange to determine decoding capabilities prior to generating the video frames for delivery, and such use would not have required any alteration of the system of Avellan.

196. Moreover, POSITAs would have understood that Avellan’s process of generating a sequence of screen captures for compression into a “video frame format” is compatible with the MPEG format, which compresses video data into a sequence of video frames for decoding. As a result, use of MPEG as the “second format” would have been obvious and not required any alteration of the system of Avellan. Similarly, prior to the ’441 Patent, the MPEG format was commonly used to encode video, and the MPEG codec was commonly found in a range of user devices, including laptops, desktops, smartphones, tablets, and Internet-equipped televisions.

197. As a result, it is my opinion that Avellan and Pavlovskaja-PCT in view

of Suzuki renders Claim 17 obvious.

J. Ground 10: Claim 24 is obvious in view of Avellan, Pavlovskiaia-PCT and Gangadharan

198. Gangadharan teaches a protocol 106 for “transmitting signaling messages to and from HTML5 applications.” Ex-1014 at 5:8-10. “The protocol utilizes JavaScript Object Notation (JSON) and, thus, leverages JSON objects commonly used by HTML5 applications, to specify a message format, data exchange protocol, and reliability protocol.” Ex-1014 at 5:10-14.

199. POSITAs would have been motivated to combine Avellan and Gangadharan because, as stated in Gangadharan, JSON “is a text-based open standard designed for human-readable data interchange” and “can be used for serializing and transmitting structured data over a network connection, e.g., between a server and web application” and “can be used by a network-side controller to mediate between HTML5 applications and non-HTML5 endpoints” and “can also be used between HTML5 endpoints.” Ex-1014 at 5:16-37. POSITAs recognize that JSON is a flexible standard that easily allows for exchanging data to/from a web server.

200. POSITAs would have had a reasonable expectation of success using Gangadharan’s JSON-based protocol to send requests to Avellan’s caching server because Avellan discloses sending requests from client browser 106, and a common use of JSON is to read data from a web server and display the data in a rendered web

page on a browser. JSON is also language independent and can be used with a wide variety of client-server architectures. For example, Gangadharan explicitly teaches that “JSON objects [are] commonly used by HTML5 applications.” Ex-1014 at 5:10-14.

201. As a result, it is my opinion that Avellan and Pavlovskiaia-PCT in view of Gangadharan renders Claim 24 obvious.

K. Ground 11: Claim 25 is obvious in view of Avellan and Wannamaker

202. Based on the citations in the Petition and the accompanying explanations for Preamble 10 and Elements 10b through 10g, it is my opinion that Avellan also discloses the corresponding language of Preamble 25 and Elements 25a through 25f. With respect to Element 25b’s phrase “performed over a first TCP-IP socket,” Avellan also discloses this for the reasons stated in the Petition.

203. With respect to Element 25g, Wannamaker discloses a system that “can deliver broadcast services” using an “application server [that] transcodes Web pages into a format that is viewable on the set-top box.” Ex-1013 at [0120] and [0132]. The application server host various processes, including a “log server” and a “host monitoring server.” Ex-1013 at [0139]-[0147]. Wannamaker teaches that “[p]rocesses register *their socket host and port* with the supervisor.” Ex-1013 at [0149]. In connection with those processes, Wannamaker discloses an “operator management interface (OMI)” that can “monitor and control the application server”

from a remote location and has “the capability to view log messages, start up and shut down the system, monitor and terminate user sessions, and monitor downstream bandwidth.” Ex-1013 at [0305]-[307]. POSITAs would recognize that the status information would be sent to the OMI from the application server through “a second TCP/IP socket”—i.e., the socket host and port registered with the supervisor process.

204. POSITAs would have been motivated to combine Avellan and Wannamaker because use of a second TCP/IP port for monitoring would allow a remote monitoring station to receive data independently, which better organizes data traffic and avoids confusion about which process should be receiving/sending data. Similarly, monitoring the system of Avellan, as in Wannamaker, would have the advantage of allowing an operator to better respond to system faults and evaluate system performance.

