PUBLIC VERSION

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AYLO FREESITES LTD,
Petitioner,

v.

DISH TECHNOLOGIES L.L.C.,
Patent Owner.

IPR2024-00045
Attorney Docket No.: 081841.0167

DECLARATION OF DR. KEVIN JEFFAY IN SUPPORT OF PATENT OWNER RESPONSE

PATENT OWNER'S EXHIBIT LIST

Ex. No.	Description of Documents
2001	Declaration of Dr. Kevin Jeffay in Support of Patent Owner's Preliminary Responses under 35 U.S.C. § 313 and 37 C.F.R. § 42.107
2002	File History of U.S. Patent No. 11,470,138
2003	Terminal Disclaimers of Patent Family
2004	U.S. Patent No. 6,389,473 ("Carmel")
2005	337-TA-1265 Investigation Commission Opinion
2006	Declaration of Dr. Kevin Jeffay in Support of Patent Owner's Response
2007	Trowt-Bayard *et al.*, *Videoconferencing & Interactive Multimedia: The Whole Picture* (Flatiron Publishing, 1997)
2008	Nigel Chapman *et al.*, *Digital Multimedia* (John Wiley & Sons, LTD, 2000)
2009	Transcript of Deposition of Dr. Henry Houh (July 9, 2024)
2010	Declaration of Inventor Robert Drew Major
2011	MOVE Networks Streaming Media Technology
2012	MOVE Networks Technology Overview
2013	Sling TV Emmy Award (CX-1084)
2014	MOVE Awarded Fundamental Patent (CX-1122)
2015	MOVE Networks Article (CX-0013)
2016	OnHollywood 100 (CX-1078)
2017	OnHollywood 100 Winner (CX-1079)

2018	OnMedia 100 Winner (CX-1080)
2019	Red Herring Global 100 (CX-1081)
2020	MOVE Networks TechCrunchies Finalist (CX-1082)
2021	MOVE Networks Makes Web TV Watchable (CX-0046)
2022	ABC.com Makes Watching TV at Work Better (CX-1106)
2023	MOVE Networks, a next-gen content distribution platform (CX-1134)
2024	Better than YouTube (CX-0045)
2025	Long-Form Video Gaining Viewers (CX-1115)
2026	Move Over Joost (CX-1125)
2027	Coming Faster Than You Think (CX-1110)
2028	WSJ Pushing to Bring TV to the Internet (CX-1128)
2029	CNN Level 3 Collaborates with MOVE (CX-1113)
2030	The Sport Page ESPN 360 (CX-1132)
2031	E-Mail 5/15/2007 (CX-1047C)
2032	E-Mail 6/16/2007 (CX-1049C)
2033	E-Mail 11/26/2007 (CX-1050C)
2034	ABC Big Move Away from Flash (CX-1116)
2035	Disney ABC Throws Down (CX-1130)
2036	The Lowdown on Apple (CX-1131)
2037	AOL and CBS Put Online HD (CX-1109)
2038	MOVE Quality Solution (CX-1121)

2039	ABC Becomes First Network HD Streamer (CX-1112)
2040	ABC.com to Stream HD Video (CX-1108)
2041	ABC Adds Full Screen Mode to Online Shows (CX-1104)
2042	MOVE Networks Releases Live Streaming (CX-1123)
2043	ABC Offering Full Screen Streaming HD (CX-1105)
2044	Level 3 Streams and Other News from SMW (CX-1114)
2045	Microsoft Unlocks Power of the Web (CX-1092)
2046	[Reserved]
2047	Disney Backs Video Start-Up (CX-1111)
2048	Here Comes More HD Video (CX-1077)
2049	E-Mail 1/20/2009 (CX-1146C)
2050	MOVE and Microsoft Term Sheet (CX-1051C)
2051	To the Ends of the Earth (CX-1074)
2052	MOVE Gets Streaming Patent; Are Adobe & Apple Hosed? (CX-1120)
2053	DISH's Motion for Preliminary Injunction, *DISH Techs. v. MG Premium Ltd et al.*, No. 2:23-cv-552-HCN-DAO, D.I. 19.
2054	[Reserved]
2055	Apple and MOVE NDA Agreement 11/15/2006 (CX-1137C)
2056	Apple and MOVE NDA Agreement (CX-1085C)
2057	E-Mail on 2/23/2009 (CX-1219C)
2058	Microsoft Invests in Net Video (CX-1087)
2059	MOVE Networks Publishing System (CX-1247C)

2060	Silverlight Shines (CX-1090)
2061	[Reserved]
2062	Exemplary Claim Chart Illustrating MOVE Networks' Use of Invention
2063	Excerpt of Deposition of David Ericson in *In re Certain Fitness Devices, Streaming Components Thereof, and Systems Containing Same*, Inv. No. 337-TA-1265 (taken Jan. 6, 2022)
2064	MOVE Crosses the Hour Threshold
2065	Readies Online HD Shows as Streamlettes (CX-1107)
2066	Delivering a Better Viewing Experience
2067	MOVE Adaptive Stream
2068	Utah Valley Entrepreneurial Forum Hall of Fame 2013
2069	Utah Technology Hall of Fame 2005
2070	ABC TV New Player Rocks
2071	E-Mail 1/23/2008 (CX-1052C)
2072	ABC.com Streamlettes (CX-1133)
2073	MOVE Networks Newsroom (CX-1124)
2074	ABC.com Readies Online HD (CX-1135)
2075	Metrics Point to Maturation of Online (CX-1117)
2076	More Money Pouring Into Rich Media (CX-1118)
2077	MOVE Put Mass Back Into Mass Media (CX-1126)
2078	E-mail 2/25/2008 (CX-1053C)
2079	E-mail 5/14/2008 (CX-1055C)

2080	2010 EchoStar 10-K (CX-0052)
2081	E-Mail 8/26/2008 (CX-1059C)
2082	Microsoft Extends Vision (CX-1148)
2083	DISH's Motion to Terminate Against Peloton
2084	Joint Motion to Partially Terminate Against Mirror
2085	DISH Petition to Rescind Limited Exclusion Order Against iFit
2086	MOVE Networks Awarded Fundamental Patent (CX-1091)
2087	Synchronized Multimedia Integration Language (SMIL 2.0)

I. Introduction

1. I, Dr. Kevin Jeffay, hereby declare as follows:

A. Engagement

2. I am an independent consultant with over 40 years of experience in technologies related to media streaming. I have been retained on behalf of DISH Technologies L.L.C. ("Patent Owner" or "DISH"), as an expert consultant on telecommunications technology related to streaming media content over networks including the Internet.

3. As part of this work, I was previously requested by counsel for DISH to review the Petitions for *Inter Partes* Review and accompanying Declarations of Dr. Henry Houh, which were submitted by Petitioner Aylo Freesites LTD, and to assess Dr. Houh's analysis of U.S. Patent Nos. 10,951,680 (the "'680 Patent"), 11,677,798 ("the '798 Patent"), 9,407,564 ("the '564 Patent"), 10,469,554 ("the '554 Patent"), 8,868,772 ("the '772 Patent"), 11,470,138 ("the '138 Patent"), 10,469,555 ("the '555 Patent"), 10,757,156 ("the '156 Patent") (the "Asserted Patents" or "ABR [Adaptive Bit-Rate] Patents") in view of certain prior art references. Thereafter, I provided my opinions regarding validity of the Asserted Patents.

4. I understand that Petitioner submitted a petition ("Petition") for an *inter partes* review, challenging Claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30 of U.S. Patent No. 10,469,554 ("'554 Patent"). I have been asked by counsel for DISH to provide technical opinions in connection with the *inter partes* review of the '554 Patent.

5. I submit this declaration in support of Patent Owner's Response. I reserve the right to supplement my opinions, should I be requested to provide additional analysis in connection with the patentability of Claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30 of the '554 Patent.

6. I am being compensated at $800 per hour for my services in this matter. My compensation is not dependent upon the outcome of this matter. If called upon to do so, I am prepared to testify as an expert witness in this regard.

B. Background and Qualifications

7. I am qualified by education and experience to testify as an expert in the field of computer networking and video streaming. Attached, as Exhibit A, is a copy of my resume detailing my experience and education. Additionally, I provide the following overview of my background as it pertains to my qualifications for providing expert testimony in this matter.

8. I am a full professor in the Department of Computer Science at the University of North Carolina at Chapel Hill where I currently hold the position of Gillian T. Cell Distinguished Professor of Computer Science. I have been a faculty member at UNC since 1989. From 2014-2022, and again in 2024, I also served as the Chairman of the Department.

9. I received a Ph.D. in computer science from the University of Washington in 1989. Before that I received a M.Sc. degree in computer science from the University of Toronto in 1984, and a B.S. degree with Highest Distinction in mathematics from the University of Illinois at Urbana-Champaign in 1982.

10. I have been involved in the research and development of computing systems for over 40 years. I have been a faculty member at the University of North Carolina since 1989 where I perform research and I teach in the areas of multimedia networking, computer networks, distributed systems, real-time systems, and operating systems, among others. A major theme of my research has been the development of technology to improve the performance of data transfers on the Internet generally and for real-time applications specifically. My research has examined problems ranging from network and operating system support for real-time multimedia applications such as audio and video streaming, voice-over-Internet protocol (VoIP) and Internet videoconferencing,

to the design of congestion control mechanisms in network routers, to measurements and analysis of network traffic to passively assess the performance of servers on the Internet.

11. For example, starting in the late 1980s, the focus of my research was the development of network and operating system technology to enable the real-time transfer of streams of audio and video data across the Internet. This involved, among other things, the development of media encoders, media players, and network communication protocols for adaptive transmission of live audio and video data on the Internet. This work culminated in my research group developing some of the first videoconferencing systems for the Internet. Several of the papers authored by myself and members of my research group on this project won awards for their technical contributions.

12. The videoconferencing and adaptive streaming research attracted the attention of industry groups such as IBM, Intel, Digital Equipment Corporation, Cabletron, and AT&T Bell Laboratories. For example, starting in 1991 IBM supported aspects of my research at UNC and these efforts resulted in U.S. Patent No. 5,892,754 on adaptive media streaming being issued to IBM and UNC.

13. During this time, I was also collaborating with researchers at the Intel Architecture Labs in Hillsboro, OR, to modify an Intel product, the ProShare videoconferencing system, to use technology developed in my research lab at UNC for adaptive media transmission. By the late 1990s, the ProShare product included the ability to also transfer desktop information of a PC to a remote PC.

14. My research group also developed other "data conferencing" systems, also known as "shared window systems," that were capable of transferring the desktop information on a PC to a remote PC in real-time. One system that we built, called "XTV," was operational by 1991. The source code for XTV was made freely available and, by 1993, had been downloaded by over 600

users and institutions. The system was functionally and visually equivalent to today's Cisco's WebEx and Zoom's screen sharing products and services. It provided a sophisticated means of transferring the desktop information of a PC to a remote site. In the XTV system, individual windows displayed on the desktop, or the entire desktop itself, could be selected for sharing with remote users. The XTV system also allowed remote users to remotely control and manipulate the desktop whose information was being distributed, as well as remotely control the applications that were generating the desktop information that was being shared.

15. In much of my research, I regularly build and use clusters of computers interconnected by network switches, bridges, and routers to form and evaluate experimental and production networks. For example, in the late 1990s and early 2000s, my research evolved to consider router-based mechanisms for controlling the performance of network traffic. In much of this research, my students and I built and instrumented network routers and performed large scale experiments with this equipment. The instrumentation included, for example, the development of network monitors that would receive copies of packets flowing on a network link and analyze and store packets or the results of analyses on these packets, all in real-time. Based on these experiments, in 2003, my group at UNC won the most prestigious research award for original research in computer networking. UNC applied for, and received, U.S. Patent No. 7,447,209 for aspects of this research.

16. This project, and others, took place in a networking lab my students and I constructed at UNC over a number of years. The lab consists of several hundred computers and networking devices. Managing this lab required establishing and configuring VLANs, firewalls, and other security appliances to isolate the lab from the campus network (and vice versa).

17. More recently, my research group has considered the design and operation of next generation aerial networks. UNC applied for, and received, U.S. Patent No. 9,832,705 for aspects of this research.

18. I have authored or co-authored over 100 articles in peer-reviewed journals, conference proceedings, texts, and monographs in the aforementioned areas of computer science and others. In addition, I have edited and co-edited numerous published proceedings of technical conferences and have edited a book of readings in multimedia computing and networking (with Hong-Jiang Zhang) published by Morgan Kaufman. I am a co-author (with Long Le and F. Donelson Smith) of a monograph related to computer network protocols, and a co-author (with Jay Aikat and F. Donelson Smith) of a second monograph related to experimental computer networking.

19. My research extends to leadership positions in several journals, conferences, and committees. I have previously served as Editor-in-Chief for the journal Multimedia Systems and Associate Editor for the journal Real-Time Systems. In addition, I have been an active participant in the Association for Computing Machinery ("ACM") and the Institute of Electrical and Electronics Engineers ("IEEE"). Specifically, I have been a member of the steering committees for the ACM Special Interest Group on Multimedia, and the ACM Special Interest Group on Data Communications ("SIGCOMM") and its subgroup on Internet Measurement. I have also served as a member of the IEEE Technical Committee on Real-Time Systems. As a result of this involvement, I have served as a program chair or member of the technical program committee for over 100 professional, international, and technical conferences, workshops, and symposia. I was previously on the steering committee for the ACM technical committee on Internet measurement, where we worked on community standards for measurement-based research. I have also served on

numerous proposal review panels for the National Science Foundation and other international funding agencies in the aforementioned areas of computer science.

20. In addition to the U.S. patents referenced above, I am a named inventor on a fourth patent. Each of these patents is generally related to computer networking and the delivery of services over networks including audio and video transmission.

21. I have developed and taught undergraduate and graduate level courses on operating systems, computer networking, computer security, and multimedia computing. These courses have been developed for, and delivered to, students at UNC as well as for industry professionals.

22. I have served as an expert witness and technical consultant in litigation and *inter partes* review matters concerning videoconferencing, data conferencing and screen sharing, cellular and wireline telephony, voice over IP (VoIP) telephony, multimedia networking, distributed systems, operating systems, computer networks, datacenter networking, embedded systems and embedded software, and real-time systems, among others. I have testified in several trials, arbitrations, and claim construction hearings as an expert witness.

II. Relevant Legal Principles

23. I have applied the following legal principles provided to me by counsel in arriving at the opinions set forth in this report.

A. Prior Art

24. I understand that a person shall not be entitled to a patent if the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention. I understand that disclosures made one year or less before the effective filing date of the claimed invention shall not be prior art if the disclosures were made by an inventor, joint inventor, or by another who obtained the subject matter directly or indirectly from the inventor or a joint inventor; or the disclosures were made by another

after an initial disclosure by an inventor, joint inventor, or by another who obtained the subject matter directly or indirectly from the inventor.

25. I understand that prior art also includes issued patents or published applications in which the patent or application names another inventor and was effectively filed before the effective filing date of the claimed invention. I understand that such disclosures shall not be prior art if (1) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor; (2) the subject matter disclosed had been publicly disclosed by the inventor before the effective filing date; or (3) the disclosed subject matter and the claimed invention were owned by the same entity no later than the effective filing date.

B. Anticipation

26. It is my understanding that invalidation by "anticipation" only exists if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. I understand that the references must be viewed from the perspective of a person of ordinary skill in the art (a "POSITA"). I understand that two or more items of prior art cannot be combined to find anticipation. I also understand that the single prior art reference must include all elements arranged as required by the claim. I further understand that to be considered anticipatory, the prior art reference must be enabling and must describe the patentee's claimed invention sufficiently to have placed it in the possession of a person of ordinary skill in the field of invention. I understand that the disclosure in the particular item of prior art does not have to be in the same words as the claim, but all of the requirements of the claim must be there, either expressly or inherently, so that a person of ordinary skill in the art looking at that particular item of prior art would be able to make and use at least one embodiment of the claimed invention.

27. I understand that a reference that does not expressly anticipate a claim or claim element can be found to inherently anticipate, but only if the reference necessarily includes the unstated

limitation or necessarily functions in accordance with the claim or claim element. I understand that inherency cannot be established by probabilities or possibilities. And I further understand that a reference must enable someone to practice the invention in order to anticipate under § 102.

C. Obviousness

28. I understand that a patent claim is invalid if the claimed invention would have been obvious to a person of ordinary skill in the art at the time the invention was made. I understand a claimed invention is obvious when, even if all the requirements of the claim cannot be found in a single item of prior art that would otherwise anticipate the claim, it would have been obvious to a person of ordinary skill in the art, having knowledge of all of the analogous prior art, to have come up with the claimed invention.

29. I understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. Most, if not all, inventions rely upon building blocks of prior art, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. Accordingly, to determine whether an invention is obvious, I understand it can be important to determine whether there is a reason that would have prompted a person of ordinary skill in the art to combine the elements in the way the claimed new invention does. I understand that such teachings, suggestions, and motivations may be found in the prior art, the knowledge of a person of ordinary skill in the art, or the nature of the problem solved by the claimed invention.

30. In evaluating whether the challenged claims would have been obvious, I have also considered the following factors:

- Whether Petitioner has identified a reason that would have prompted a person of ordinary skill in the art to combine elements or concepts from the prior art in the same way as in the claimed invention;

- Whether the claimed invention applies a known technique that had been used to improve a similar device or method in a similar way; and
- Whether the claimed invention would have been obvious to try, meaning that the claimed innovation was one of a relatively small number of possible approaches to the problem with a reasonable expectation of success by those skilled in the art.

31. I understand that it is important to be careful not to determine obviousness using hindsight, because many true inventions can seem obvious after the fact. Obviousness is determined from the position of a person of ordinary skill in the art at the time the claimed invention was made, and I understand it is improper to consider what is known today or what is learned from the teaching of the patent. For example, I understand it is improper to use the challenged patent as a road map for selecting and combining prior art.

32. I understand that the ultimate conclusion of whether a claim is obvious should be based on a determination of the following factual issues:

- The level of ordinary skill in the art that someone would have had at the time the claimed invention was made;
- The scope and content of the prior art;
- The differences, if any, that existed between the claimed invention and the prior art; and
- Secondary considerations or objective evidence of non-obviousness.

33. I understand that objective evidence or secondary considerations of non-obviousness include the following:

- Commercial success of a product due to the merits of the claimed invention;

- A long-felt, but unsolved, need for the solution provided by the claimed invention;
- Unsuccessful attempts by others to find the solution provided by the claimed invention;
- Copying of the claimed invention by others;
- Unexpected and superior results from the claimed invention;
- Acceptance by others of the claimed invention as shown by praise from others in the field of the invention; and
- Disclosures in the prior art that criticize, discredit, or otherwise discourage the claimed invention and would therefore tend to show that the invention was not obvious.