205. POSITAs would have had a reasonable expectation of success in implementing a second TCP/IP port for monitoring because the TCP/IP protocol suite is commonly-known and POSITAs recognize how to set up TCP/IP ports, including for purposes of transmitting system status information. As discussed above, Avellan already contemplates use of TCP/IP and implementing a second socket for monitoring status would not require altering Avellan’s operation. Ex-1004 at 1:14-16.

206. As a result, it is my opinion that Avellan in view of Wannamaker

renders Claim 25 obvious.

L. Ground 12: Claim 26 is anticipated by Avellan

207. Based on the citations in the Petition and the accompanying explanations, it is my opinion that Avellan anticipates Claim 26.

208. With respect to Element 26h, Avellan teaches that “preferably more than one server 134 stores Internet data in a cache 136 *for redundancy* and to better distribute communication channels for that server 134.” Ex-1004 at 9:55-57. POSITAs would recognize that the concept of “redundancy” in servers means that Avellan therefore teaches that when a fault is detected at a caching unit, pre-recorded video images can be retrieved from memory associated with a different caching unit.

M. Ground 13: Claim 26 is obvious in view of Avellan and Wannamaker

209. Wannamaker teaches that “[m]ultiple servers can be replicated within the application server, forming one logical server.” Ex-1013 at [0101]. “If a server fails, transactions are routed to another server in the server group.” Ex-1013 at [0101]. Wannamaker also teaches that each server “caches the converted content for future reuse.” Ex-1013 at [0270]. “The rendered 36 cache is a storage area for content that has been converted into a particular form (MML).” Ex-1013 at [0236]. In response to an application’s request, “[i]f valid content is in a rendered cache of one of the content processors, the cache manager [CM] immediately copies the content to the rendered caches” of each server. Ex-1013 at [0239]. “The application

[then] uses the content, assured that the proper content is in the rendered cache.” Ex-1013 at [0242]. Thus, Wannamaker discloses caching rendered content for delivery and, in response to a server failure, routing the transaction to another server in the logical server group, which is able to retrieve the requested content from a rendered cache for delivery.

210. POSITAs would have been motivated to combine Avellan and Wannamaker because providing a previously recorded media stream when a fault is detected promotes continuity of service and overall user experience, especially as compared to simply transmitting an error message to the user.

211. POSITAs would have had a reasonable expectation of success in combining Avellan and Wannamaker because both involve the same core idea of rendering web content and encoding it into a video frame format for delivery to a user, and like Wannamaker, Avellan already discloses caching streams across multiple servers. Thus, combining Avellan with Wannamaker’s recorded-playback disclosure would not require altering Avellan’s operation.

212. As a result, it is my opinion that Avellan in view of Wannamaker renders Claim 26 obvious.

IX. Materials Reviewed and Considered

213. My findings contained in this declaration are based on my education, research, experience, and background in the field of computer and communication

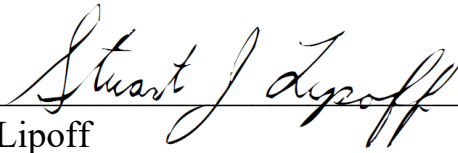
networks, and specifically, in relation to wireless communication systems, as well as on my investigation and study of prior art references and other documents disclosed in this declaration, including the following:

EX. NO.	DESCRIPTION
Ex-1001	The '441 Patent.
Ex-1002	This Declaration.
Ex-1003	U.S. Patent No. 7,940,303 to Farber, et al. ("Farber"), which was filed on November 12, 2009.
Ex-1004	U.S. Patent No. 8,954,600 to Avellan, et al. ("Avellan"), which was filed on March 2, 2012.
Ex-1005	U.S. Patent No. 9,009,111 to Vermeulen, et al. ("Vermeulen"), which was filed on May 14, 2012.
Ex-1006	U.S. Patent No. 8,442,110 to Pavlovskaja, et al. ("Pavlovskaja"), which was filed on October 9, 2008.
Ex-1007	WIPO International Publication Number WO 2010/044926 to Pavlovskaja, et al. ("Pavlovskaja-PCT"), which was published on April 22, 2010.
Ex-1008	U.S. Patent No. 8,676,822 to Davis ("Davis"), which was filed on February 6, 2009.
Ex-1009	U.S. Patent Application Publication No. 2012/0117569 to Fogel, et al. ("Fogel"), which was published on May 10, 2012.
Ex-1010	U.S. Patent No. 8,819,043 to Durante, et al. ("Durante"), which was filed on November 9, 2010.
Ex-1011	U.S. Patent No. 9,635,075 to Ma, et al. ("Ma"), which was filed on March 8, 2010.
Ex-1012	U.S. Patent No. 6,463,445 to Suzuki, et al. ("Suzuki"), which was filed on September 30, 1999.
Ex-1013	U.S. Patent Application Publication No. 2004/0031052 to Wannamaker, et al. ("Wannamaker"), which was published on February 12, 2004.
Ex-1014	U.S. Patent No. 9,331,967 to Gangadharan, et al. ("Gangadharan"), which was filed on October 31, 2013.
Ex-1015	Prosecution History of Application No. 15/538,911, which is now U.S. Patent No. 10,123,074.
Ex-1016	Prosecution History of the '441 Patent.

X. Conclusion

214. The Challenged Claims simply recite concepts known in the art at the time. Thus, the Challenged Claims were either anticipated or rendered obvious by the prior art. Based on my experience, knowledge of the field at the relevant time, and a thorough analysis of prior art references, it is my expert opinion that the Challenged Claims of the '441 Patent are unpatentable.

Executed on 20 December 2024, at Las Vegas, NV, USA.



Stuart Lipoff

Appendix A

Stuart J. Lipoff
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Las Vegas, NV 89109
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My practice focus deals with topics in Communications, Information, Technology, Electronics, E-Business, and Media.

I provide clients with management consulting and technology-based consulting across a wide variety of industries drawing on the base of communications industry and technology expertise. Areas of focus include--public and private network voice and data communications, cable television, cellular mobile radio, broadcasting, security systems, image processing, broadband access technology, internet applications, and consumer electronics.

EDUCATION AND CERTIFICATION:

BS Electrical Engineering- Lehigh University, 1968
BS Engineering Physics- Lehigh University, 1969
MS Electrical Engineering- Northeastern University, 1974
MBA, Suffolk University, 1983
Registered professional engineer- State of Nevada and Commonwealth of Massachusetts
Certificate in Data Processing- Institute for Certification of Computing Professionals (ICCP)
FCC general radio telephone license

PROFESSIONAL ACTIVITIES:

- Fellow of the Institute of Electrical and Electronic Engineers (IEEE)
- Member of IEEE Consumer Electronics Society Board of Governors and past president of The Society
- VP of Publications for IEEE Consumer Electronics Society
- Senior Editor IEEE Consumer Electronics Magazine
- Past Chairman Boston Section of IEEE Vehicular Technology Society
- Past Chairman Boston IEEE Boston Fall 2000 Vehicular Technology Society Conference
- Member of program committee and past conference chairman of IEEE International Conference on Consumer Electronics
- Past Chairman of IEEE Consumer Electronics Standards Committee
- Past Awards chairman of IEEE Ibuka Award for Consumer Electronics
- Elected Member, Society of Motion Picture and Television Engineers (SMPTE)
- Elected Member Society of Cable Television Engineers (SCTE)
- Elected Member Association of Computing Machinery (ACM)
- Past member of USA advisory board to National Science Museum of Israel
- Elected member of Cable TV Pioneers

PREVIOUS EMPLOYMENT:

Arthur D. Little, Inc (25 Years) - VP Communications, Info Technology, & Electronics
Motorola Communications Division (3 years) - project engineer in portable radio products
Bell & Howell Communications Company (5 years) - engineering manager for paging products

AWARDS & RECOGNITION:

- Seven U.S. patents
- Co-author of book on information systems technology: "The Arthur D. Little, Inc Forecast on Information Technology and Productivity", (1991: Wiley)
- Co-author of book on developing mobile radio technology: "New Opportunities at 220 MHz", (1991: National Association of Business and Educational Radio)
- IEEE Centennial Metal in 1984 and Millennium Metal in 2002
- A best paper award at 1989 International Conference on Consumer Electronics