34. I have been informed that a patentee is entitled to a rebuttable presumption of nexus between the asserted evidence of objective indicia and a patent claim if the patentee shows that the asserted objective evidence is tied to a specific product and that the product is the invention disclosed and claimed. In other words, presuming nexus is appropriate when the patentee shows that the asserted objective evidence is tied to a specific product and that product embodies the claimed features, and is coextensive with them. If on the other hand, the patented invention is only a component of a commercially successful machine or process, the patentee is not entitled to a presumption of nexus.

III. Overview of Cited Art

A. Ogdon

35. U.S. Patent No. 6,161,137 by Ogdon and Johnson is titled "Method and System for Providing a Presentation on a Network." EX1004. Ogdon discloses a networked presentation

system for providing a presentation to a plurality of client nodes on a communications network. *Id.* at 1:9-15. It also describes dividing a presentation into different "segments" that have different "versions" (*e.g.*, a PowerPoint slide with "a single image," a slide with "a combination of images," a slide with an "animation," etc.). *Id*. at 2:55-3:8. But these "segments" are discrete portions of a presentation that can be "substituted" in and out with different "versions" of the same, discrete portion of the presentation. *Id.* Ogdon's "segments" correspond to slides in a PowerPoint slide show and are discrete, stand-alone pieces of content that accompany a presenter-led performance of a presentation. Ogdon's only disclosure of distributing "live" content involves distributing "live voice audio" through a "phone bridge," *i.e.*, a telephone network. *Id*. at 4:48-55. Similarly, Ogdon's only disclosure of "stream" is in relation to an "audio file or stream." *Id*. at 13:12-19, 27:17-19, 28:31. Furthermore, Ogdon describes this audio as providing "substantial continuity in presentation regardless of whether a portion of the video for the presentation is displayed or not." *Id*. at 24:28-39.

B. Allen

36. WIPO Publication No. WO 02/075482 A2 by Allen et al. is titled "System and Method for Distributing Streaming Media." EX1005. Allen discloses a technique for digital processing of video signals for use with a variety of streaming media encoders. *Id*. at 1:14-16. Although Allen describes encoding content "in three different bitrates, 56Kbps, 300Kbps, and 600Kbps," nowhere does Allen disclose or suggest dividing the resulting streams into smaller, time-divided increments, or "streamlets." *Id.* at 12:2-5; *see also id.* at 3:16-18. Instead, one continuous stream is sent to a user based on "the capabilities of the user's system." *Id.* at 1:18-21.

C. SMIL 2.0

37. Synchronized Multimedia Integration Language 2.0 ("SMIL 2.0") (EX1006) describes an XML markup language for multimedia presentations. "Using SMIL 2.0, an author can describe

the temporal behavior of a multimedia presentation, associate hyperlinks with media objects and describe the layout of the presentation on a screen." EX1006 at 1. SMIL 2.0 defines three XML markup "elements" and "attributes." The "switch element allows an author to specify a set of alternative elements from only the first acceptable element is chosen." *Id.* at 61. The "dur" attribute specifies the "length of the simple duration." *Id.* at 128–29. And the "<seq> element plays the child elements one after another in a sequence." *Id.* at 123.

IV. Level of Ordinary Skill in the Art

38. Dr. Houh contends that a person of skill in the art ("POSITA") at the time of invention of each of the ABR Patents "would have had at least a B.S. degree in computer science or electrical engineering (or comparable degree) and two years of experience in networking or streaming media, or a M.S. in computer science or electrical engineering (or comparable degree)." EX1003 at ¶45.

39. I disagree. Instead, it is my opinion that a POSITA at the time of the claimed invention would have been someone with at least a bachelor's degree in electrical engineering or computer science, or an equivalent degree or experience in a related field, with at least two years of practical experience or coursework in the design or development of distributed multimedia delivery systems.

40. Dr. Houh's proposed definition of a POSITA is improper because it does not require any experience with "multimedia delivery systems" or "streaming media," and instead may be satisfied by someone with "networking" experience alone, or someone with simply a Master's degree in a relevant field and no networking experience. Accordingly, the definition of a POSITA I propose above is more suitable. However, for purposes of my analysis presented below, Dr. Houh's proposed definition may be accepted as sufficient.

V. Claim Construction

41. In general, I understand that claim terms are to be given their plain and ordinary meaning according to a POSITA at the time of the invention. Here I understand that the International Trade Commission ("Commission" or "ITC") in Investigation No. 337-TA-1265 (the "1265 Investigation") previously construed the term "streamlet(s)" as recited in two of the ABR Patents as "any sized portion of a content file each of which is stored separately." However, this construction is not required for purposes of rendering the opinions I express here.

42. Regarding the term "virtual timeline" (Claims 11-14 and 23-25), a POSITA would readily understand the meaning of the term "virtual timeline" from the plain language of the claims themselves, which is consistent with the use of the term in the specification. The term "virtual timeline" therefore does not require a specific construction.

43. A POSITA would have understood that the claimed "virtual timeline" is broad enough to include a "playlist." For example, the specification states that "the virtual timeline (hereinafter 'VT') 600 may comprise a file that is configured to define a ***playlist*** for a user to view." 'EX1001 at 12:36-38 (emphasis added). Although the specification goes on to describe two exemplary alternatives of such a "playlist"—one in which three different "shows" are listed (*id*. at 12:38-41) and one in which the same "content" is "looped" (*id*. at 12:44-49)—these are just non-limiting examples of "playlists," as indicated by the repeated use of open-ended language like "[f]or example" and "may" to introduce these concepts.

44. Moreover, while it is true that this first example describes the "virtual timeline" as "compris[ing] at least one quantum media extension 602" that "describes an entire content file 200," the specification makes clear that this is just "one embodiment." The "alternative embodiment" described in the specification (i.e., the embodiment that loops "content") makes no mention whatsoever of "an entire content file" and, therefore, does not require it. It follows that

the term "virtual timeline" also does not require it. Regardless, it would be improper to read either of these exemplary embodiments into the term "virtual timeline" absent evidence of a clear disavowal of claim scope, and Petitioner does not attempt to identify any beyond the open-ended language in the specification (*i.e.*, "[f]or example," "may," etc.) discussed above. "Virtual timeline" should therefore be interpreted to require a "playlist," which may or may not include "entire content files."

45. I have not identified any other terms of the challenged claims of the '554 Patent that require construction for purposes of rendering the opinions I express here.

VI. Dr. Houh Fails to Show the Patents are Invalid

46. I understand that Petitioner has the burden of proving unpatentability of the challenged claims by proving, by a preponderance of the evidence, that each element of the challenged claims is disclosed by the prior art or would have been obvious based on the prior art. But neither Petitioner nor Dr. Houh met such a burden here. I have reviewed Dr. Houh's declarations and conclude that in each declaration Dr. Houh fails to show any of the claims are invalid. I disagree with Dr. Houh's conclusion that each challenged claim is allegedly invalid over Ogdon, Allen, and/or SMIL 2.0. At the onset here, I note that as part of my service as an expert witness in patent litigation matters related to video streaming, I have had occasion to research the state of the art in video streaming in the late 1990s and early 2000s. As part of this research, and prior to my engagement in these matters, I had previously encountered patents in the family of the ABR Patents, specifically, U.S. Patent No. 7,818,444 to Brueck and Hurst around the 2016 – 2017 time period. Having done original research in adaptive streaming in the 1990's, I recall being impressed by the '444 Patent, in particular, its architecture for what it termed "multi-bitrate video and/or audio content streaming." The architecture included using a web server hosting sets of content files where each set represented segments ("streamlets") of a larger media presentation encoded in

the same format but at a particular streaming bit-rate. End-user stations were able to adaptively stream the media presentation by requesting content files in the same format, but at different bitrates, so as to receive media at a particular bit-rate that the end-user station had estimated was sustainable. While this paradigm of client adaptation and requesting of content is common for streaming media today (in particular, requesting via HTTP), the '444 Patent impressed me as being the earliest patent I had seen with such an architecture.

47. In addition, while HTTP is today the dominant transport means for streaming media, I was impressed by the use of HTTP in the ABR Patents. As discussed above, I had worked on a variety of streaming media projects throughout the 1990s and recall that during this time I was skeptical that effective streaming systems could be developed using HTTP (because of its overhead, its reliance on TCP for underlying transport, and because of the lack of support for real-time content delivery in commodity web servers). Servers supporting streaming (or even video-on-demand) were commonly thought to require special support for media adaptation (*e.g.*, transcoding) and/or real-time storage and retrieval systems (*e.g.*, real-time file systems).

48. Thus, when I was approached by counsel for DISH Network to work on a related matter, I agreed because I had a good faith basis for believing that the ABR Patents were valid (and useful). And nothing in my objective review of the evidence provided by Dr. Houh has changed this opinion.

49. Dr. Houh's declaration and the Aylo IPRs fail to show the patent is invalid for numerous reasons, which I address in the sections that follow. In rendering my opinions below, I address, as examples, elements of each challenged claim that are not disclosed, suggested, or rendered obvious by any prior art reference or combination raised by Dr. Houh. In my opinion, the claims containing such elements are not invalid. Moreover, to the extent that I have provided a reason that a specific

independent claim is not rendered invalid, my opinion is that none of the claims depending from such independent claim are invalid for at least the reasons given for that dependent claim's respective independent claim.

50. The fact that I do not specifically address any claim does not constitute a waiver or concession of invalidity as to any such claims.

VII. Ground 1: Claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30 are Not Rendered Obvious over Ogdon in View of Allen

51. In Ground 1, Petitioner alleges that Ogdon in view of Allen renders obvious claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30.

52. I understand that Dr. Houh relies exclusively on Ogdon as the primary reference in each and every alleged ground of invalidity of the '554 Patent. But Ogdon itself has numerous deficiencies that Dr. Houh fails to address. In fact, Ogdon directly teaches away from video streaming as claimed by the '554 Patent (and the ABR Patents).

A. Ogdon is Deficient as a Primary Reference

1. Ogdon Does not Disclose or Suggest, and Teaches Away from, Video Streaming

53. Ogdon does not disclose or suggest video streaming as claimed by independent claims 1, 16, 26, and 30 of the '554 Patent and, in fact, expressly ***teaches away*** from it. Specifically, Ogdon recognizes that "telepresentations" such as videoconferences were problematic due to their "substantial expense" and the requirement for "specialized video conferencing systems with high data transmission lines" and specialized facilities with their incumbent high establishment and maintenance costs. EX1004 at 1:19-48. A POSITA would recognize that the dominant factor driving Ogdon's conclusions was the requirement for supporting a video of a presentation within the videoconferencing or videoconferencing-like system where video was a media treated and managed separately from any corresponding audio (*i.e.*, "video" in Ogdon was pure video and did

not include audio, *see*, *e.g.*, *id*. at 3:64 – 4:10). Having personal familiarity with the specialized systems and environments Ogdon discloses for telepresentations throughout the 1990s, I recognize and appreciate the issues Ogdon raises.[1]

54. Ogdon appears to claim priority to a 1997 provisional application. EX1004 at 1:4-6. As of 1997, Ogdon correctly argues that the dominant approach to live, interactive "telepresentations" such as videoconferences of requiring specialized physical locations (rooms) with specialized equipment and connectivity to remote sites (rooms) had "numerous drawbacks." *Id.* at 1:19-42.[2] Instead, Ogdon discloses an alternative that uses a combination of the telephone network or the Internet for delivery of audio and uses the Internet for its conception of video. However, audio and video are provided through "different communication channels." *Id.* at 3:64–4:1.

55. Specifically, Ogdon recognizes that most of the overhead[3] required to receive and process video at a client could be obviated by distributing only the "presentation materials" (*i.e.*, a series

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[1] Throughout the 1990s, UNC generally, and the Department of Computer Science specifically, maintained a set of facilities for "distance learning" and remote conferences that supported live, 2-way audio and video streaming using dedicated telecommunications circuits to partner sites at Duke University and North Carolina State University (among others). In this system, audio was acquired and managed separately from video.

[2] Ogdon does not use the word "stream." However, Ogdon does use the term "video conference" in two places (EX1004 at 1:27-29, 9:9-15) in distinguishing from its disclosed approach of merely "viewing the presentation." *Id*. at 9:9-15.

[3] Ogdon acknowledges that "telepresentations" and "video conference[es]" were growing in popularity in the 1997 time frame of Ogdon's earliest claimed priority date. EX1004 at 1:19-23. These technologies were early ancestors of today's "Zoom" meetings, where a live video feed, typically of a room, would be captured at one conference site and distributed to one or more remote sites via a network typically comprised of dedicated telecommunications circuits. Audio was typically disseminated via "conventional telephone" because it was very difficult to beat the quality of telephony audio, however it may also be distributed by a data network technology. *Id.* at 2: 4-6. However, these telepresentation video conferences required "expensive" and "specialized" video conferencing systems. *Id.* at 1:22-37. Indeed, a POSITA would have understood that video conference telepresentations or video streaming would have been extremely rare and expensive in 1997, particularly in typical home or even office settings where network bandwidth and access to videoconferencing hardware was extremely limited. Ogdon confirms that the availability and use of such conferencing systems was limited. *Id.* at 1:30-42.

of multimedia "segments" or "slides" in a slide deck) instead of distributing the live video of the presentation in a stream. While distribution of presentation materials alone is less desirable than live video, Ogdon teaches that its proposed solution is beneficial because it "allow[s] individuals to access and/or participate in a presentation using standard telephony and Internet network connections found in most offices and many homes." EX1004 at 1:43-48. Conference participants therefore would not need to drive to dedicated "telepresentation" or "video conference" centers to attend a remotely hosted meeting—they could simply view basic "presentation materials" over a low bandwidth connection and listen in to a teleconference bridge in lieu of streaming video of the presentation. By obviating the need for "streaming" video, this simulates a live "presentation performance." Ogdon thus primarily seeks to increase access to remote presentations and is able to do so because "video" in Ogdon is not a stream of integrated audio and video but rather is the transmission of video images of the presentation only (*e.g.*, the PowerPoint slides). A POSITA would understand that Ogdon's video is not suitable for "streaming" today's video content such as movies or television content because Ogdon necessarily treats and transmits audio separately from video of the presentation and does not synchronize the audio with the video (which would not be necessary in Ogdon given that, as explained below, the video is of the presentation (*e.g.*, PowerPoint slides) and not of a speaker). Because Ogdon relies on the telephone network for transmission of audio and the Internet for "video," relative to Internet delays, audio would arrive "instantaneously" at conference participants whereas the video would experience significant delays and delay variation when transmitted over the Internet of 1997. As a result, transmitting video from a speaker in Ogdon separately from the audio, over the Internet and without support for synchronization ("lip sync" or "lip synchronization") would result in an unacceptable presentation. Indeed, much of the research I was engaged in in the period leading up to the 1997

filing date of Ogdon dealt with the complexity of trying to manage latency for transmission of live media over the Internet. In 1997, solutions to these problems were the subject of Ph.D. level research.[4] Thus, a POSITA encountering Ogdon would understand that these systems and methods were not capable of supporting synchronized playout of the video content as that term is understood today. And a POSITA encountering Ogdon as of the 2004 date of the challenged claims would have the same understanding that Ogdon is not teaching a video "streaming" solution for the very same reasons.

56. By contrast, the '554 Patent (and the ABR Patents) is directed to a more contemporary conception of video and is directed to ***video streaming*** (*i.e.,* distributing a continuous live video feed (or large pre-recorded video content) for consumption over a network where video in this context is understood to be a single integrated stream of moving images and the corresponding audio). EX1001 at [Title], [Abstract]. And because "video" in the ABR Patents is a single integrated stream, "lip sync" is not necessary as audio is transmitted together with (at the same time as) the corresponding video. While the ABR Patents also recognize the limitations of network infrastructure and client hardware. These are limitations of 2004 and not 1997. And unlike Ogdon, the ABR Patents do not disclose a shortcut or alternative to streaming video, or streaming video separately from audio. Instead, the ABR Patents disclose a solution that allows a large number of remote clients to each ***stream video content*** (*i.e.*, full motion video integrated with audio), at the same time even though each client may have different network resources available. Such different network resources may include different connection speeds and equipment. In other words, the ABR Patents disclose and claim a solution that enables video streaming for use in different

[4] *See, e.g.*, "A Transmission Control Framework for Continuous Media," Ph.D. Dissertation, University of North Carolina, Department of Computer Science, Terry Michael Talley, 1997.

applications, including videoconferencing through the transmission of a single integrated data stream. As such, the ABR Patents obviate any and all problems with synchronizing audio and video and enable them to support applications not possible in Ogdon such as distribution of television and movie programming.

57. Beyond the reliance on a single integrated video stream, the ABR Patents are able to support this wide array of application in part by creating sets of "streamlets," or "multiple files," from the original large content file or video feed, where a plurality of streamlets in each set are aligned by starting time and duration (typically a few seconds) but have different bitrates. By segmenting and encoding the streamlets, the claimed inventions allow for contiguous playback of the streamlets or files that collectively yields playback of the full content with synchronized audio and video. The common alignment of the streamlets or files in each set allows a playback device to select one quality of streamlet or file from a particular set and, as needed, to adjust for changing bandwidth resources, to select a different quality of streamlet or file from the subsequent set. When the bandwidth of the user's network is constrained, the client can select a lower bitrate to maintain playback continuity instead of stalling and re-buffering. By using streamlets or multiple files, the claimed inventions eliminate the need for users to download the full content file before beginning playback, thereby offering instantaneous viewing along with the ability to fast forward, rewind, direct seek (features not possible in a system like Ogdon where audio and video are not synchronized), and browse multiple streams. Additionally, segmenting the media into streamlets or multiple sets of files enables users to retrieve and enjoy content at the most appropriate bitrate possible as the media is streamed, thereby reducing latency, providing the highest quality video playout that is sustainable, and thereby improving the playout quality and user experience with

computer devices used to stream content data over a network. It is also well suited for live stream playback.

58. Ogdon's "presentation" is not a video stream as that term is used in the ABR Patents, and Ogdon's presentation "segments" are not "streamlets" as disclosed and claimed in the ABR Patents. They are not time-divided into smaller segments, nor do they collectively represent a larger stream as recited in the challenged claims. Instead, Ogdon's "segments" correspond to slides in a presentation such as slides of PowerPoint slide show—they are discrete, stand-alone pieces of content that accompany a presenter-led performance of a presentation.[5] To be sure, while the individual slides (or "segments") may include multimedia content, including "video" (*i.e.*, a "single image [or] complex combination of images, audio, animation and video … [and] interactive questions that audience members answer *e.g.*, by clicking on their display screens" (EX1004 at 3:4-10)), Ogdon's "segments" are distinguishable from "streamlets" because they are not portions of any continuous larger video or live video feed and they are not synchronized with the presentation audio. Indeed, Ogdon does not disclose streaming any larger videos with integrated audio such as "movies," "sports events," "music," "concert," or any of the other streaming content disclosed by the ABR Patents. *See* EX1001 at 7:13-15. In fact, the phrases "video stream" and "video streaming" does not appear in Ogdon; nor does "compression" (an essential requirement for transmission of motion video over the Internet in 1997), or even "live video." Ogdon's only disclosure of distributing "live" content involves distributing "live voice audio" through a "phone bridge," *i.e.*, a telephone network. EX1004 at 4:48-55. Similarly, Ogdon's only disclosure of "stream" is in relation to an "audio file or stream." *Id*. at 13:12-19, 27:17-19, 28:31. Furthermore, Ogdon describes this audio as providing "substantial continuity in the

[5] Ogdon refers to these discrete pieces of content as "segments."

presentation regardless of whether a portion of the video for the presentation is displayed or not." *Id*. at 24:28-39. A POSITA would recognize Ogdon's disclosures as simply affirming the well-known principle that in videoconferencing applications, audio carries the vast majority of the information content and as such care is always taken to optimize audio delivery. This explains why Ogdon explicitly separates and separately manages audio and video and discloses the use of the telephone network for delivery of audio.[6] Moreover, because Ogdon does not disclose video coming from a live camera (*e.g.*, a camera on the speaker), a POSITA would understand that Ogdon can treat audio separately from video and not be concerned about precise synchronization of the two.