**See website at <http://www.lipoff.org> for internet citations.

SUMMARY

Mr. Lipoff is president of IP Action Partners Inc, a network of consultants who provide services to stakeholders in the TIME (telecommunications, information technology, media, electronics, and ebusiness) field of interest. In providing his clients with consulting services, he draws upon his 40+ years of experience in a wide variety of technologies and industries to assist clients with knowledge-based consulting services involving complex business decisions. Clients turn to him for his unique ability to combine a deep understanding of industry dynamics with his equal depth in the underlying technologies. Because he is at home in either the board room or the laboratory, the services he provides range from top line revenue enhancement to operations and capital efficiency improvement working across all levels of the client organization. His clients include component suppliers, equipment manufacturers, service providers, and those who make investments in technology ventures. Typical assignments involve product development assistance, technology assessments, M&A corporate development, visioning the future, strategic planning, strategic business development support, competitive product positioning, change management, and overall business decision support.

He has assisted clients evaluate product development plans and apply technologies in activities ranging from conceptual studies to detailed development and implementation of products, services, and strategies. Mr. Lipoff has industry expertise in several high-volume manufacturing operations in electronics, electromechanical, and related industries. He has assisted clients in managing their technology, improving the product development process, managing complex external procurements, and resolving problems in design, procurement, and manufacturing.

Mr. Lipoff was employed 25 years by Arthur D Little, Inc (ADL) as VP and Director of Communications, Information Technology, and Electronics (CIE); 4 years by Bell & Howell Communications Company as a Section Manager, and 3 years by Motorola's Communications Division as a Project Engineer. At ADL he was responsible for the firm's global CIE practice. At both Bell & Howell and Motorola, he had project design responsibility for portable wireless

communications and paging products.

Stuart Lipoff has Bachelors Degrees in Electrical Engineering and in Engineering Physics, both from Lehigh University. He also has received a Masters Degree in Electrical Engineering from Northeastern University, and a MBA degree from Suffolk University.

Mr. Lipoff is a fellow of the IEEE Consumer Electronics, Communications, Computer, Circuits, and Vehicular Technology groups. He is a member of the IEEE Consumer Electronics Society (now Consumer Technology Society) National Board of Governors and was the Boston Chapter Chairman of the IEEE Vehicular Technology Society. He served as 1996-7 President of the IEEE Consumer Electronics Society and has served as Chairman of the Consumer Electronics Society Technical Activities and Standards Committees, served as VP of Publications for The Consumer Electronics Society with responsibility for The Society's academic and general publications, and as VP of Industrial Activities and Standards. Currently he serves as the Historian for The Consumer Technology Society. He has also chaired the search committee for Sony supported Mazura Ibuka Award in consumer electronics. As Vice President and Standards Group Chairman of the Association of Computer Users, he served as the ACU representative to The ANSI X3 Standards group. For the Federal Communications Commission's Citizens advisory committee on CB radio (PURAC), he served as Chairman of the task group on user rule compliance. He has been elected to membership in the Society of Cable Television Engineers (SCTE), The Association of Computing Machinery (ACM), and The Society of Motion Picture and Television Engineers (SMPTE).

Stuart Lipoff holds a FCC General Radiotelephone License and a Certificate in Data Processing (CDP) from the ACM supported Institute for the Certification of Computing Professionals (ICCP). He is a registered professional engineer in The Commonwealth of Massachusetts and also in the State of Nevada.

Mr. Lipoff holds seven USA patents and has published articles in Electronics Design, Microwaves, EDN, The Proceedings of the Frequency Control Symposium, Optical Spectra, and numerous IEEE publications. He has presented papers at many IEEE and other meetings. In the fall of 2000, he served as general program chair for The IEEE Vehicular Technology Conference on advanced wireless communications technology. He has organized sessions at The International Conference on Consumer Electronics and was the 1984 program chairman. He conducted an eight-week IEEE sponsored short course on Fiber Optics Systems Design. In 1984, he was awarded IEEE's Centennial Medal and in 2000 IEEE's Millennium Metal.

He served as a member of the USA advisory board to the National Science Museum of Israel and has presented a short course on international product development strategies as a faculty member of Technion Institute of Management in Israel. He has also served as a board member of The Massachusetts Future Problem-Solving Program.

Mr. Lipoff is internationally recognized as an authority and opinion leader in new economy related businesses and technology. Citations supporting his recognition can be found on his web site at <http://www.ipaction.com>.

Some examples of projects he has performed in the broadcasting, cable TV, computer products, consumer electronics, media, telecommunications, and wireless communications sectors include:

- For Comcast Corporation, he supported a number of their initiatives in public network wireless services. This support included evaluation of investment opportunities, valuation of various options for acquiring spectrum in FCC auctions, development of capital investment estimates for several alternative business opportunities, and the development of decision support models used by management to select between alternatives.
- For a provider of pay per call alternate operator services to prison inmates, he evaluated their technology and assets with an emphasis on their ability to associate calling and calling party phone numbers with databases combined with their employees with multiple language skills. Following this evaluation, he worked with the client to identify and plan for offering services to clients other than prison inmates. Examples of such clients included government operated call centers, hospitals, police departments, and telephone catalog sales call centers.
- For International Mobile Machines (IMM), a firm that licenses patents to cellphone OEMs, he developed a roadmap of future services, architectures, and technology to support alternative visions of the development of cellular. He then worked with the firm to generate R&D projects designed to increase the base of patents for IMM to license in the future.
- For International Finance Corporation (the venture capital group of The UN's World Bank), he evaluated an investment opportunity in Cellon Inc, a PRC based cellphone design house. This project included inspection of Cellon's facilities in the PRC and France as well as detailed review of Cellon's facility assets, technology strengths, and intellectual property.
- For the patent and licensing division of The General Electric Company, he has evaluated a number of patent portfolios in the wireless telecommunications space and provided feedback to the client on the application and value of these patents.
- For Tele2 (a pan European cellular and wireline telephone company), he supported their efforts to procure an advanced cordless telephone from contract manufacturers in China (PRC). This involved development of detailed technical specifications, coordination of a request for information, (RFI), and evaluation of the responses.
- For Millicom International (a cellular provider in several developing nations), he studied capital spending and developed best practice benchmarks. The work products were then employed in forward planning and to develop strategies for improvement of their financial performance. The project involved the collection of data from over 25 systems in 12 countries and developing capital efficiency metrics that were normalized to the specific geographic and demographic specifics of each system. The project not only provided a measure of present and historical capital efficiency but also provided a management system to be employed for the future.
- For the banks providing financing to The Iridium Mobile Satellite Service, he served as a technical advisor and assisted in developing the contracts between the banks and Motorola in

which Motorola secured the loan. As a technical advisor, he had extensive day-to-day interactions with Motorola's manufacturing and product design organization. The interactions included examination of the manufacturing cost, methods, and processes of Motorola's Subscriber Products Group cellphones, pagers, and related portable wireless data communications devices.

- For Sony USA, he supported a feasibility analysis of a planned investment by Sony into a wireless PCS carrier in the USA. This involved the development of alternative business models, financial analysis, and technical analysis in order to determine financial attractiveness and risk of proceeding with the venture.
- For Samsung Electronics Global Marketing, he developed a strategic framework for a line of portable and personal multimedia products to be introduced in the USA. The project included developing a common theme for a set of products that ranged from cellphones, MP3 music players, electronic books, PDAs, to hand-held games. One common theme was developed, product features and capabilities were detailed, and market adoption models were developed to forecast demand.
- For Korea Mobile Telephone, he supported the project that developed a strategic plan to position KMT relative to Korea Telecom.
- For Symbol Technology, a manufacturer of hand-held industrial computing products, he co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Later he worked with this same client to select voice over internet protocol (VoIP) codecs and algorithms that support the client's current product offering cordless industrial voice telephony over a quality of service (QoS) managed wireless IP network.
- Leadership of the project for CableLabs that studied the technology and economics of wireless personal communications technology. This project is highlighted in the history of CableLabs in their website as one of the significant accomplishments of The Labs. The project included the selection of CDMA technologies and the development of strategies to compete with incumbent cellular carriers. This effort led to the formation of a consortium between Sprint and the cable MSOs that has evolved into the present Sprint PCS business.
- For Rockwell Semiconductor, he supported a major project to identify and explore diversification opportunities beyond their current line of fax modems and compression chips. The project identified opportunities in wireless communications, broadband enterprise networks, and video signal processing. After identification of the opportunities, market forecasts were developed, competitors identified, and an analysis of the attractiveness versus fit with Rockwell was performed to support a request for board approval of diversification plans.
- For Cambridge Silicon Radio (UK), he worked with the client to develop a prioritized list of applications for their Bluetooth component offerings. The project mapped applications into specific target customers and based upon an analysis that considered the market needs with