59. Ogdon also discloses "communicat[ing] the video portion of a presentation to a user site via the Internet." EX1004 at 2:2-3. But this "video portion" of Ogdon does not refer to a "video stream." As explained above, Ogdon's only disclosure of "stream" is in relation to an "audio file or stream." *Id*. at 13:12-19, 27:17-19, 28:31. Ogdon uses the term "video" to refer to "visual" content, generally, throughout the specification and makes clear that such video/visual content "can be as simple as a single image," while certain of Ogdon's claims (*e.g.*, Claims 6 and 20) expressly recite that a "video" may include content with "no motion." EX1004 at 2:66-3:8; 29:45-47, 32:22-27; *see also* EX2007 at 1 ("Although the term 'video,' in its strictest sense, refers only to images, common vernacular reflects the assumption that audio is synchronized with these images…. The transferred images may be pictures of the participants themselves, but they may

[6] An award-winning paper I authored in 1994 showed the importance and utility of separating and separately managing audio and video data transmission in videoconferencing over computer networks (*see*, "Transport and Display Mechanisms For Multimedia Conferencing Across Packet-Switched Networks," K. Jeffay, D.L. Stone, F.D. Smith, Computer Networks and ISDN Systems, Volume 26, Number 10, July 1994, pages 1281-1304. Republished in "A Guided Tour of Multimedia Systems and Applications," B. Furht, M. Milenkovic, editors, IEEE Computer Society Press, 1995).

also include video clips or other material such as still pictures of objects or information that is stored on a computer (e.g., graphics, data files, applications)."). A POSITA would understand the limited availability and large infrastructure costs of today's conception of video streaming at the time of Ogdon's disclosure and would appreciate that Ogdon also seeks to avoid the same "drawbacks" with video streaming that it expressly acknowledges as explained above. Accordingly, a POSITA would understand the term "video portion of a presentation," as used by Ogdon, to be referring to the "visual" components of a presentation, such as slides, images, logos, and even animated GIF's or limited video clips embedded in the presenter's "presentation materials."

60. Ogdon also discloses that a presentation may also have "alternative segments" that can be retrieved "depending on, for example, performance characteristics of network transmissions." EX1004 at 3:1-2, 36-38; *see also id.* at 3:38-44. However, Ogdon does not disclose these "alternative segments" as a solution to enable streaming video as that term is used in the ABR Patents. Instead, Ogdon discloses alternative segments as static images or slides that enable a participant to participate in a presentation or meeting by viewing at least some limited set of presentation content. For example, Ogdon discloses that a presentation may include "first and second ordered segments" in "full animation," while "alternative segments" are provided in "slide show format." *Id*. at 3:44-57. However, Ogdon's alternative segments are "slides," not "streamlets" or "multiple files" of a video. They are not copies of a larger integrated, synchronized audio/video stream encoded at a different bitrate and do not contain video data. Instead, they are static slide presentation content. While they may be presented "synchronously" in place of the

default "full animation" segments, the alternative slides are not aligned in time and duration with the video animation segments because they are not videos—they are images of static slides.[7]

61. To further illustrate Ogdon's lack of relevance to video streaming, consider Ogdon's disclosure that "collections of presentation elements can also be resident at the client node 56 since some portions of a presentation can also be distributed on CD-ROMs. Accordingly, step 524 of FIG. 2C (as well as other steps in the flowchart of FIG. 2) also may access a CD-ROM drive or other transportable storage media for various portions of a presentation." EX1004 at 23:23-35. A POSITA would not understand Ogdon's "presentations" to be a video stream at all, let alone a stream of video as that term is used in the ABR Patents. Instead, Ogdon's presentations comprise a series of various images, slides, and multimedia content accessible from various locations (including locally via CD) and pre-assembled in "scripts" by a presentation leader for synchronizing relevant material with presenter audio.

62. In sum, Ogdon is not analogous art to the field of video streaming that the ABR Patents are directed to because Ogdon separates and separately manages audio and video, does not provide a means for synchronizing audio and video, recognizes problems with video only delivery, and then teaches replacement solutions that circumvent the need to perform ***any*** video delivery. Ogdon also does not propose a solution to the problem faced by the inventors of the ABR Patents because Ogdon identifies a related problem (*i.e.*, bandwidth limitations on video-only delivery for the

[7] Ogdon's claim 9 discusses conveying either a "first video portion" or a "second video portion" based on data transmission rates; however, that claim states that the second video portion is "different" from the first video portion and only "corresponds in content" with the first video portion, rather than conveying the identical content at a different encoded bitrate. In the context of the Ogdon specification, a POSITA would understand this claim does not disclose time-aligned copies of the identical underlying content encoded at different bitrates as the claims require, but rather involves conveying alternative content to the full-bandwidth video. In addition, as noted, Ogdon's conception of video is not that claimed in the ABR Patents.

networks of 1997) and then proposes other ***non-streaming*** solutions for facilitating a meeting between remote presentation participants. Merely recognizing the futility of trying to solve a problem (*i.e.*, video delivery via limited network infrastructure) and then posing work-arounds that do not actually resolve that problem (*i.e.*, distributing presentation materials in lieu of video) does not present information germane to solving the underlying problem.

63. Furthermore, the teachings of Ogdon described above, particularly the identification of problems and alternative solutions, provide further objective indicia of non-obviousness. The description of such alternative solutions separate from the one presented in the ABR Patents demonstrate both that there was a long-felt need for a good solution for video streaming which went unsatisfied and that experts at the time were skeptical that it was possible to have a pure video streaming solution where one had to consider bandwidth limitations over a network.

64. Other methods of transferring video content were more well-known at the time of Ogdon, such as embedded video and progressive download, which each utilize persistent (hard drive) storage to download content, even though playback may commence before the download is complete. EX2008 at 341 ("Streamed Video and Video Conferencing" chapter comparing "embedded video" and "progressive download" delivery methods, where the "file usually remains on the user's hard disk … after playback is completed," with "true streaming video [which] is never stored on the user's disk" outside of a "small buffer."). A POSITA would understand that the term "streaming" as recited in the challenged claims refers to a particular method of transferring a video over the Internet in which the client temporarily caches or buffers limited duration portions of the streamed content but does not permanently store it. EX2008 at 341 ("true streaming video is never stored on the user's disk" outside of a "small buffer.").

65. Ogdon acknowledges the special requirements of "streaming" systems, yet discloses a ***different*** approach for distribution of its presentation materials. For example, Ogdon describes two ***distinct*** IP-based delivery mechanisms for the audio accompanying Ogdon's presentation materials: ***download*** and ***streaming***:

> (10.7) Audio RaFile-An audio file ***prepared in advance*** of the presentation, may be ***downloaded to client nodes*** 56 via network 70.
> (10.8) Audio Ralive-Live ***streaming*** of an audio file, via network 70, requires ***dynamic real time buffering*** at the client nodes 56.

EX1004 at 27:14-19.

66. But Ogdon ***only*** discloses the "download" approach for delivery of presentation materials (*e.g.,* slides, images, or video clips) and does not disclose "streaming" that content. Indeed, as discussed above in this section, Ogdon repeatedly discloses "audio streaming" and its requirements without once disclosing "video stream" or "video streaming." The fact that Ogdon teaches "streaming" for some types of content (*i.e.,* audio), but not for others (*i.e.,* video) actively teaches away from video streaming and, at the very least, demonstrates that Ogdon does ***not*** disclose a video streaming system as claimed. Simply put, an "audio stream" is not a "video stream." This is particularly true in the context of Ogdon, where the audio and video portions of the presentation are separated from each other and transmitted via different communication channels (*e.g.*, audio via conventional telephony and video via the Internet) and not synchronized.

67. Even if Ogdon were referring to "streaming" presentation materials, it certainly does not disclose streaming a single larger "video" (*i.e.*, video integrated and synchronized with audio). Ogdon recognizes that most of the overhead required to deliver and process video at a client could be obviated by distributing only the "presentation materials" (*i.e.*, a series of multimedia "segments" or "slides" in a presentation such as a PowerPoint presentation or HTML-based webpage) rather than the full live video stream. EX1004 at 2:13-66. By contrast, as reflected by

the preambles of each independent challenged claim, the '554 Patent is directed to "streaming" a single, larger, continuous video (*e.g.*, live event video) with synchronized audio for consumption over a network. EX1001 at 1:31-34; *see also id.* at 7:10-17. Thus, while Ogdon may provide some video segments to clients in the context of a larger mixed-media presentation, Ogdon is entirely different from a video "streaming" system as claimed.

68. Ogdon appears to claim priority to 1997, the early years of the digital revolution of video content. For example, 1998 saw the birth of the MPEG-4 standard that was a dominant driver in the digital video encoding market. At this time, most video materials were still delivered in analog format, rather than as the digital video we have today. Thus, Ogdon did not use "stream" or "streaming" in conjunction with its use of video because that was not something contemplated at the time. Indeed, Ogdon makes clear that video may ***not*** be presented to some users ***at all***, and emphasizes the availability of fully audio only versions to replace the video version in order to accommodate users with lower bandwidths. For example, Ogdon expressly relies on the "audio portion" of the presentation to provide "substantial continuity in presentation ***regardless of whether a portion of the video for the presentation is displayed or not***" (emphasis added). EX1004 at 24:28-39. Ogdon's "video portion" of a presentation is actually merely referring to the graphical display, which includes slides (static and animated) and other presentation content—not continuous motion video feeds. Ogdon's figures and specification contain no disclosure of a camera or any of the (expensive) compression/decompression hardware that would have been required in 1997 to acquire, transmit, and use live motion video of, for example, a presentation speaker. And again, Ogdon teaches away from the use of such hardware.

69. The "video portion" of Ogdon's presentation thus corresponds to video images of the presentation itself, *e.g.*, individual slides a human presenter would display during a presentation.

Such presentation materials are distinct, stand-alone pieces of content that accompany a presenter-led performance of a presentation. Ogdon's delivery of presentation "segments" is not equivalent to streaming a video as that term is understood today and as required by the ABR Patents because the "video" portions of a "segment" may be delivered via other methods such as complete or progressive download.

2. Ogdon Fails to Disclose Encoding a Video into a Plurality of Streams

70. Each challenged claim of the '554 Patent recites encoding a video in "different bitrates" to create "a plurality of streams" including low, medium, and high quality streams. Each of these "plurality of streams" corresponds to the same video. While each streamlet has a different quality level (*e.g.*, 100 kbps (low), 200 kbps (medium), 600 kbps (high)), they are identical in length and content. Example images from such "streamlets" are shown below:

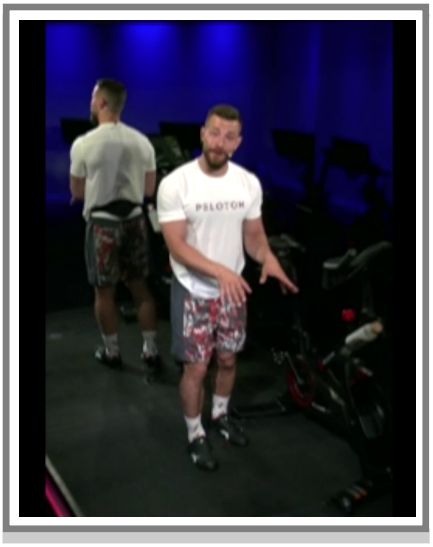
<u>Exemplary Claimed "Streamlets"</u>

[redacted]

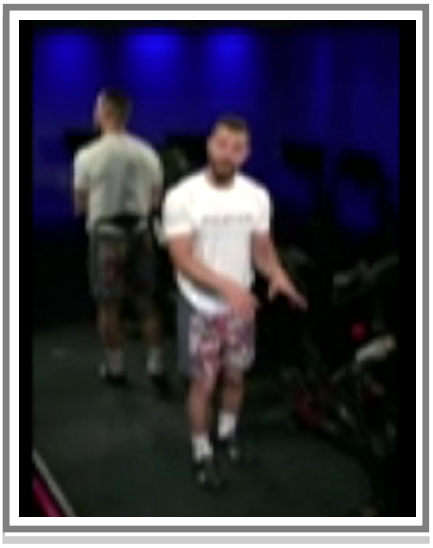
PUBLIC VERSION

High Quality
(Large Streamlet Size)

Medium Quality
(Medium Streamlet Size)



Low Quality
(Small Streamlet Size)



71. I understand that in the Institution Decision, the Board found that Ogdon fails to disclose "storing multiple copies of the same video." IPR2024-00146, Paper 9 at 40; IPR2024-00047, Paper 8 at 18 ("Ogdon never describes two copies of the same video presentation. It also does not refer to creating two copies of identical content (video or otherwise) that are encoded differently."); IPR2024-00047, Paper 8 at 18 (same); IPR2024-00147, Paper 9 at 19 (same).

72. Dr. Houh relies primarily on Ogdon's disclosure of "one or more presentation versions" and/or "variations" as allegedly disclosing this limitation across all challenged claims. *See, e.g.,* EX1003 at 61-64. However, neither concept discloses encoding a video (of any kind) at a plurality of different bitrates to create different copies of a video as claimed and there is no disclosure in Ogdon of video consisting of integrated audio and video data as required for video streaming in the ABR Patents.

73. Specifically, Ogdon explains that "each [presentation] ***version*** may be for a different group of audience members such as a group for ***Japanese speaking audience members, or audience members affiliated with a particular organization***." EX1004 at 2:30-35 (emphasis added). Here, Ogdon contemplates that different presentation variations, or versions, refer to different content, customized based on language preferences of the audience or organization affiliation. "For

example, a first variation might be directed to the customers of a corporation, another variation directed to the sales representatives of the corporation, and yet another directed to the investors of the corporation." *Id.* at 25:38-42. Thus, Ogdon teaches creating separate presentation materials as "versions" or "variations" of content that are customized to a given audience. Customized versions of presentation materials do not disclose or suggest the claimed copies of a video with integrated audio encoded at different bitrates at least because the underlying content in each presentation is different. Indeed, the customized versions are not ***copies*** of a source video at all. They are different videos. Moreover, Ogdon is silent regarding encoded customized versions at different bitrates. Ogdon never uses the word "bitrate" and has no discussion or even mention of video encoding.

74. Dr. Houh also relies on the following portion of Ogdon as allegedly disclosing this limitation:

> Ogdon further discloses that each stream (at each corresponding bitrate) comprises a group (elements, collections, or subcollections) of streamlets (segments) encoded at a respective one of the bit rates. EX1004, 2:43-49 ("each version of a presentation typically has its subcollection of segments (i.e. presentation elements) **ordered according to their presentation sequence**" and "every segment (or subcollections thereof) in one version **corresponds with a segment** (or subcollections thereof) having the same presentation order **in each of the other versions**."), 2:49-55 ("corresponding segments (or subcollections thereof) in different versions" are the same such that "any of the corresponding alternative segments (or subcollections thereof) from different versions can be presented as a replacement for another such corresponding segment (or subcollection) during the presentation."); claim 21 ("said first subcollection is replaceable with said second subcollection").

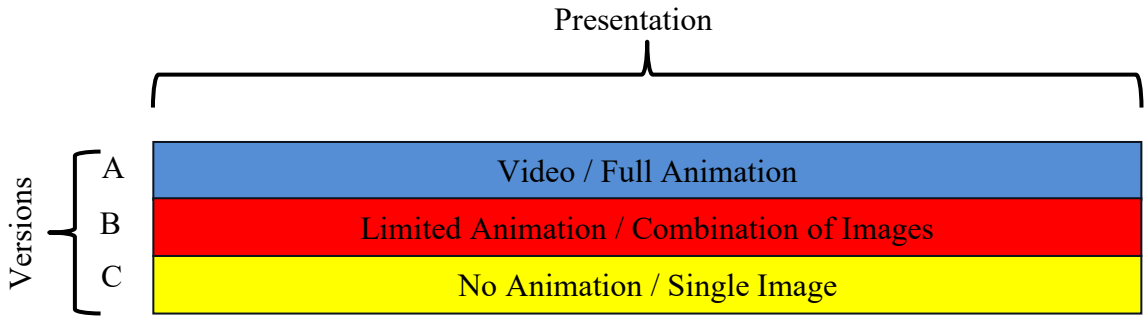
EX1003 at ¶65. Here, Ogdon discloses creating multiple presentation versions that each include "segments (subcollections)" of content. Ogdon gives two examples of segments. First, Ogdon discloses a configuration where the segments of one version contain "real time or animated video" and segments for another version contain "graphic slides." Of course, "graphic slides" are not a

copy of a video encoded at a different bitrate. Instead, "slides" are an alternative presentation format that would appear to include different content. Ogdon's first example here does not disclose or suggest a plurality of streams as claimed. Indeed, Ogdon does not contain any disclosure of the required video streams encoded at different bitrates.

75. Second, Ogdon discloses a first presentation version including segments for an "audio presentation via a telephone" whereas an alternative segment collection is a "multimedia presentation element that is a combination of one or more of the following types of HTML multimedia data …." Notably, none of the "versions" or "segments (subcollections)" disclosed here include a video stream. To be sure, Ogdon discloses that part of an alternative segment subcollection can be HTML (Hyper-Text Markup Language), which is a content formatting language that dictates the display of text and graphical elements in a web browser, with the potential to display some "animation and video" content. However, nowhere does Ogdon disclose or suggest a video stream as that term is used in the ABR patents let alone a plurality of video streams encoded at different bitrates. At best, part of one "segment" may include "video," (as opposed to the segment itself being a video segment) while the other version includes only "an audio presentation." Thus, Ogdon's different "versions" refer to entirely different content, not copies of the same video encoded at a plurality of different bitrates. Ogdon's different "versions" of a presentation are not "streams" recited in the challenged claims.

76. The different "subcollections," or "versions," of Ogdon's content range from content "as simple as a single image or as complex as a combination of images, audio, animation and video," as depicted below. EX1004 at 2:66-3:8, 2:44-63, 22:42-47.