CSR's capabilities, a prioritized roadmap of products was developed to steer the R&D portfolio.

- TCE markets cordless telephones in the USA under the GE Brand Name. The introduction of cost and size reduced imported products had an unexpected and immediate negative impact on market share. I was retained to develop modifications to the existing product to size reduce the existing product by reworking the existing inventory as well as develop a next generation product for new production. The project involved a combination of industrial design, antenna design, modification of the impedance matching electronics for the new antenna, and re-qualification of device under FCC regulations as a low power unlicensed communications device. The large telescoping antenna was replaced with a center loaded size reduced flexible antenna. An additional printed circuit board was designed and fabricated to tune and match the new antenna to the existing cordphone transceiver. Additional modifications to the transmitter involving component changes were developed to increase the transmitter power to overcome the additional loss in the loaded antenna. Manufacturing process sheets were designed and implemented in the factory to support the rework of the existing inventory. Engineering change orders were prepared for a new product design that included the changes on a single unified printed circuit board.
- For the investors in Mitel Semiconductor (Canada), he assisted the client value their telephone and business phone system telecommunications semiconductor device products and know-how in the firm. The project required a competitive review of Mitel Products and technology, and then evaluating the future likely needs of the marketplace. Our recommendations indicated which products should be the basis of further investment and most likely to be valued in a sale or licensing.
- For the flash memory global marketing group of Samsung, he led a project that explored the opportunities for flash memory in the emerging group of personal multimedia devices. These PMM devices ranged from PDAs, MP3 players, electronic books, to enhanced cellphones. The project developed visions and roadmaps for the rollout of these products and then translated this to the specific flash memory needs. A key aspect of the project was to determine the digital rights management and intelligence needs of the flash memory as content storage media. The analysis drove the Samsung developments and led to their participation in the SD flash consortium.
- For TRW, he participated in an assignment which reviewed all their non-classified military and defense technology to identify commercial applications. A number of systems applications in security for wireless communications and antifraud were developed which became the basis for successful spin-off operations. In addition, this project examined their GaAs design and production capabilities. The project resulted in foundry business for the GaAs fab in large volume consumer applications for direct to home satellite TV receivers.
- For a corporate cross-sector event organized by Motorola Corporate for all their divisions, he prepared presentations on the visions of the future in each of the major sectors in which Motorola has an interest. The presentations included: consumer electronics, medical, automotive, industrial electronics, and communications. The presentations provided a basis

for the cross-sector teams to engage in long term planning for each division.

- For a manufacturer of hand-held industrial computing products, he co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Later he worked with this same client to select voice over internet protocol (VoIP) codecs and algorithms that support the client's current product offering cordless industrial voice telephony over a quality of service (QoS) managed wireless IP network.
- Leadership of the project that studied the technology and economics of wireless personal communications technology. The project included the selection of CDMA technologies and the development of strategies to compete with incumbent cellular carriers. This effort led to the formation of a consortium between Sprint and the cable MSOs that has evolved into the present Sprint PCS business.
- For Bell South he contributed to a major operations improvement project involving developing forecasts for the future competitive environment, customer needs, a strategy to compete, and new business models. These forecasts were then applied to develop business redesign recommendations and a list of new services offerings.
- For a large multinational cellular service provider, he performed a review of their capital efficiency. The project involved the collection of data from over 25 systems in 12 countries and developing capital efficiency metrics that were normalized to the specific geographic and demographic specifics of each system. The project not only provided a measure of present and historical capital efficiency but also provided a management system to be employed for the future.
- For Tadiran, an OEM supplier of subscriber premise telephony equipment sold in multiple countries he engaged in an operations improvement project looking at all aspects of the design, manufacturing, distribution, and support of this high-volume consumer product. By means of including unique capabilities in the design of the next generation product that allowed for automatic configuration, he was able to improve the firm's performance in multiple dimensions. The new product allowed for a single universal product that reduced inventory costs, simplified distribution, and reduced order fulfillment time. A cost benefit analysis was performed to demonstrate the value of the significant investment required and showed Leadership of the project which developed the series of DOCSIS specifications for high-speed residential cable modems. The scope of work included developing a roadmap and strategic framework for evolving the business from simple high speed internet services to multimedia broadband services combining voice, data, and secure electronic content delivery. This project was performed under contract to the MCNS consortium of cable TV operators representing 85% of the subscriber base in North America and has since been adopted by the United Nations as a global telecommunications standard.
- Whistler is generally known as a large volume manufacturer of radar detectors sold to consumers to avoid speeding violations. He was retained to develop a new recreational marine product called Brite Buoy. This product was a two-part battery powered system consisting of a floating radio receiver that operates a flashing lamp and a handheld coded radio transmitter

operating at 900MHz that activates the lamp. The product was designed to allow a boat owner to find their mooring in the evening. He designed the unit to make maximum use of the existing radar receiver IF section in order to allow the benefits of large volume purchase of common components as well as reduce risk and time to market. He designed and developed a SAW Filter stabilized transmitter incorporating low-cost modulators used in garage door openers. The unit was design for manufacture using the clients existing high volume automated surface mount assembly lines.

- For B&H, he led the team that developed a digital radio paging product employing thick film hybrid RF and custom baseband integrated circuits. The project was designed for high volume manufacturing using in-house production systems.

EXPERT WITNESS ENGAGEMENTS

Case	Jurisdiction	Case Number	Witness for:
One World Technologies, Inc. v. United States, United States Department of Homeland Security, United States Customs and Border Protection, and Commissioner Kevin K. McAleenan	The United States Court of International Trade	18-00200	Plaintiff
Clearplay, Inc. v. DISH Network L.L.C. and EchoStar Technologies L.L.C.	The United States District Court for the District of Utah	2:14-cv-00191-DN	Defendant
Maxell, Ltd. v. Fandango Media, LLC	The United States District Court for the Central District of California	2:17-cv-07534-AG-SSx	Plaintiff
Sisvel International S.A., 3G Licensing S.A., and Sisvel S.P.A. v. HMD America, Inc. and HMD Global Oy	United States District Court for the Southern District of Florida; Miami Division.	20-22051-Civ-Gayles	Plaintiff
Sisvel International S.A. and 3G Licensing S.A. v. ZTE (USA) Inc. and ZTE Corporation	United States District Court for the Northern District of Texas	3:19-cv-01694-N	Plaintiff
The Chamberlain Group, Inc. v. One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment	The United States International Trade Commission	337-TA-1016	Respondent
Dynamics Inc. v. Samsung Electronics, Co., Ltd.	The United States International Trade Commission	337-TA-1170	Respondent