Diagram Illustrating Ogdon's Different Segment Versions



77. Dr. Houh also relies on Ogdon's vague disclosure of retrieving "presentation elements of ***greater size*** (and corresponding ***enhanced quality of presentation***)" (EX1003 at ¶61 (quoting EX1004 at 2:30-66)), and that "presentation quality may be ***enhanced*** from ***limited or no animation to full animation***." (*id.* (quoting EX1004 at 22:44-47)). Based on this limited disclosure, Dr. Houh concludes "[a] POSITA would have understood "approximately the same presentation duration" to disclose both (1) durations that are precisely equal to each other, and (2) durations that are nearly equal to each other." IPR2024-00146, Paper 1 at EX1003 (at ¶62).

78. I disagree with Dr. Houh. When Ogdon refers to enhancing the "quality of presentation" in the above quoted portions, it is referring to different presentation elements with different content. For example, Ogdon discloses presenting one element as a graphic slide with still images (*i.e.,* "no animation") as a low-bandwidth option and animated video (*i.e.*, "full animation") as a high-bandwidth option. A POSITA would not understand a slide with images ("no animation") to be a video much less a video stream of integrated audio and video with any associated bitrate. In the context of streaming video, "bitrate" is a measure of the number of bits that are processed per unit time when the video is displayed. Since the number of bits required to display a static image is a constant and once the image is displayed it will remain on the screen until it is erased, and no additional bits are required to be received or processed. As such, a POSITA would understand the

concept of "bitrate" does not apply to images. Instead, the image would simply have a file size (*i.e.*, the number of bits required to represent the image on disk).

79. Moreover, Ogdon's reference to elements with "limited … animation" would have no generally accepted meaning to a POSITA and I note that Dr. Houh also fails to render an opinion about what exactly that term would mean to a POSITA. Ogdon provides no explanation. For example, Ogdon does not disclose any process of, for example, removing certain frames of a full animation to produce a more "limited animation" version of the presentation element. After combing the specification, "limited animation" could possibly refer to "GIF's" (EX1004 at 5:32-34) which is a standard media type for bitmap images that can be used to display short, looping animations. But Ogdon is also silent on encoding any larger high quality source video into a GIF. Moreover, the looping animation of GIF's is entirely unsuitable for video streaming (imagine if each 3-second clip of a video stream ran in a loop until the next 3-second clip was available) and would not provide a means for synchronizing this "video" with Ogdon's separately transmitted audio.

80. As a broader point, Ogdon references the terms "animation" and "video" throughout its disclosure, sometimes combining the two terms into a single concept and sometimes distinguishing animation from video. *See e.g.,* EX1004 at 2:64 ("animated video"), 3:5 ("animation or video"). When taken in context with Ogdon's other teachings[8] and the state of the art as of the presumed 1997 priority date of Ogdon,[9] Ogdon's use of the term "video" strongly suggests to a POSITA that "video"-based presentation segments actually refer to an animated series of fixed images shown

[8] Recall that Ogdon begins by outlining challenges in conducting "telepresentations" because they require special "***video*** conference" equipment for streaming video and higher bandwidth than was readily available for streaming videos at the time. *See supra* §VII.A.
[9] For example, RealNetworks, a recognized early pioneer in the development of multimedia players, only introduced RealVideo in 1997.

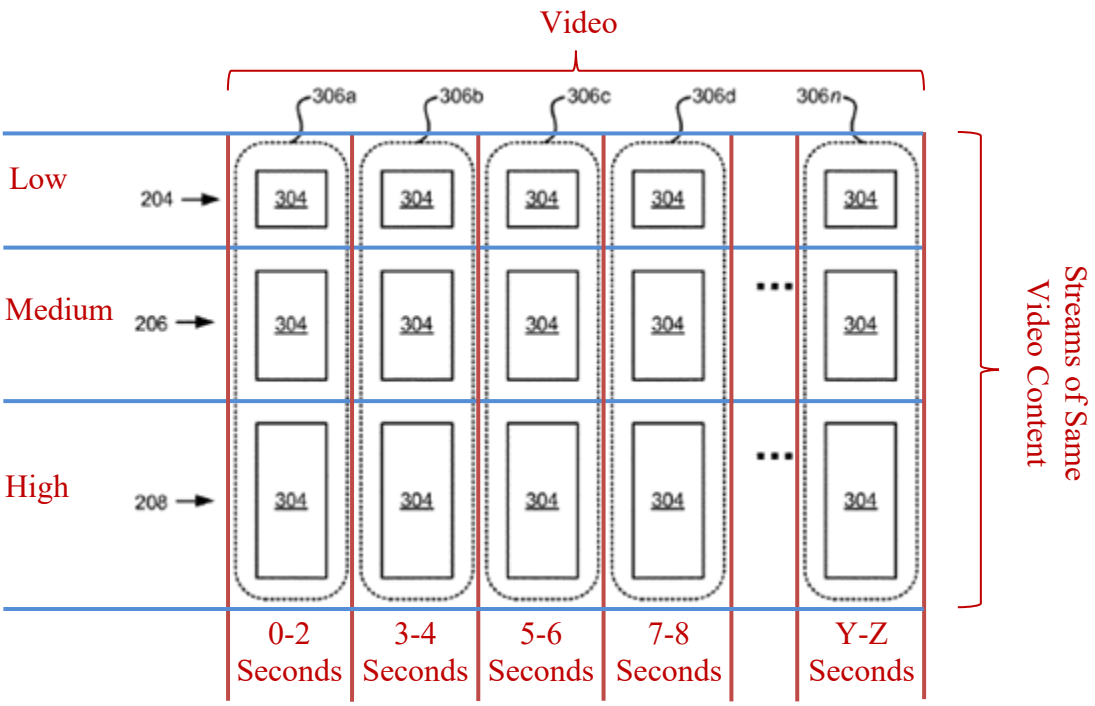
sequentially in a loop without audio, like the disclosed "GIF animations." EX1004 at 5:33. For example, a "GIF" might include a series of 3 images that are displayed sequentially in a loop. I recall from my personal experience, that the use of GIFs to show animated "videos" on the (relatively new) world wide web in 1997 was popular.

81. This is quite different from what the inventors of the ABR Patents considered to be a "video" for adaptive bitrate streaming. "Videos" in the ABR Patents integrated audio and video, were much larger in duration (*e.g.*, movies, sporting events, television programs, etc.), suitable for segmenting into smaller streamlets for delivery to a client, and capable of being encoded at different bitrates. Nothing in Ogdon discloses streaming such a "video" or creating a plurality of copies of a source video encoded at different bitrates.

3. Ogdon Fails to Disclose Streamlets Corresponding to the Same Portion of a Video Across Streams

82. Each challenged claim of the '554 Patent recites encoding each video stream into a plurality of streamlets or files corresponding to portions of the video.

83. The '554 Patent's Figure 3b depicts exemplary "streamlets" 304, where a video is divided into both different time slices 306a-306n (vertical, red division) and qualities of the same video content, 204-208 (horizontal, blue division). EX1001 at 7:25-67, FIG. 3b (annotations added).



84. Dr. Houh relies on Ogdon's disclosure of a "subcollection of segments (*i.e.*, presentation elements) ***ordered according to their presentation sequence***" as allegedly disclosing these limitations. EX1003 at ¶66 (quoting EX1004 at 2:44-45, 3:46-47). Specifically, Ogdon's "presentation sequence" is a list of presentation elements (*i.e.,* slides) that is assembled by the presenter in a "script," and can be changed on the fly (*i.e.*, "in the middle of a presentation"). EX1004 at 3:16-18. Ogdon's "presentation sequence" does not disclose or suggest encoding a source video or live video feed into a plurality of streams, each having streamlets or files that yield different portions of the source video. This distinction from what is claimed in the ABR patents is critical because the patents are meant to provide seamless streaming of a video, in part by adapting video quality according to present and changing network conditions. Without the segments corresponding to the same portion of the video, the content would jump in accordance with file differences.

85. Dr. Houh also relies on Ogdon's disclosure that "corresponding segments (or subcollections thereof) in different versions" are the same such that "any of the corresponding alternative segments (or subcollections thereof) from different versions can be presented as a replacement for another such corresponding segment (or subcollection) during the presentation." EX1003 at ¶¶65, 70 (quoting EX1004 at 2:49-55) (emphasis omitted). However, as discussed above, Ogdon's "presentation versions" are not a plurality of video streams encoded at different bitrates, nor are they copies of the same video, nor are they videos as that term is used in the ABR patents. Instead, Ogdon's presentation versions are entirely different presentations in different formats, such as a collection of graphic slides for one version, presenter audio for another version, and animation for yet another version of the presentation and none of these versions are synchronized with any corresponding "video."

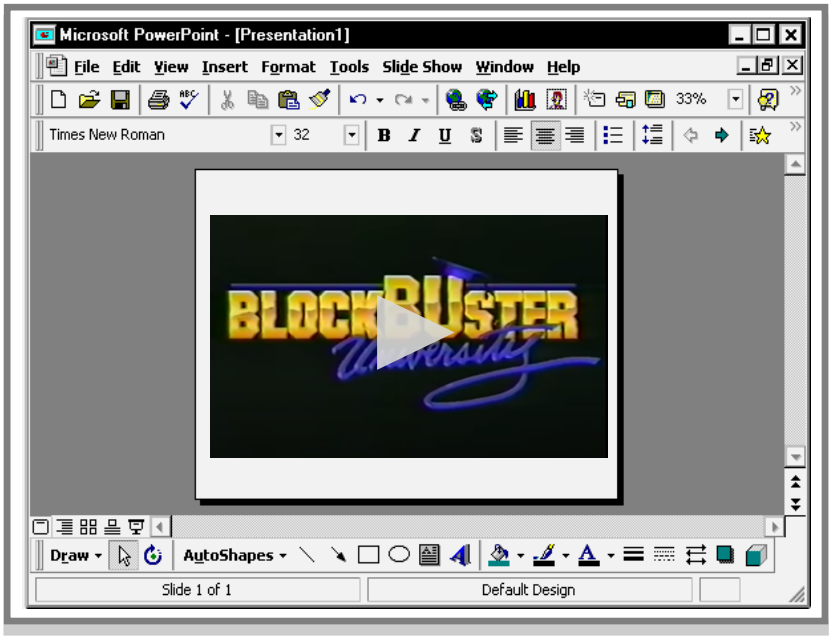
86. As depicted below, for example, the first "version" of a "segment" may include a video, the second "version" of a "segment" may include multiple images, and the third "version" of a "segment" may include a single image.

Ogdon's "Segments"

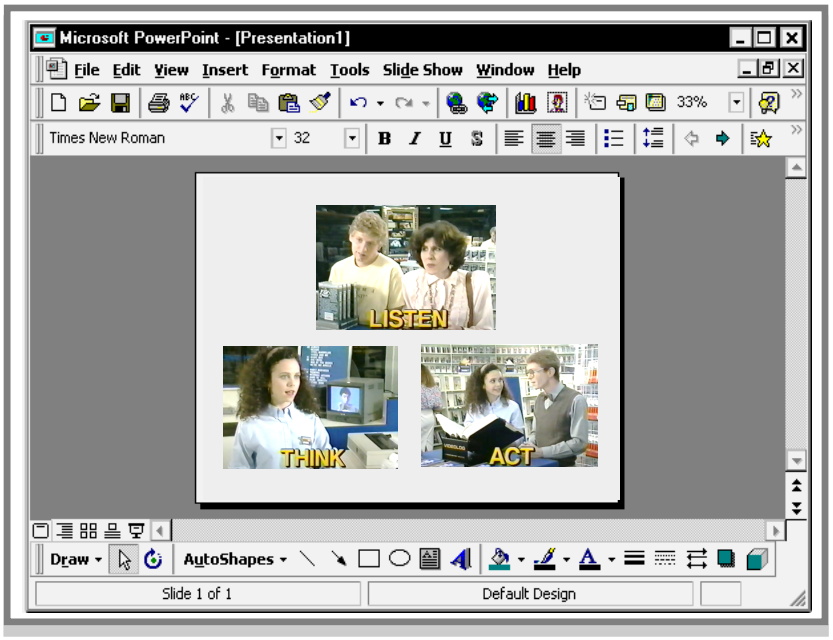
[redacted]

PUBLIC VERSION

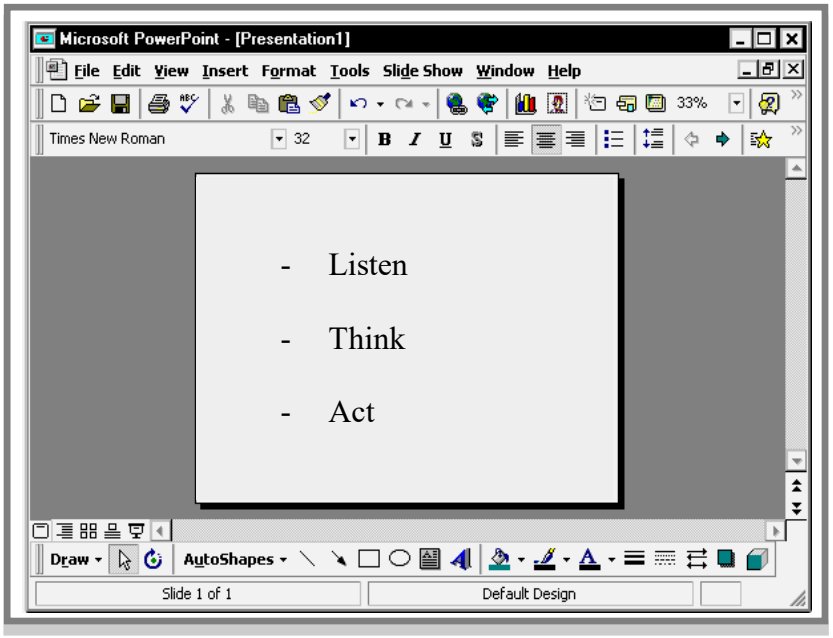
Version 1 (Embedded Video)



Version 2 (Multiple Images)



Version 3 (Text Only)



EX1004 at 2:66-3:8 ("a multimedia presentation element ... can be as simple as a single image or as complex as a combination of images, audio, animation and video").

87. While Ogdon does not explain what the "presentation duration" of each segment refers to, a POSITA would understand that it could define how long a segment is displayed to a user so that presenter audio roughly synchronizes with the displayed content (*i.e.,* synchronized on time scales of the duration of the segment (seconds) and not the time scales required to ensure lip sync in the case of synchronized audio and video (milliseconds)). *See, e.g.,* EX1004 at 4:36-40 ("the host node coordinates any accompanying audio portion for this segment so that the timing for the presentation of these audio and video portions of the segment(s) are synchronized."); *id*. at 3:1-10 ("an alternative segment (subcollection) may be a multimedia presentation element that is a combination of one or more of the following types of HTML multimedia data: audio, images, animation or video, wherein such a multimedia element ***plays over a set period of time and can be as simple as a single image or as complex as a combination of images***, audio, animation and video." (emphasis added)). A POSITA would therefore understand the "duration" of the segment

to include a presenter-defined term that refers to the amount of time the content is relevant to the corresponding presenter audio. "Presentation duration" does not disclose or suggest that segments across versions are streamlets of video that each have the same playback duration and correspond to the same portion of a source video.

88. Dr. Houh's reliance on Ogdon's disclosure of using alternative segments as "replacement[s] for another such corresponding segment" as meeting these limitations is also flawed. EX1003 at ¶¶65, 70. Specifically, "replacing" an animated segment with an alternative "graphic slide" segment as disclosed by Ogdon does not disclose or suggest video streamlets or files that yield the same portion of a larger source video as recited by these limitations because a "graphic slide" is simply not a video or a portion of a larger video.

89. Moreover, even if Ogdon were to disclose providing multiple alternative segments as ***video segments*** (it does not, and Dr. Houh fails to identify any such teaching or suggestion in Ogdon), such a disclosure would not disclose or suggest the claimed files or streamlets because Ogdon's presentation segments are discrete media segments that are arranged by a presenter in advance to correspond to live presenter audio. These "segments" are slides used by a human presenter who is leading the change of slides and overall performance of the presentation. They are not sequential parts of a larger overall video stream such as a movie, sporting event, or television show. Ogdon discloses that a presentation leader can "**skip** and/or **rearrange** portions of a presentation performance" on the fly as needed to best address his or her audience, such as in response to "user feedback." EX1004 at 2:14-23, 25:59-62 (emphasis added); *see also id*. at 20:56-67. Ogdon further discloses that "some portions of a presentation will **automatically** be **skipped** if a performance of the presentation is running behind." *Id.* at 25:63-26:1. Thus, these "segments" are not "multiple files." Ogdon's "presentations" are incompatible with streaming a larger video,

which the claims of the ’554 Patent expressly require. Moreover, a POSITA would understand that Ogdon’s such functionality of automatically skipping some portions of a presentation would be highly undesirable in the context of video streaming because for example, unexplained “skipping” of streamlets of a larger video stream would result in confusion as whole scenes or cuts of dialogue would be removed from the original content and result in “jerky” video. EX2009 at 173:6-174:12.

90. In its Institution Decision, the Board correctly observed that none of these different “versions” of the “visual” portion of the presentation corresponds to the same video. IPR2024-00146, Paper 9 (ID) at 40. Ogdon therefore substitutes entirely different content in and out of a presentation when network conditions change, rather than switching between different bitrates, or qualities, of the same content, as required by the challenged claims. Ogdon discloses that its presentations are divided into “segments,” “each segment of a presentation is treated as a ***unique*** (multi)media element.” EX1004 at 6:1-5. Ogdon does not disclose any relation between these “unique” segments other than that they may be displayed during the same presentation. In other words, each “segment” is a distinct, stand-alone piece of content, like a PowerPoint slide, that can be substituted in and out for other pieces of content. But Ogdon does not disclose that either that piece of content or anything within it (*e.g.*, a video), is divided into smaller portions. At bottom, Ogdon’s “segments” are not “streamlets,” or portions of a stream, because the “unique (multi)media elements” that make up those “segments” are not “video streams.” And even when Ogdon’s segments include “video,” they are not subdivided into time-aligned portions of different bitrates, as recited in the challenged claims.

91. A POSITA would also understand that at the time of Ogdon’s alleged invention, the division of digitally encoded video into streamlets was not a trivial operation. In 1997, the coding standards available included MPEG-1, MPEG-2, and H.263. A POSITA would understand that

these video coding standards were not conducive to having a larger video stream be segmented. It is clear from Ogdon's complete silence on video encoding generally and on this process of segmenting the encoded video specifically that such a process was neither considered by the inventors of Ogdon nor was it practical. Ogdon only uses the terms "encoding" or "decoding" in the context of the "audio" portion of its slideshow presentations; not in the context of video. Further evidence that Ogdon does not contemplate streaming video is the fact that Ogdon also does not disclose the operation of "buffering" video which a POSITA in 2004 would understand is essential for continuous video playout. Instead, Ogdon discloses that, if there is "insufficient time" to retrieve a visual "segment" of a presentation, that visual "segment" is simply skipped. EX1004 at 24:28-39.