Case	Jurisdiction	Case Number	Witness for:
Universal Electronics, Inc. v. Roku Inc., et al	The United States International Trade Commission	337-TA-1200	Respondent - Roku
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	CBM2018-00033	Petitioner
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	CBM2018-00034	Petitioner
TCT Mobile (US) Inc. and TCT Mobile, Inc. v. Wireless Protocol Innovations, Inc.	The United States Patent Office Trial and Appeal Board	IPR2016-01494	Petitioner
TCT Mobile (US) Inc. and TCT Mobile, Inc. v. Wireless Protocol Innovations, Inc.	The United States Patent Office Trial and Appeal Board	IPR2016-01704	Petitioner
TCT Mobile (US) Inc. and TCT Mobile, Inc. v. Wireless Protocol Innovations, Inc.	The United States Patent Office Trial and Appeal Board	IPR2016-01861	Petitioner
TCT Mobile (US) Inc. and TCT Mobile, Inc. v. Wireless Protocol Innovations, Inc.	The United States Patent Office Trial and Appeal Board	IPR2016-01865	Petitioner
One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment v. The Chamberlain Group, Inc.	The United States Patent Office Trial and Appeal Board	IPR2017-00073	Petitioner
One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment v. The Chamberlain Group, Inc.	The United States Patent Office Trial and Appeal Board	IPR2017-00126	Petitioner
One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment v. The Chamberlain Group, Inc.	The United States Patent Office Trial and Appeal Board	IPR2017-00214	Petitioner
Live Person, Inc. v. 24/7 Customer, Inc. and 24/7 Customer International Holdings, Ltd.	The United States Patent Office Trial and Appeal Board	IPR2017-00610	Petitioner
Live Person, Inc. v. 24/7 Customer, Inc. and 24/7	The United States Patent Office Trial and Appeal Board	IPR2017-00616	Petitioner

Case	Jurisdiction	Case Number	Witness for:
Customer International Holdings, Ltd.			
One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment v. The Chamberlain Group, Inc.	The United States Patent Office Trial and Appeal Board	IPR2017-01132	Petitioner
One World Technologies, Inc. d/b/a Techtronic Industries Power Equipment v. The Chamberlain Group, Inc.	The United States Patent Office Trial and Appeal Board	IPR2017-01137	Petitioner
Google Inc. v. Uniloc USA, Inc. and Uniloc Luxembourg, S.A.	The United States Patent Office Trial and Appeal Board	IPR2017-01683	Petitioner
Google Inc. v. Uniloc USA, Inc. and Uniloc Luxembourg, S.A.	The United States Patent Office Trial and Appeal Board	IPR2017-01684	Petitioner
Google Inc. v. Uniloc USA, Inc. and Uniloc Luxembourg, S.A.	The United States Patent Office Trial and Appeal Board	IPR2017-01685	Petitioner
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	IPR2018-00342	Petitioner
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	IPR2018-00343	Petitioner
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	IPR2018-00344	Petitioner
Comcast Cable Communications, LLC v. Promptu Systems Corporation	The United States Patent Office Trial and Appeal Board	IPR2018-00345	Petitioner
Google LLC v. Hammon Development International, Inc.	The United States Patent Office Trial and Appeal Board	IPR2020-00020	Petitioner
Google LLC v. Hammon Development International, Inc.	The United States Patent Office Trial and Appeal Board	IPR2020-00080	Petitioner

Case	Jurisdiction	Case Number	Witness for:
Google LLC, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc. LG Electronics Inc., and LG Electronics U.S.A., Inc. v. Parus Holdings, Inc.	The United States Patent Office Trial and Appeal Board	IPR2020-00846	Petitioner
Google LLC, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc. LG Electronics Inc., and LG Electronics U.S.A., Inc. v. Parus Holdings, Inc.	The United States Patent Office Trial and Appeal Board	IPR2020-00847	Petitioner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01157	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01158	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01159	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01160	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01161	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2020-01162	Patent Owner
Dell Inc. v. 3G Licensing S.A.	The United States Patent Office Trial and Appeal Board	IPR2021-00584	Patent Owner
Google LLC v. Parus Holdings, Inc.	The United States Patent Office Trial and Appeal Board	IPR2022-00279	Petitioner
Google LLC, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc. LG Electronics Inc., and LG Electronics U.S.A., Inc. v. Parus Holdings, Inc.	The United States Patent Office Trial and Appeal Board	IPR2022-00355	Petitioner

Case	Jurisdiction	Case Number	Witness for:
Google LLC, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc. LG Electronics Inc., and LG Electronics U.S.A., Inc. v. Parus Holdings, Inc.	The United States Patent Office Trial and Appeal Board	IPR2022-00358	Petitioner

CLIENTS

ASSA
Caavo
Charles Schwab
Comcast
Contec
Dish
Frost Bank
GE MDS
Google LC
HID Global

Kajeet
Local Radio
Maxell
Production Products Corp.
RIM
Roku
Samsung
Sisvel MCP
Unified Patents
WSOU