92. As discussed above, Ogdon has numerous deficiencies as a primary reference that Dr. Houh fails to address. As independent Claims 16, 26 and 30 each recite features similar to the features of independent Claim 1, Claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30 are not rendered obvious in view of Ogdon and Allen for at least the reasons as discussed above.

B. Ogdon and Allen Fail to Disclose "Streamlets"

93. Dr. Houh relies on the combination of Ogdon and Allen as allegedly rendering independent Claims 1, 16, 26 and 30[10] obvious, including their recitation of "streamlets." In relevant part, Dr. Houh states:

> …Allen teaches encoding the same video at low, medium, and high quality levels. Since Ogdon contemplates a live video presentation that is segmented and stored at various quality levels (EX1004, Abstract, 1:62-2:1, 6:2-5, 10:7), a POSITA would have been motivated to encode each recorded video segment of Ogdon into each quality level in parallel in real-time prior to storing at the webservers (*see* 1[A]) … A POSITA would have understood this to be a convenient and practical way to

[10] By virtue of their dependency on Claims 1, 16, 26 and 30, Dr. Houh also relies on the combination of Ogdon and Allen as allegedly rendering Claims 2-5, 7, 8, 10-14, 17-20, 22-25, 27, and 28 obvious. The arguments here therefore apply equally to those dependent claims.

> generate different quality levels for each segment in real-time for distribution to client nodes. EX1003 at ¶ 67.

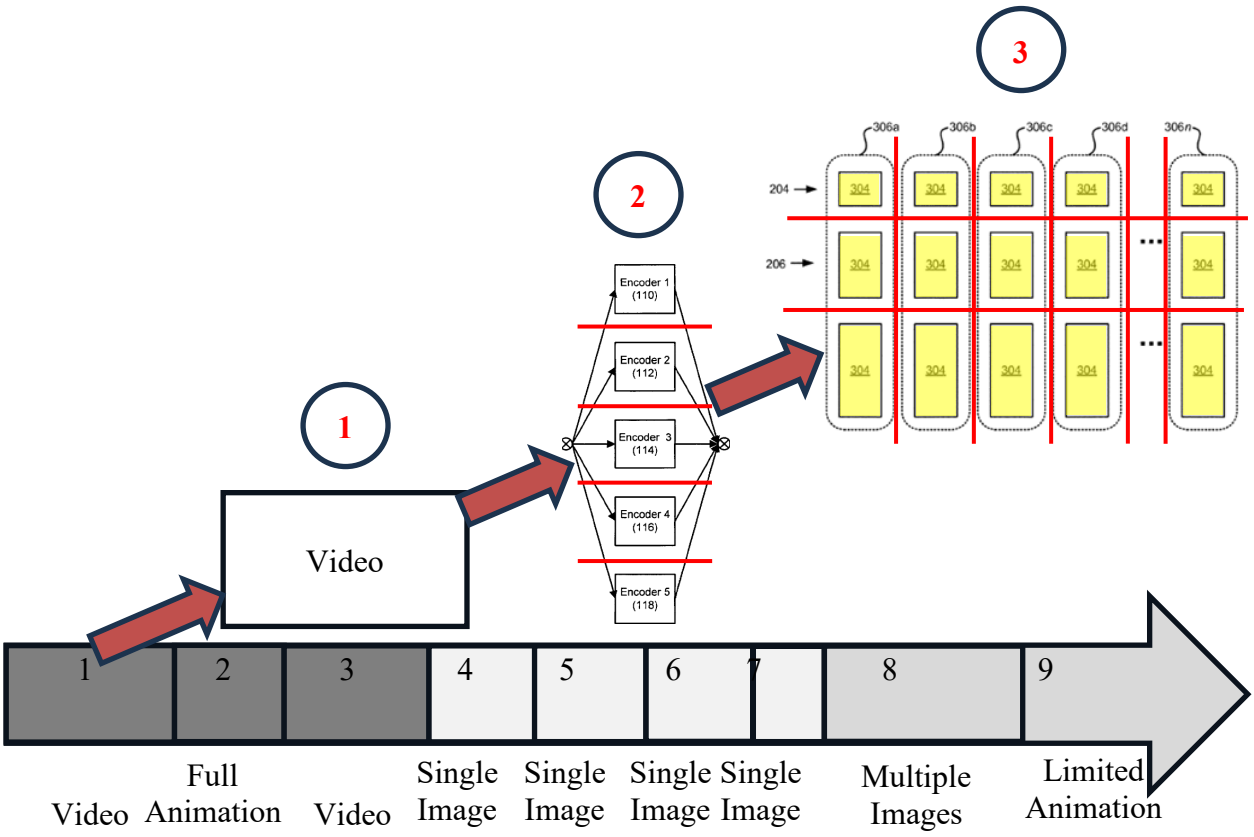
94. Thus, Dr. Houh starts with Ogdon's "segments," and applies Allen's teaching to encode each of those "segments" at a different quality level to allegedly arrive at the relevant limitations. *Id*. But Allen cannot cure the fact that Ogdon's "segments" are not "streamlets," but rather are unique multimedia elements (*e.g.*, PowerPoint slides or HTML-based webpages), as discussed *supra* at §VII.A.3. And Dr. Houh does not propose any ***modification*** to Ogdon's "segments" that might cure these deficiencies. His arguments therefore fail for similar reasons as discussed above.

1. Dr. Houh Fails to Articulate Any Modification to the Ogdon-Allen Combination to Meet the "Streamlet" Limitations

95. While Dr. Houh relies on the combination of Ogdon and Allen to render each independent claim obvious under Ground 1, Dr. Houh does not rely on Allen to disclose any alleged "segmentation" of Ogdon's presentation materials. Instead, Dr. Houh merely relies on Allen to encode **each of Ogdon's disclosed** "**segments**" at different bitrates. *See, e.g.*, EX1003 at ¶¶63, 64. The proposed combination thus fails to render the "streamlet" limitations obvious because it fails to modify or cure the deficiencies in Dr. Houh's mapping of Ogdon's "segments" to the claimed "streamlets," which the Dr. Houh proffers without modification.

96. For Allen to cure the deficiencies of Ogdon, it would not only need to modify Ogdon to encode the video in the highest quality "version" of Ogdon's "segments" at different bitrates, it would also have to subdivide those videos into time-aligned portions of different bitrates and provide some means for synchronizing Ogdon's video with its audio. Because Ogdon's "segments" are "unique (multi)media element(s)," rather than larger-form video streams, this modification would involve (1) extracting the video clip embedded in a "segment" (*e.g.*, a

PowerPoint slide or HTML-based webpage),[11] (2) encoding the video into different bitrates to create a plurality of "streams" (vertical red lines below), and (3) dividing each "stream" into smaller, separate portions of the larger stream (horizontal red lines below) (*i.e.,* "streamlets"), as depicted in a demonstrative I created below:



97. In this example, each of the three horizontal rows highlighted in yellow corresponds to a separate "stream"—specifically, a high quality, medium quality, and low quality stream—and each of the five vertical columns highlighted in yellow corresponds to a separate time-aligned portions of each "stream." The individual boxes highlighted in yellow—fifteen of them total—are the

[11] Ogdon explains how its videos are a "type[] of HTML multimedia data" and that a "segment" may be "[a] single HTML file containing presentation content." EX1004 at 2:66-3:8, 27:6-7; *see also id.* at 6:61-65 (referring to "video content (e.g., on HTML pages). HTML, or Hyper-Text Markup Language, is a content formatting language that dictates the display of text and graphical elements in a web browser.

resulting "streamlets." Dr. Houh fails to articulate any such modification, much less a reason to modify Ogdon in this manner.

98. Dr. Houh merely states the following with regard to "obviousness" of the claimed "streamlets":

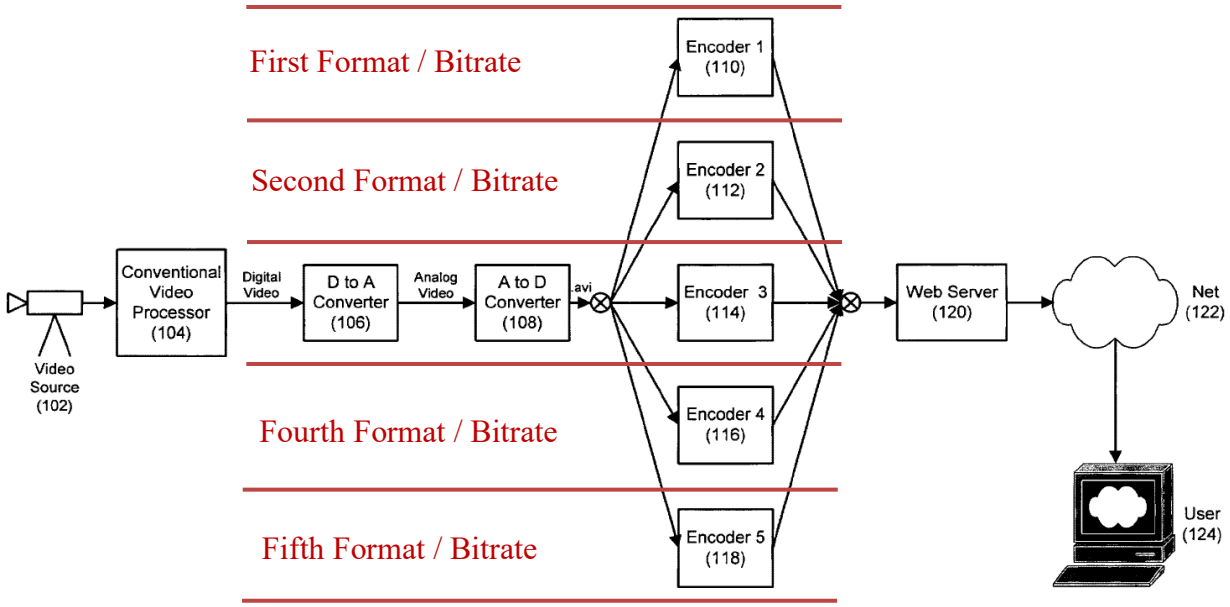
> a POSITA would have been motivated to encode each recorded video segment of Ogdon into each quality level in parallel in real-time prior to storing at the webservers (see 1[A]) … A POSITA would have understood this to be a convenient and practical way to generate different quality levels for each segment in real-time for distribution to client nodes. A POSITA would have had a reasonable expectation of success with such a modification because ***Ogdon teaches corresponding segments at different quality levels*** and a POSITA would have known how to ***encode each raw video segment into a corresponding quality level*** (bitrate) on a segment-by-segment basis in parallel. EX1003 at ¶¶67-68.

99. Thus, Dr. Houh's proposed "modification" is limited to application of Allen's teaching to encode video at multiple bitrates to Ogdon's "corresponding segments at different quality levels." Entirely missing is any mention of ***further dividing*** the "raw video segments" of allegedly different quality into smaller portions of ***the same video***. And as mentioned, Dr. Houh fails to address Ogdon's complete lack of any means for providing lip sync between its separately transmitted audio and video. Dr. Houh therefore fails to articulate a modification to the Ogdon-Allen combination that would meet the "streamlet" limitation in each of the challenged claims. Instead, and as discussed at length in the sections above, a POSITA would understand that Ogdon teaches away from its combination with Ogdon in the first instance. *See supra* §VII.A.2. So does Allen, albeit for separate and independent reasons, as discussed *infra* at §VII.B.3.

2. Allen Does Not Disclose or Suggest Segmenting a Stream

100. There is good reason Dr. Houh does not attempt to use Allen to further divide Ogdon's "segments" into time-aligned subsections of a "stream," or "streamlets." It is because Allen does not subdivide its own streams in this manner.

101. Although Allen discloses encoding "***nine*** individual streams" of video in different format/bitrate combinations, none of the resulting videos are further divided into "streamlets," as depicted below in this demonstrative I created:



EX1005 at 12:2-5, 3:16-18, FIG 1A (annotations added).

102. Instead, one continuous stream is sent to a user based on "the capabilities of the user's system." *Id.* at 1:18-21; 9:5-11 ("The end user is asked to make a manual input (click button, check box, etc.) to indicate … the desired format … as well as the desired delivery bit rate …. The transmission system then serves the format and speed so selected."). Further, Allen never describes providing a stream of video content as part of a slide show presentation that is controlled by a human presenter. Thus, Allen could not be used to modify Ogdon's "segments" into "streamlets" even if there were a reason for doing so (there is not).

3. Allen Teaches Away From Encoding the Same Video Into Multiple Different Bitrates

103. Dr. Houh alleges that a POSITA would have been motivated to modify Ogdon's presentation distribution system with Allen's teachings to provide multiple bitrate encodings at a

server with "a reasonable expectation of success." EX1003 at ¶64. Not only does Ogdon teach away from Allen's streaming technology, Allen teaches away from dividing a video stream into streams of different bitrates. The Petition cites to two sentences of Allen's ***background*** section describing how such a prior art encoding operation might be set up. Pet. 35, 36 (citing EX1005 at 5:15-21, 3:16-18). But rather than touting the benefits of the multi-bitrate encoding the Petition attempts to inject into Ogdon, Allen extensively disparages it.

104. Allen explains that the "problems" with the multi-bitrate approach "***are many***, and include:"

- None of the available selections may match the end users' particular requirements . . .
- Simultaneous transmission in different formats needlessly consumes network bandwidth.
- There is no ability to localize either formats or content, i.e., to tailor the signal to a particularized local market.
- There is no means, after initial system setup, to reallocate resources among the various encoders.
- Conventional video processing equipment does not lend itself to automated adaptation of processing attributes to the characteristics of the content being processed.
- Single point failure of an encoder results in complete loss of an output format.
- Because of bandwidth requirements and complexity, the prior art approach cannot be readily scaled.

EX1005 at 4:8-25, 9:12-10:4; *see also id*. at 6:3-20 ("The problems with the prior art approaches include the following: (a) Streaming encoders do not supply the processing options required to create a video stream with characteristics well-tailored for the viewer…(b) Currently available tools for video processing do not provide all the required image processing capability in an efficient method that is well-suited for real-time conversion.").

105. In view of these many "problems" and "limitations," Allen concludes that "it is ***highly probable*** that the user will have a ***suboptimal experience***" if a stream is divided into streams of

different, predetermined bitrates regardless of an end user's streaming capabilities. EX1005 at 10:5-8. According to Allen, "the present architecture for delivering streaming media places ***insurmountable burdens*** on everyone in the value chain, and stands directly in the way of attempts to develop a viable economic model around broadband content delivery." *Id*. at 13:5-8.

106. After laying out these drawbacks of the multi-bitrate approach, Allen explains that the solution to these problems is to encode the video in only a ***single bitrate***, but to move this encoding task to the "last mile," or "edge" of the network (*i.e.,* "one hop (in a network sense) from the end users."). *Id*. at 104:9-11, 116:15-21. In contrast to the centralized prior art encoding approaches disparaged by Allen, where content had to be encoded in "an impossible number of streams" to accommodate clients with "wildly varying bit rates," "the problem nearly disappears" with Allen's edge-based approach because, according to Allen, "it is likely that all of the users have the ***same network speed***" when they are all just "one hop" from the edge server performing the encoding. *Id*. at 104:9-16, 116:6-19. With "edge-based encoding," the internet "service provider" (ISP) can "optimize streaming media for the known conditions within their network" by encoding content at the best ***single bitrate*** for the known connection speed of their users. *Id*. at 116:15-21.[12] Thus, rather than allowing a client to choose the optimal bitrate for its current network conditions, the optimal bitrate is determined by a "service provider" of the edge server closest to the client and a single stream is encoded at that one bitrate.

107. Ignoring Allen's admonitions that the combined system would face "insurmountable burdens" and result in a "suboptimal experience" (*id*. at 10:5-8, 13:5-8), Petitioner and Dr. Houh

[12] To be sure, Allen discloses that "two or three" streams would still need to be encoded in different "formats" under its disclosed approach in order to accommodate client media players. EX1005 at 104:16-19. But Allen teaches that each of those streams would be tailored to "the same network speed" and thus would have the same bitrate. *Id.* at 104:15, 116:16-19.

contend that it would have been obvious to encode "streamlets" of the same portion of a larger video at different bitrates.

4. The Combination Changes Ogdon's Principle of Operation

108. As discussed above in §VII.A.1, Ogdon is directed to increasing access to presentations for remote participants who lack the specialized equipment and high speed networks required for live video streaming (*i.e.*, "video conferencing."). As recognized by the Board in the ID, Ogdon addresses this fundamental issue by providing "different versions" of presentation content (*e.g.*, slides, images, and animations), rather than providing a plurality of video streams or dividing those streams into "streamlets." IPR2024-00146, Paper 9 at 40.

109. Dr. Houh, however, ignores Ogdon's express teaching that users generally ***lacked*** the equipment and infrastructure necessary to view streaming video and turns Ogdon's principle of operation on its ear by ***reverting*** Ogdon's non-streaming solution ***back into*** a video streaming solution—the exact thing Ogdon sought to avoid. Dr. Houh's proposed modification therefore improperly replaces the content-substituting feature Ogdon touts as its invention with a video streaming solution that would fail to support the limited-bandwidth networks of Ogdon's targeted home and office users.

110. The Petition contends that changing Ogdon's principle of operation to provide the same video content in different bitrates would be "convenient and practical" because "a POSITA would have known how to encode each raw video segment into a corresponding quality level (bitrate) on a segment-by-segment basis in parallel." Pet., 23. But Petitioner and its expert fail to describe how the proposed modification would be implemented. For example, Ogdon discloses a multi-tiered control configuration where a "presentation leader" controls the presentation and a "host" instructs the client nodes to retrieve presentation content. Would multi-bitrate encoding be "convenient and practical" to implement at the host or leader sub-system tiers of Ogdon? The Petition does not say.

Nor does Ogdon disclose any encoding process at either tier that would even potentially be ripe for modification.

111. The very content produced by Ogdon is not suitable for combination with Allen's encoders. Allen's multi-bitrate encoding configuration processes a "steady and continuous stream" of video data. EX1005 at 2:5. But Ogdon does not produce any such content because Ogdon's presentation materials are ***discrete*** slides or webpages, they are not "steady" or "continuous," nor are they a "stream." Petitioner's proposal to "encode each recorded video segment of Ogdon" (Pet. at 23) therefore fails because the "segmented" content of Ogdon is not "a steady, continuous, stream" as required by Allen.

112. These clear shortcomings of the proposed combination, which go unresolved by the Petition, are a product of the fact that Ogdon and Allen's disclosures are not analogous to each other. Thus, a POSITA would not modify Ogdon with Allen as the Petition proposes.

5. Ogdon Fails to Disclose or Suggest "Streamlets" of the Same "Duration"

113. Dr. Houh is incorrect that Ogdon's "segments" must be the "same duration" to allow one "version" to be substituted for another, as Ogdon describes. EX1003 at ¶71. This flawed reasoning hinges on the incorrect assumption that Ogdon's different "versions" of "segments" are different qualities of the same type of content—specifically, a video. *Id.* They are not. They are different types of content altogether—*e.g.*, a video versus a single image—that, by their very nature, have different lengths (or no length whatsoever). The Board's preliminary finding that "Ogdon describes storing *different versions* of a presentation, rather than multiple *copies of the same video*," confirms as much. IPR2024-00146, Paper 9 (ID) at 40 (italics in original).

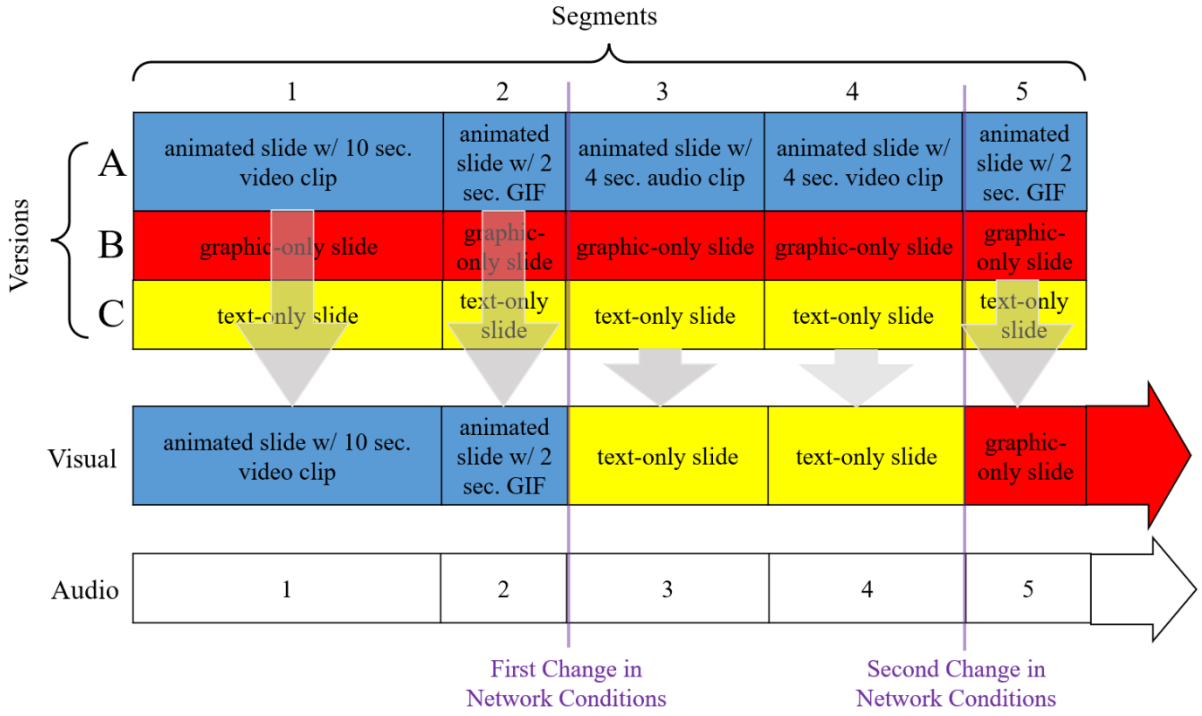
114. Indeed, Ogdon describes changing the content of its "segments" as network conditions deteriorate, rather than changing the quality of that content. It steps down content types in the

following order: video or animation → combination of images or single image → only text, as discussed *supra* at §VII.A.1. Ogdon will even skip a "segment" altogether if it cannot be retrieved before the "presentation leader" moves on to the next "segment." *See, e.g.*, EX1004 at 24:28-39 (explaining what happens when "segments are not retrieved in time for performance").

115. In this regard, the length of time that any "segment" in Ogdon is displayed, if at all, is entirely ***independent*** of the content of that "segment." A "segment" that includes a single image will be displayed the same length of time as a "segment" that includes a video, even though the "segment" with the single image technically has no length whatsoever compared to the video. *See* EX1006 at 107 (recognizing that "discrete media," like an "image file," "has ***no intrinsic duration***," while "continuous media," like a "video," has "a ***measurable and well-understood duration***."). Both "segments"—the video and the single image—will be displayed until the "presentation leader" indicates that the next "segment" should be displayed, or that the presentation is over. *See, e.g.*, EX1004 at 4:29-36 (explaining how host nodes "receiv[e] ... presentation instructions from a presentation leader indicating the next presentation segment(s) to be presented"), 21:16-19 ("the leader(s) may choose to identify [the next] segments"); 21:24-29 (referring to "the leader supplied identifications for the segment collection"). And one "segment" can be substituted for the other, even though they have different durations.

116. To allow synchronization of the audio and visual portions with each other, Ogdon divides each portion into different "presentation elements," or "segments," that "play[] over a set period of time," as depicted below.

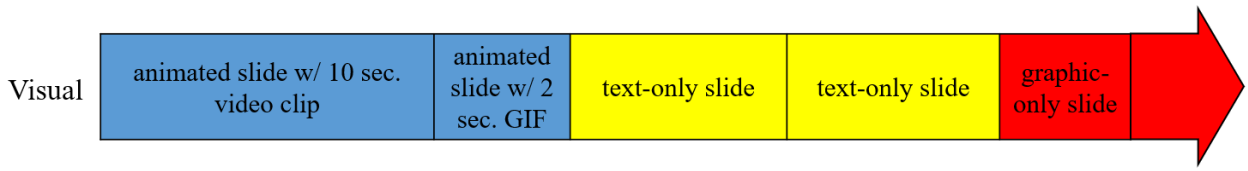
Diagram 2



117. Thus, although the "segments" in the example above appear to be the same length from one "version" to the next, they are not. They are merely presented for approximately the same length of time, regardless of whether they include a video, a combination of images, or a single image.

118. In Diagram 2, every presentation includes five different slides, or "segments." They include different types of media elements (*e.g.*, "a combination of one or more of ... audio, images, animation or video"). As depicted below, this results in different users potentially viewing different "versions" of the presentation with different visual content as network conditions change.

Diagram 3



119. In Diagram 3, the presentation's "visual" portion begins with a slide from Version A, then simpler slides (*e.g.*, slides with text) from Version C are substituted in for the subsequent slides from Version A. When network conditions improve after the fourth slide, more complex slides (*e.g.*, graphics) from Version B are substituted. The "audio" portion of the presentation remains the same throughout.

120. Ultimately, it is enough for Ogdon that its "segments" are "***approximately*** the same presentation duration" as each other because one "version" can be substituted for another even if they are different durations. EX1004 at 2:49-55 (emphasis added). Moreover, Ogdon will simply skip a "segment" if a particular "version" is too long, or too large. *Id.* at 24:28-39. Ogdon's willingness to accept disruption of its visual content and to "approximate[]" the durations of its segments is antithetical to the claimed invention of the '554 Patent,[13] which is able to provide uninterrupted video streaming primarily through its use of "streamlets" that are the "same duration" across streams of different quality (*e.g.*, low quality stream, medium quality stream, high quality stream). Ogdon's reference to "segments" of "***approximately*** the same presentation duration" is therefore not enough to read on the "streamlets" of the "same duration" recited in the challenged claims.

121. In fact, Ogdon's "segments" cannot be the same duration because Ogdon touts "advantages" of providing segments with different durations. EX1004 at 6:44. According to Ogdon, "this enables dynamic control of the pace of the presentation by a presentation leader while each client node selects specific materials to attain that pace." *Id*. at 6:40-47. A client can therefore

[13] As discussed *supra* at §VII.A, Ogdon provides "continuity in the presentation" by ensuring the ***audio*** portion of the presentation proceeds, "regardless of whether the ***video*** portion for the presentation is displayed or not." EX1004 at 24:28-39 (emphasis added).

request shorter- or longer-duration segments based on the presenter's indicated "pace." Ogdon thus teaches away from segments of the same duration, which would not have this "advantage."

122. Recognizing that no prior art reference discloses this key limitation, Petitioner and Dr. Houh allege that a POSITA would have been motivated to modify Ogdon to create equal-duration alternative segments "to provide seamless streaming for the user." Pet., 25; EX1003 at ¶71. But Dr. Houh admitted during cross examination that support for this theory came not from any prior art reference, but from the common knowledge of a POSITA (presumably in 2004 and certainly not in 1997) who would have found the claimed approach "simpler." EX2009 at 211:4 – 213:22 (articulating benefits, coextensive with those disclosed in the '554 Patent, of time-dividing streamlets with the same duration and concluding that "the system would be simpler."). I understand that this form of hindsight-based reasoning is doubly improper where, as here, the reasoning is used to supply a limitation missing from the prior art, and where that missing limitation goes to the heart of the invention and plays a major role in the subject matter claimed.

123. Moreover, Petitioner and its expert provide no analysis whatsoever explaining how Ogdon could be modified to achieve this purportedly "simpler" approach. The touted benefits of Ogdon's presentation system are that the presentation may adapt and change based on user feedback and questions permitting "audience member involvement in the presentation." EX1004 at 3:8-23, 4:41-67 ("the leader can choose to change scripts in the middle of a presentation based on user feedback" including the ability to "stop presentation … and change to a different subcollection of segments…. Subsequently, the leader can resume the initial script at any time."). How a POSITA could take a system designed for presentation flexibility based on audience feedback and convert it into a system with rigidly time-aligned streamlets is left to the reader's imagination. This is not sufficient to establish obviousness.

C. Ogdon Fails to Disclose or Suggest Individual "Streamlet Requests"

124. Independent Claims 16, 26, and 30 each recite "stream[ing] a live event video" by placing a "***streamlet request***."[14] In other words, those claims require a client to place a single request to a server for a single streamlet. Even if Ogdon's "segments" could be considered "streamlets" (they cannot), Ogdon fails to disclose or suggest this limitation.

125. Ogdon fails to disclose or suggest client selection of a stream and/or client requests for individual files or streamlets for at least the reasons discussed above in §VII.A.2 regarding Ogdon's failure to disclose a plurality of streams and files or streamlets of those streams. Since Ogdon fails to disclose a plurality of streams with corresponding streamlets at a server, Ogdon also fails to disclose or suggest requesting subsequent portions of a larger video by requesting, for each portion, files or streamlets from that stream.

126. Moreover, while Ogdon generally discloses benefits of "controlled client requests," the client requests are ultimately controlled by a "presentation leader" via a server or "host" that "transmit[s] presentation controlling commands." EX1004 at 3:30-38. For example, Ogdon discloses that a ***presentation leader*** controls which segment versions are available for each portion of the presentation, and that the presentation can manually change scripts in the middle of a presentation to require clients to view a different variation of the presentation. *Id*. at 3:16-23 ("Thus, multiple sequentially-ordered scripts can be created so that the leader can choose to change scripts in the middle of a presentation based on user feedback. Accordingly, a presentation leader has the ability to ***stop presentation of a particular script and its current subcollection of segments and change to a different subcollection of segments to be delivered to the audience***.

[14] Dependent Claims 4 and 7 recite similar limitations regarding a "streamlet request … to retrieve the first streamlet." Dependent Claim 23 recites similar limitations regarding a "streamlet request" based on the "request[ed] and receive[d] [] virtual timeline."

Subsequently, the leader can then resume the initial script at any time." (emphasis added)). Thus, Ogdon does not disclose "automatically requesting … subsequent portions of the video" because retrieving each segment is dependent upon the server's/leader's instruction, which may change at any time to eliminate or replace the version being presented.

127. Ogdon describes making **batch** requests to retrieve an entire "collection" of segments, which it also refers to as a "subversion" or "subcollection" of the overall presentation. Specifically, Ogdon discloses:

> Subsequently, in step 528, the client node 56 provides the identity of the selected webserver and next ***collection of segments*** to the client node's browser 78 and the browser, in turn, sends a network 70 ***request*** to the selected web server for ***the selected (subversion) of segments***. Following this step, the client presentation software 88 monitors the time elapsed before transmission of ***the selected collection of segments*** is completed, and determines whether these segments are provided within an appropriate window of time that allows them to be presented during the performance of the presentation. Thus, in Step 532, the client presentation Software 88 determines whether the ***requested collection*** of segments is cached on the client node 56 within a desired time prior to the proposed performance of the collection of segments.

EX1004 at 23:41-54 (emphasis added); *see also id.* at 22:55-58 (referring to a "***request***" for the sizes of a "candidate ***collection*** of one or more presentation elements") (emphasis added); 24:17-21 (referring to "the initially ***requested*** segment ***collection***") (emphasis added); 24:40-49 ("obtaining the ***requested collection*** of segments") (emphasis added), 24:60-65 (referring to "the ***requested collection*** of segments") (emphasis added).[15]

[15] Ogdon also discloses that "segments [are] transferred to client nodes in ***bursts***." EX1004 at 6:1-7 ("Although each segment of a presentation is treated as a unique (multi)media element, the present invention is capable of delivering an ***entire collection of presentation segments to a client node*** while the presentation is being performed. This enables a more smooth flow of data during the presentation ***even though the segments may be transferred to the client nodes in bursts***.") (emphasis added); *see also id.,* at Col. 22 (describing metrics for calculating expected time required to retrieve for retrieving the next "collection" of segments).

128. Ogdon further discloses that these "collections," or "subcollections," are "intended to be an ***indivisible*** portion of a presentation performance." *Id.* at 2:39-42 (emphasis added).

129. Thus, Ogdon discloses requesting an ***entire*** "collection of segments," rather than individual "segments," much less subdivided portions of those "segments" (*i.e.*, "streamlets").

130. Even if, *arguendo*, multiple video "segments" could be considered subparts of the same video by virtue of their being part of the same "collection" (they cannot, as there are only discrete videos in each "segment" in Ogdon), Ogdon only describes requesting complete collections, rather than subparts of those collections. And when the "collection" is only a single "segment" (*e.g.*, EX1004 at 19:52-59), then there also is only a single video that can be requested, without subparts. A request for a single "segment" therefore cannot correspond to a request for a single subpart of a video (*i.e.*, a request for an individual "streamlet"). It is, at most, a request for an entire video that is ***not*** part of a collection with any other videos. Thus, Ogdon always requests an entire "collection" of video "segments," rather than subparts of a video, including when a "collection" only includes a single "segment."

131. In contrast to Ogdon's requests for entire "collections" or "subcollections" of "segments," requests for individual streamlets, as claimed, are advantageous because they allow fine-grained client control over the streaming process by requesting each individual portion of the video encoded at the desired quality level. This unique functionality also allows the use of standard Web servers, rather expensive media servers, which helps reduce the cost and complexity of the distribution network. Thus, the client can rapidly adjust the data rate in response to changes in available bandwidth. By contrast, Ogdon's approach, if applied to video streaming, would result in buffering or skipping entire "segments" if network conditions were to change when downloading an entire "subcollection." *See supra* §VII.A.3. Ogdon's approach fails to account for

this inventive aspect of the challenged claims and, therefore, fails to disclose "plac[ing] ***a streamlet request*** to the server."

D. Ogdon Fails to Disclose or Render Obvious "adaptive-rate content streaming of live event video" as Required By Element 1[Pre].

132. I understand that the preamble of a claim may be limiting if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. In my opinion, the preamble of Claim 1 goes beyond a mere statement of intended use and gives life to the claim because it expresses the intentional purpose which the claimed system enables. Specifically, by providing groups of time-divided streamlets in a plurality of streams, the claimed system enables the novel "adaptive-bitrate" streaming concept invented by this patent.

133. The Board's conclusion that "Ogdon teaches the preamble" (ID, 18) is respectfully contradicted by its correct finding that Ogdon fails to disclose encoding the same video at different bitrates (IPR2024-00146, Paper 9 (ID) at 40).[16] *See also* IPR2024-00047, Paper 8 at 18 ("Ogdon never describes two copies of the same video presentation. It also does not refer to creating two copies of identical content (video or otherwise) that are encoded differently."); IPR2024-00047, Paper 8 at 18 (same); IPR2024-00147, Paper 9 at 19 (same). Even if Ogdon disclosed video "streaming" (it does not; *see supra* §VII.A.2), a POSITA would have understood that "adaptive-rate content streaming" necessarily requires the ability to select among multiple different bitrate versions of content for streaming. Because the Board confirmed that Ogdon does not disclose providing multiple different bitrate versions of the same video, it also cannot disclose the ability to select the proper version for streaming among multiple versions of the same video.

[16] Dr. Houh does not cite to Allen or any other reference as teaching the preamble. *See, e.g.*, EX1003 at ¶59.

134. As discussed above, Ogdon is directed to an ***adaptive content*** system where different ***types*** of content are provided to users (*e.g.,* switching from content "as simple as a single image" to content "as complex as a combination of images, audio, animation and video"), rather than an ***adaptive rate*** system where different ***qualities*** of the same video are provided to users (e.g., switching from one bitrate of the same video to another). *Compare* EX1001 at 7:31-36, 13:21-26 *with* EX1004 at 2:66-3:8. This selection of entirely different content is fundamentally different from adaptively adjusting the bitrate of the same video content during streaming, as required by the challenged claims. Rather than encode the same video at different bitrates to account for changes in network conditions, Ogdon describes creating entirely different content "for a different group of audience members" or to account for "network transmission slow-downs." EX1004 at 2:30-35, 2:43-66, 22:42-47. Thus, Ogdon fails to disclose or render obvious "adaptive-rate content streaming of video."

E. Ogdon and Allen Do Not Render Obvious "select[ing] one of the low quality stream, the medium quality stream, and the high quality stream" as required by Claims 4, 7, 16, 26, and 30

135. Claims 4, 7, 16, 26, and 30 recite "select[ing] one of the low quality stream, the medium quality stream, and the high quality stream." Those claims require that the video stream "selection" be "based upon a [client] determination … to select a higher or lower bitrate version of the streams." Ogdon and Allen cannot be relied upon to show this feature.

136. Dr. Houh relies ***solely*** on Ogdon as allegedly disclosing these limitations. *See, e.g.*, EX1003 at ¶79 (citing to Ogdon's disclosure that "the client presentation software ... uses its most recent network 70 data transmission characteristics ... to select ... ***an appropriate version*** of the next collection of segments to be retrieved" as allegedly meeting this limitation). But as explained *supra* at §VII.A.1, Ogdon does not disclose or suggest a "plurality of streams" from which a higher or lower quality stream can be selected. *See* IPR2024-00146, Paper 9 (ID) at 40 (preliminary

finding that Ogdon fails to disclose "storing multiple copies of *the same video*"). Ogdon therefore cannot disclose making a "select[ion]" from a "plurality of streams."

137. Allen cannot be used cure Ogdon's deficiencies. First, Allen only describes receiving "***manual input*** (click button, check box, etc.) to indicate ... the desired delivery bit rate," rather than a "content player," "end user station," or "client module" making a "determination" and "selection" of the desired bit rate, as recited in the challenged claims. EX1005 at 4:2-6 (emphasis added). Second, Ogdon disparages the concept of creating a "plurality of streams" in favor of a fundamentally different approach in which only a single bitrate is encoded in the "last mile" of the distribution network. *See supra* §VII.B.3. Thus, while Allen discloses that an "end user" (*i.e.*, human) can ***manually*** select a stream, it teaches away from implementing a system that requires such a selection and, therefore, teaches away from the ***further*** modification of Ogdon and Allen that would be required to automate Allen manual selection and provide the functionality Ogdon is clearly missing.

F. Ogdon Fails to Disclose or Render Obvious "a plurality of web servers ... retrieve from the storage device the requested first streamlet" as Required by Claim 4

138. Claim 4 recites "a plurality of web servers located at different locations across the internet" that are each configured to retrieve streamlets from "the storage device" in response to client requests. Thus, these claims require ***different*** **webservers** that, in response to client requests, each retrieve content from **the *same*** central storage device. While Ogdon discloses a plurality of webservers at different locations, Ogdon fails to disclose or suggest this limitation because Ogdon's separate webservers each retrieve content from their **own local storage device—**they do not each retrieve content from **the *same* central storage device** as claimed.

139. The '554 Patent refers to the configuration claimed here as a "proxy cache." EX1001 at 7:1-3. The '554 Patent explains that a plurality of "proxy cache servers" servers replicate content

from a central content server by "asking for content on behalf of the client module." *Id.* at 7:3–6. Accordingly, the '554 Patent discloses a process where content is cached at a plurality of remote proxy cache servers by first retrieving content from a central storage device responsive to client requests.

140. Although Ogdon discloses that clients retrieve content from "content webservers" (EX1004 at 19:54-67), Ogdon fails to disclose that those webservers retrieve content from any central storage device responsive to client requests as claimed. Contrary to Dr. Houh's contention, Ogdon does not disclose the "proxy server" configuration claimed.

G. Ogdon Fails to Disclose or Suggest a "Virtual Timeline"

141. Although the term "virtual timeline" is broad enough to be met by a "playlist" and, therefore, is not limited to "entire content files," as discussed *supra* at §V, Ogdon's "scripts" cannot be read onto the claimed "virtual timelines" because the challenged claims require that a server (*e.g.*, a "web server") send the "virtual timeline" to the ***client*** (*e.g.*, an "end user station"). Ogdon, on the other hand, describes a "content manager 104" that "distributes presentation data, such as scripting information for a presentation." EX1004, 9:31-33. The "host 200" then must "request the one or more scripts for the presentation from the content manager 104" before providing them to "client nodes 56" for "presentation performance to their respective audience members." *Id.* at 18:37-40, 21:50-58. Thus, Ogdon's server sends a script to hosts—not clients. In other words, Ogdon fails to disclose or suggest a client requesting its "script" or a server response to the client and, therefore, does not disclose or suggest the claimed "virtual timeline."

VIII. Ground 2: Claims 1-5, 7, 8, 10-14, 16-20, 22-28, and 30 are Not Rendered Obvious over Ogdon in View of Allen and SMIL 2.0

A. Ogdon in view of Allen and SMIL 2.0 Fails to Disclose or Render Obvious "streamlets in each of the quality levels corresponding to the same portion of the video have equal durations" as Required by Claims 1, 16, 26 and 30

142. Dr. Houh relies on the SMIL 2.0 specification ("SMIL 2.0") under Ground 2 as an alternative to the Ground 1 combination of Ogdon and Allen to allegedly disclose a plurality of corresponding "streamlets" across quality levels having "equal durations." EX1003 at ¶¶ 144–46. But SMIL 2.0 does not cure the deficiencies noted above with respect to Ogdon and Allen because SMIL 2.0 also fails to disclose or suggest a plurality of video streams divided into streamlets, where corresponding streamlets have the same duration. Further, SMIL 2.0 never describes providing a stream of video content as part of a slide show presentation that is controlled by a human presenter.

143. SMIL 2.0 is a markup language that "allows authors to write interactive multimedia presentations … [by] describ[ing] the temporal behavior of a multimedia presentation." EX1006 at 1. The author first defines a set of "elements," representing visual components, like images, shapes, audio, and video clips, and then specifies display properties of the defined elements.

144. SMIL 2.0 provides at least two relevant mechanisms for controlling display of presentation elements: the "switch" element and the duration, or "dur," attribute. "The switch element allows an author to specify a set of alternative elements" (*id*. at 64), while the "dur" attribute "defines the basic presentation duration of an element" (*id*. at 123, 129).

145. SMIL 2.0 discloses one example that invokes both "switch" and "dur" mechanisms to display a simple square that changes color from blue to green to red every 5 seconds. I have annotated this example below.

```
<smil xmlns="http://www.w3.org/2001/SMIL20/Language"
      xmlns:BrushMedia="http://www.w3.org/2001/SMIL20/BrushMedia" >
  <head>
    <layout>
      <region id="colorbox" top="0px" left="0px" height="50px" width="50px" />
    </layout>
  </head>
  <body>
    <switch>
      <seq systemRequired="BrushMedia">
        <brush dur="5s" color="#0000FF" region="colorbox"/>
        <brush dur="5s" color="#00FF00" region="colorbox"/>
        <brush dur="5s" color="#FF0000" region="colorbox"/>
      </seq>
      <seq>
        <img dur="5s" src="blue.jpg"  region="colorbox"/>
        <img dur="5s" src="green.jpg" region="colorbox"/>
        <img dur="5s" src="red.jpg"   region="colorbox"/>
      </seq>
    </switch>
  </body>
</smil>
```

Square

Color sequence for square if "BrushMedia" Supported

Color sequence for square if "BrushMedia" is not supported

EX1006 at 273; EX1003 at ¶145 (citing same). Although the square will change to the same colors on every client device, the underlying resources invoked to render those colors differ depending on whether the client supports the "BrushMedia" library. *Id.* If the BrushMedia library ***is*** supported, the system will color the square with the color specified by the hexadecimal codes shown in the underlined "color" attributes above ("#0000FF" for blue, "#00FF00" for green, and "#FF0000" for red). If the "BrushMedia" library is ***not*** supported, then the system will retrieve the images specified in the "img" elements, and display those within the box in lieu of using a system color library.

146. Critically, however, the alternate "brush" and "img" elements within the "switch" tags that color the square in the above example are not ***portions*** of a larger video stream. In fact, they do not describe a video at all, whether segmented or otherwise. Thus, although each element displays for the same 5 second duration, the displayed elements are not videos, much less portions of a larger video of equal duration.

147. Like Ogdon, SMIL 2.0 is directed to "multimedia presentations," like those based on PowerPoint slides or HTML-based webpages. EX1006 at 1. SMIL 2.0 defines "an XML-based language that allows authors to ... associate hyperlinks with media objects and describe the layout of the presentation on a screen." *Id*. It also allows authors to "describe the ***temporal behavior*** of a multimedia presentation," such as how long a particular slide or webpage will be displayed during a presentation. *Id.* (emphasis added). But that "temporal behavior" corresponds to how long a slide or webpage is displayed, not the length of the various elements (*e.g.*, a video, a single image, *etc*.) embedded within the slide or webpage. This is similar to the "segments" in Ogdon, which are presented for the same length of time, regardless of whether they include a video or a single image. *See supra* §VII.A.3.

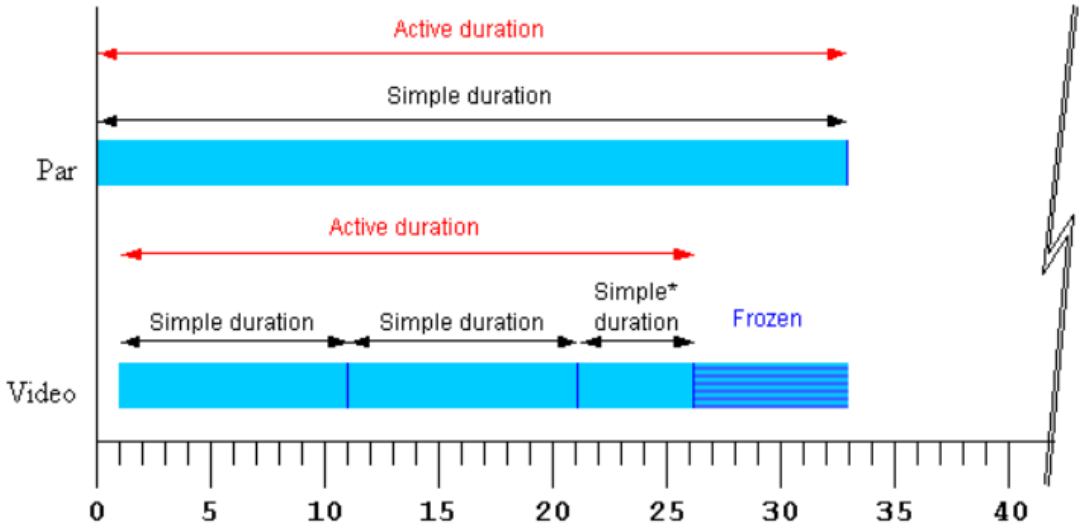
148. For example, SMIL 2.0 defines "media object elements" that "allow the inclusion of media objects into a SMIL presentation." EX1006 at 108. These "media object elements" are similar to the "unique (multi)media element[s]" in Ogdon, which may include content as simple as a "[s]till image, such as PNG or JPEG," or content as complex as "[a]nimated vector graphics" or a "[v]ideo clip." *Id.*; *see also* EX1004 at 2:66-3:8 ("a multimedia element ... can be as simple as a single image or as complex as a combination of images, audio, animation and video"). SMIL 2.0 explains how an "[i]mage file ... has ... an ***intrinsic duration*** of zero," while a "video file ... has an ***intrinsic duration*** defined by the media [itself]." EX1006 at 107. These durations are entirely independent of the length of the slide or webpage in which the image or video appears.

149. To be clear, SMIL 2.0 separately defines the duration of "media object elements" from the duration of the slides or webpages in which they appear. Images, animations, and video files are assigned a "simple duration" that may be an arbitrary length (*i.e.*, a non-zero "[c]lock-value"), the "intrinsic duration" of the media itself, or "indefinite." EX1006 at 128-29. Animations and videos

also may be repeated over a longer period using the <repeatCount> attribute, which is referred to as the "active duration" of that content. *Id.* at 31. The duration of the slide or webpage, on the other hand, is defined by the <par> attribute, which "supports ***all*** element timing" and may be greater than, less than, or equal to the "active duration." *Id.* at 157 (emphasis added); *see also id.* at 123.

150. That the "intrinsic duration" of SMIL 2.0's "media object elements" is ***independent*** of how long they are actually displayed is established by multiple examples in SMIL 2.0, including Petitioner's own example in which a "media object element"—specifically, an image of a square—is changed every five seconds. Pet. at 57-58. The image in that example has "an intrinsic duration of ***zero***," as SMIL 2.0 acknowledges. EX1006 at 107. Yet, SMIL 2.0 allows it to be assigned a duration of 5 seconds. *Id.* at 278.

151. SMIL 2.0 discloses another example involving a video element. In this example, a ten second video clip played in a loop over a 33 second presentation. EX1006 at 124. The clip begins playing one second after the page loads, and that same, single video clip plays in a loop two and a half times before "freezing" on the last frame for the final eight seconds of the 33 second total duration that the page is loaded. *Id*. at 123-124.




```
<par begin="0s" dur="33s">
   <video begin="1s" dur="10s" repeatCount="2.5" fill="freeze" .../>
</par>
```

EX1006 at 123-124; EX2087.[17] Notably, the video in this example is not encoded at a plurality of bitrates or time divided into segments of equal duration. Instead, the same video clip is played in a loop until it freezes on the last frame for the remainder of the presentation. *Id*. at 123. This too fails to disclose or suggest the claimed "streamlets" of equal duration across streams.

152. Dr. Houh contends that a POSITA "would have been motivated to ensure that each alternative segment in Ogdon had the same (equal) duration, *e.g.,* 5 seconds as taught by SMIL 2.0." EX1003 at ¶146. But SMIL 2.0 does define the underlying duration of any video elements. Instead, SMIL 2.0 merely allows an author to define how long those existing video elements (of independent duration) will play when they are displayed.

153. In this regard, SMIL 2.0 explains that continuous media, like video, is "intrinsically time-based," and thus has an "intrinsic duration defined by the media" itself, which differs from the duration that the media is played back. EX1006 at 107, 123. Thus, while the "dur" attribute defines

[17] I understand this image was not rendered correctly in Petitioner's Exhibit EX1006, but was retrieved from the URL link provided in the exhibit footnote. *See* EX2087.

the duration that the video resource is played back,[18] it has no effect on the actual, "intrinsic" duration of the underlying video. A POSITA would draw no motivation to modify the "intrinsic duration" Ogdon's "segments" (*i.e.*, to time-divide each into equal portions such that they have the same duration) based on this disclosure. Simply put, none of the prior art references cited by the Petition teach or suggest subdividing the same video content into time-aligned portions of different bitrates in the manner claimed by the '554 Patent.

154. SMIL 2.0 also contemplates a video being "cut short" when a presentation proceeds to an entirely different slide or webpage before a video finishes playing. EX1006 at 129 ("If the author specifies a value for dur that is shorter than the implicit duration for an element, the implicit duration will be ***cut short*** by the specified simple duration") (emphasis added); 131 ("[T]he element will end at the earlier of the intrinsic media duration, or a mouse click."). Therefore, like Ogdon, the duration of SMIL 2.0's slides or webpages is entirely independent of the duration of their embedded content (*e.g.*, a video).

155. Also relevant in these examples is that neither the colored squares in Petitioner's example nor the video in Patent Owner's example are portions of a larger video (*i.e.*, "streamlets"). The squares are either different colors (*i.e.*, blue, green, red) or different types of content (*i.e.*, a JPG or "brush element"[19]) that may be substituted for one another, like Ogdon's "segments," while the video is simply played in a loop until it freezes half-way through the third loop. EX1006 at 123. None are encoded at a plurality of bitrates or time-divided into segments of equal duration.

[18] For example, if the "dur" value is shorter than the intrinsic duration, the video would cut off before it completes.

[19] SMIL 2.0 defines a "brush element," or "BrushMedia module," as "a lightweight media object element which allows an author to paint a solid color or other pattern"). EX1006 at 113-14.

156. Also relevant in these examples is that neither the colored squares in Petitioner's example nor the video in Patent Owner's example are portions of a larger video (*i.e.*, "streamlets"). The squares are either different colors (*i.e.*, blue, green, red) or different types of content (*i.e.*, a JPG or "brush element"[20]) that may be substituted for one another, like Ogdon's "segments," while the video is simply played in a loop until it freezes half-way through the third loop. EX1006 at 123. None are encoded at a plurality of different bitrates or time-divided into segments of equal duration.

157. In sum, nothing in SMIL 2.0 defines the duration a video. That duration is ***intrinsic*** to the video itself. Nor does anything in SMIL 2.0 correspond to a "streamlet." At most, SMIL 2.0 describes discrete instances of different content that are displayed the same length of time as the slide or website in which they are embedded, such that a video will either be "frozen" if the slide or website is displayed for a duration greater than the "intrinsic duration" of the video or "cut short" if the slide or website is displayed for a duration less than the "intrinsic duration" of the video. EX1006 at 123-124, 129, 131. SMIL 2.0 therefore suffers from the same deficiencies as Ogdon. And Allen fails to cure those deficiencies.

158. Accordingly, Ground 2 also fails because SMIL 2.0 fails to cure the deficiencies of Ogdon and Allen as to the streamlet limitations.

B. SMIL 2.0 Fails to Disclose a "virtual timeline"

159. As discussed *supra* at §VII.G, the challenged claims require that a server (*e.g.,* a "web server") send the "virtual timeline" to a client and Ogdon does not disclose this architecture. SMIL 2.0 is similarly deficient. Petitioner attempts to rely on SMIL's <seq> element, and its use to define "sequent containers," as allegedly disclosing the claimed "virtual timelines." Pet., 57. But

[20] SMIL 2.0 defines a "brush element," or "BrushMedia module," as "a lightweight media object element which allows an author to paint a solid color or other pattern"). EX1006 at 113-14.

SMIL's structured language document does not cure the architectural deficiencies of Ogdon. And Petitioner does not describe how the proposed combination would work in Ogdon's multi-tiered control system (§VII.B.4), which includes a presenter, host, content servers, and client. Pet., 57-58. SMIL 2.0 therefore fails to cure the deficiencies of Ogdon.

IX. Dr. Houh's Obviousness Opinions are Foreclosed by Strong Objective Evidence of Nonobviousness Identified by the ITC

160. The Aylo IPRs rely on obviousness theories, and Dr. Houh separately asserts invalidity based on obviousness in his Claim charts corresponding to the Ogdon reference. However, Dr. Houh fails to address the objective evidence of nonobviousness, which I understand must be considered where present. Similarly, Dr. Houh fails to acknowledge or address the International Trade Commission's finding that strong evidence of secondary considerations supported a finding of non-obviousness.

161. I previously testified at length about the strength of this evidence in the 1265 Investigation. The Final Initial Determination in that Investigation (as adopted in relevant part by the ITC in its written opinion) credited my testimony in finding the following:

> … Dr. Jeffay demonstrated through corroborating evidence that Move's success is tied to the "unique characteristics of the claimed invention." As Dr. Jeffay testified, the Move system was described as early as 2008 as offering "a smooth end user experience as the Move Media Player up-shifts and down-shifts in response to network and client CPU availability." Moreover, the Move Media Player's encoding technique allowed streaming via HTTP, and the use of "[s]imple HTTP protocol transfer of media files from standard Web servers rather than deployment of expensive media servers' reduces cost and complexity." DISH further adduced evidence demonstrating that the Move Media Player was recognized as superior in streaming performance relative to its competitors, rebutting respondents' argument that "advancements in compression and encoding technologies," etc. account for the Move Media Player's success.
>
> In view of this record evidence, I find DISH is entitled to a presumption that there is a nexus between the objective evidence of non-obvious DISH proffers and the claimed invention. I find respondents have not rebutted that presumption.
>
> … [analyzing evidence of objective indicia of nonobviousness]

> Having considered the claimed invention, the prior art, the objective indicia of non-obviousness, and the record as a whole, ***I find that the objective indicia support a determination of non-obviousness. Thus, even if a hindsight combination of the prior art references identified by respondents would comprise every element of the claimed invention, I find that the objective evidence indicates a person of skill in the art at the time of the invention would not have found the invention to be obvious in view of those references***.

EX1009 (Final ID) at 213-17 (internal citations omitted, emphasis added); *see* EX2005 at 2 (adopting same).

162. The overwhelming objective evidence here of industry praise and peer recognition, surprising results and superior performance, commercial success, long-felt but unmet need, failure of others, and copying of the inventions in the ABR Patents demonstrates nonobviousness.

163. MOVE Networks, Inc. ("Move Networks" or "Move") successfully developed and patented the ABR technology of the patent claims, which revolutionized how content is delivered and experienced over the Internet. Using the patented ABR technology embodied in these claims, a user experienced less buffering, fast start of video, and a dramatically improved viewing experienced for high-end and low-end connections. *See* EX2011 at 2-3. For the first time, viewers could experience content in a manner rivaling that of traditional cable and satellite delivery.

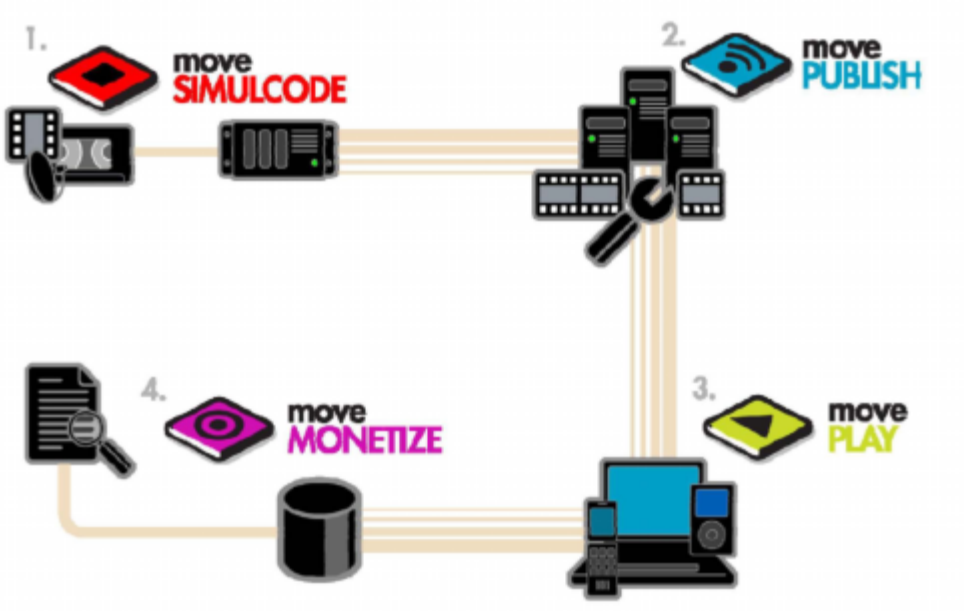
A. The streaming products offered by DISH (and its predecessor MOVE Networks) embody the claimed invention.

164. I understand DISH is entitled to a presumption of nexus if the objective evidence discussed below focusing on Move Networks' Adaptive Streaming system embodies the claims and is based on features that were novel and non-obvious. As I explain below, Move Networks' system, which includes novel and non-obvious elements such as the Move Media Player, embodies the limitations present in the challenged claims. *See also* EX2062. Moreover, I understand that the ITC has already found the claim limitations present in Move Networks' Adaptive Streaming system. *See*

EX1009 at 212 ("Dr. Jeffay has demonstrated through corroborating evidence that Move's success is tied to the 'unique characteristics of the claimed invention.'").

165. Move's contemporaneous documents prove the Move product practiced the patented claims. *See* EX2012 (Move Networks Tech Overview); EX2011 (Streaming Media Technology); EX1009 at 212. In addition, my analysis of the Move products shown in the representative claim chart exemplifies how Move practiced the limitations present in the challenged claims. EX2062.

166. Specifically, Move's system included an end user station/apparatus for adaptive rate streaming of live and on-demand digital content from a video server over a network. *See, e.g.*, EX2012; EX2011; EX2062 at 1. For example, "Move Networks provides and operates the premier video distribution platform" that "delivers pre-recorded (VOD) video content or live broadcasts over the Internet." EX2012 at 4; EX2062 at 1-2. A high-level diagram of the Move platform is shown below.



EX2012 at 6. "The platform supports a broadcast publishing process that includes the video source acquisition, encoding and preparing the video for transmission, the storage and distribution of video content, [and] client viewing of the video content." EX2012 at 6. The Move system

"provide[s] a self-optimizing, variable bitrate viewing experience." EX2012 at 10. More specifically, "a smooth end user experience" is provided "as the Move Media Player up-shifts and down-shifts in response to network and client CPU ability ... to provide a consistency of service at different bitrates." EX2012 at 12. "For instance, if the Quantum Media Manager senses that the current environment has poor connectivity, the Quantum Delivery Manager will be directed to only request streamlets from low-bandwidth profiles. If the connection speed or quality of the connection suddenly increases, the Quantum Delivery Manager starts downloading higher quality streamlets. The Quantum Media Manager continues to test the environment to provide the best viewing experience currently possible. This ability to 'upshift' and 'downshift' to multiple viewing profile bit rates on a live stream is called Adaptive Streaming." EX2012 at 23.

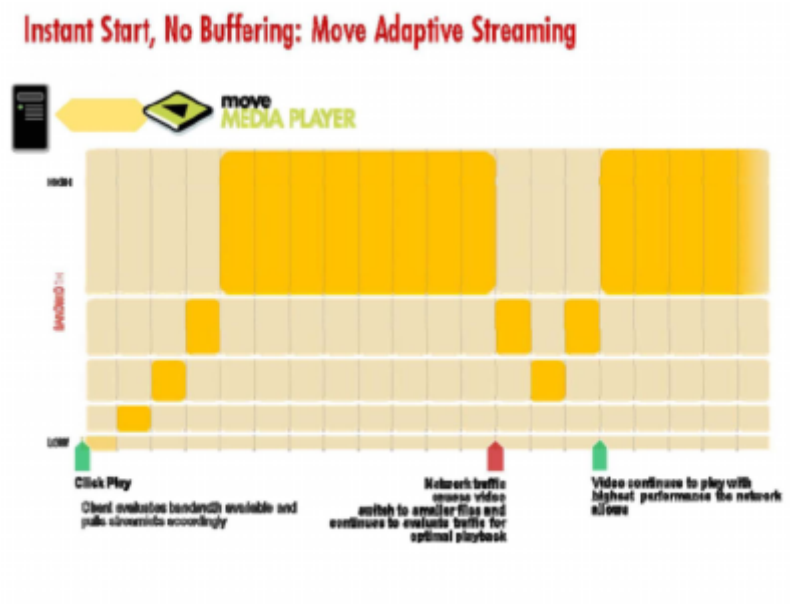
167. In the Move system, the live or on-demand video is encoded using Move Simulcode into a plurality of different bitrates to create a plurality of streams including at least a low quality stream, a medium quality stream, and a high quality stream, and at least one of the different quality streams was encoded at a bitrate of no less than 600 kbps. *See, e.g.*, EX2012 at 12, 19-21; EX2011 at 3-4. Further, each of the different bitrate/quality streams are stored on and accessed by the server as groups or sets of streamlets/files that correspond to portions of the video, and each group is encoded at the same respective one of the different bitrates. *See, e.g.*, EX2012; EX2011. For example, "[t]he process of atomizing and encoding video for transmission is called Simulcoding. The first step in this process of preparing video for transmission decomposes the captured video content into small streamlets for encoding and transmission .... The process of Simulcoding refers to the process of producing media that matches multiple viewing profiles (based on device and performance profiles) in a single process. Live content streamlets are encoded ... to provide a self-

optimizing, variable bitrate viewing experience. EX2012 at 10. The figure below provides an overview of this aspect of the Move System.

EX2012 at 11. "Move Networks deploys a cluster server ... for the process of encoding each video to multiple profiles .... The process of breaking the video into smaller streamlets or Web transmission and encoding multiple bit rates for various viewing profiles simultaneously is called Simulcoding." EX2012 at 11. "These streamlets are sent to Web servers hosted within a content distribution network (CDN)." EX2012 at 21. The "servers propagate the streamlets to caching servers at the CDN for distribution through the Internet infrastructure to the Move Networks Quantum Media Player." *Id*.

168. More specifically as to the different viewing profiles and bitrates, "Move Networks encodes to either high definition (16x9) or standard definition (3x4) aspect ratios, using one of the following 'best practice' profile sets, based on an aspect ratio (16x9) frames-per-second. Profiles up to 2.4 Mbps are used for video streams intended for distribution over high-bandwidth networks. The low-end profiles include a 'thumbnail' profile (Stream Type = T), which is used in multi-player mosaic Web pages, and an 'emergency profile (Stream Type = E) which provides a minimal experience for poor connectivity or low-bandwidth connections. The remaining profiles are 'normal' and are situated at bit rates that offer a smooth end user experience as the Move Media Player up-shifts and down-shifts in response to the network and CPU availability." EX2012 at 21.

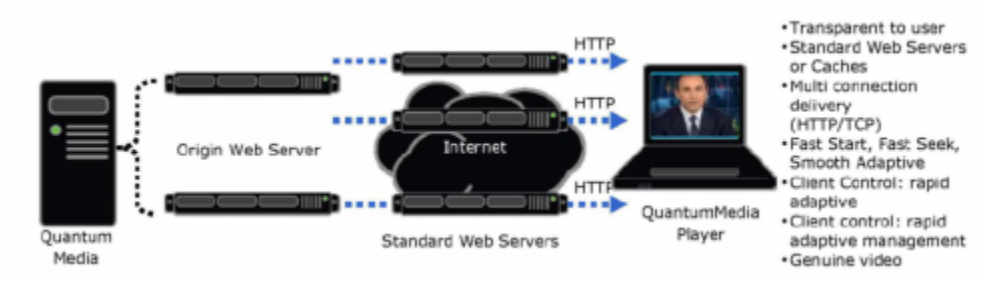
169. In the Move system, the streamlets across the groups include a time index, are time aligned, and corresponding streamlets across the groups have equal durations. *See e.g.*, EX2012; EX2011. For example, "Move Networks provides an integrated Content Management System (CMS) for entering the metadata associated with video programming, such as titles, descriptions, topics, program thumbnails, and time offsets (beginning and end points of a video segment). Time offsets can also be automatically detected in some cases based on time indexes and sudden changes in video keyframes." EX2012 at 25. Further, the figure below provides an exemplary illustration of the duration and alignment of streamlets/files of varying bitrates in the Move system.



EX2012 at 24.

170. In the Move system, the Move Media Player automatically places a streamlet request using a HTTP GET request for each streamlet over one or more network connections to the stream to retrieve a streamlet/file for the selected stream, and the HTTP GET requests identify the selected streamlet, and the requested streamlets are received from the server. *See e.g.*, EX2012; EX2011. To playback the video normally, the Move Media Player requests sequential files/streamlets from one of the copies from the video server based on the time indexes. *See e.g.*, EX2012; EX2011.

For example, the Move system provides for "[s]imple HTTP protocol transfer of media files from standard Web servers rather than deployment of expensive media servers." EX2012 at 22. This is further illustrated in the figure below.

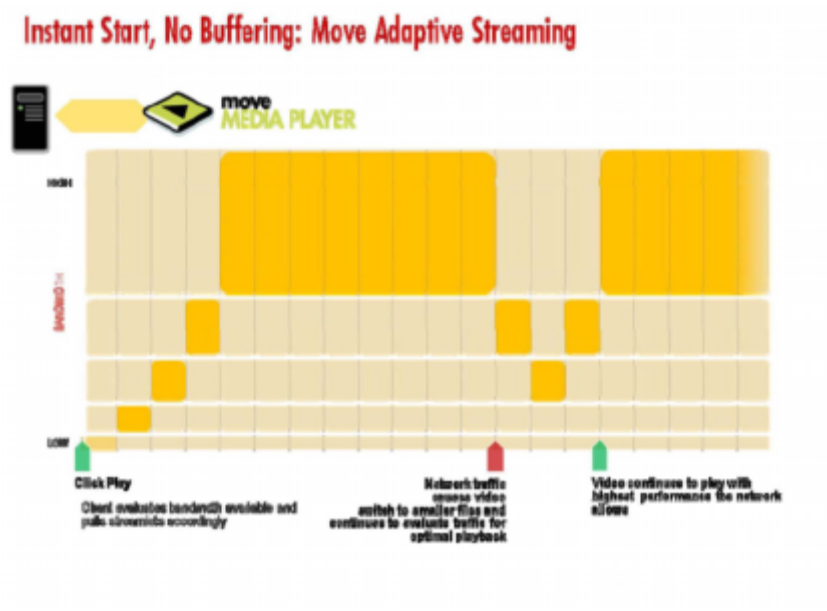


EX2012 at 22.

171. The stream selection and automatic streamlet/file requests by the Move Media Player are based upon successive local determinations to shift the playback quality to a higher or lower quality one of the copies and includes repeatedly generating a factor relating to the performance of the network that is indicative of the media player's current ability to sustain streaming the video using the streamlets/files from different ones of the copies. *See e.g.*, EX2012; EX2011. The Move Media Player makes such successive determinations to shift to achieve continuous playback of the video using the highest quality determined sustainable such that the player upshifts to a higher quality when the factor is greater than a first threshold and downshifts when the factor is less than a second threshold. *See e.g.*, EX2012; EX2011. In this context, the Move client evaluates bandwidth available and pulls streamlets accordingly, where such "pull" would be made with an HTTP GET request. *See id*.

172. For example, the Move system "provide[s] a self-optimizing, variable bitrate viewing experience." EX2012 at 10. These processes produced several benefits including "continuous playback—no noticeable buffering" and "[q]uality of service optimization based on hardware profiles and speed and quality of the connection to the Internet." EX2012 at 11. The Move system

was configured to "offer a smooth end user experience as the Move Media Player up-shifts and down-shifts in response to network and client CPU availability." EX2012 at 19. More specifically, the "Move Media Player, the Move Networks client software, delivers the video experience to the end consumer. The client decodes and renders the video streamlets to provide a continuous, optimal stream of video. A major function of the client is managing the viewing experience. The Quantum Delivery Manager ensures the player is constantly receiving the streamlets required to deliver a continuous stream of video. The Quantum Media Manager deduces the current environment to tell the Delivery Manager which streamlets to pull into the player. For instance, if the Quantum Media Manager senses that the current environment has poor connectivity, the Quantum Delivery manager will be directed to only request streamlets from low-bandwidth profiles. If the connection speed or quality of the connection suddenly increases, the Quantum Delivery Manager starts downloading higher quality streamlets. The Quantum Media Manager continues to test the environment to provide the best viewing experience currently possible. This ability to 'upshift' and 'downshift' to multiple viewing profile bit rates … is called Adaptive Streaming." EX2012 at 23. The diagram below illustrates how Move Adaptive Streaming starts instantly, doesn't stall, and adapts the streaming.

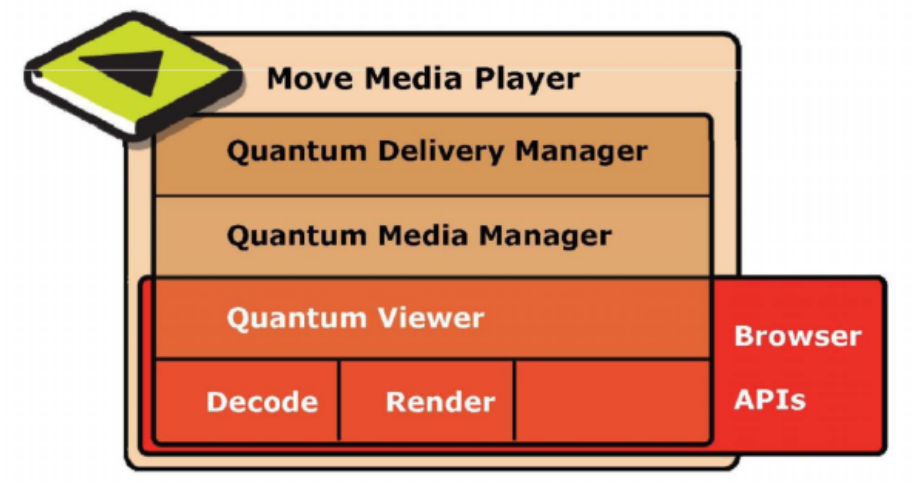


EX2012 at 24. Importantly, "the intelligence that controls the quality of service resid[es] in the client." *Id*. at 22.

173. The client of the Move system "is always on the watch to use an appropriate stream encoding rate selection so that the available bandwidth is not exceeded by downloading of the component streamlets. The basic question is not, 'what is my available bandwidth?' but '*am i receiving the current stream fast enough to present it in real time?'*." EX2011 at 8. Because "*the client* [of the Move system] *can select and retrieve directly from an array of streamlets of different encode rates*, there is no need to inform any media server and ask it to change the data it is sending." *Id.* Thus, "[i]f the client observes that over some modest interval of time (say 20 seconds or so) the player is, on average, consuming streamlets more quickly than they arrive, then a stream of lower quality must be selected." *Id.* In view of this, the Move Media Player makes successive determinations as to whether or not to shift to achieve continuous playback of the video using the highest quality determined sustainable. *See, e.g.*, EX2012 at 23.

174. As part of the streaming, the Move Media Player also requested and received a virtual timeline from the server based on the selected one of the streams. *See e.g.*, EX2012 at 26 (referencing "QVT").

175. Further, as has been described above, the Move Media Player renders and presents the requested and received streamlets on the end user station/apparatus in ascending order of playback time to playback the video normally. *See e.g.*, EX2012; EX2011. For example, "Move Media Player, the Move Networks client software, delivers the video experience to the end consumer. The client decodes and renders the video streamlets to provide a continuous, optimal stream of video." EX2012 at 23. The figure below further illustrates the components of the Move Media Player that render the video.



176. EX2012 at 25. Additionally, as noted above, Drew Major testified that "the system described in the first patent was used to encode and then deliver" the live stream of the October 1, 2005 LDS General Conference. November 5, 2021. EX2010 at ¶23.

177. The Move Networks system therefore is covered by the challenged claims and, resultingly, exhibits the benefits of the inventions claimed therein. Moreover, it is the claimed features of the Move system that resulted in the benefits described below. As explained further below, the

inventions of the ABR Patents are a verifiable example that some of the best inventions involve simple but elegant ways to solve multiple problems.

178. For example, the Move Networks Simulcoding process described above, which is responsible for preparing the different bitrate/quality streams and streamlets, "produce[s] several benefits for the video customer, including the following: 1. Quality of service benefits for continuous playback—no noticeable buffering; 2. Quality of service optimization, based on hardware profiles and the speed and quality of the connection to the Internet; 3. The ability to modify the video timeline, such as replacing a program, inserting a commercial, or switching between live and prerecorded programming; and 4. Encoding process enables scalable delivery infrastructure." EX2012 at 11. And, "the small video streamlets" are what "allow for the rich functionality available in delivery and viewing of the video. These streamlets enable the Move Networks system to operate efficiently and effectively." EX2012 at 11. In an elegant solution, by aligning the streamlets, it allowed for seamless retrieval of content while changing bitrates during a session so that the video could continue even though the network bandwidth was inconsistent and not stable. And, even though the playout of the video may decrease in quality (in ways that may or may not be discernable to the viewer), the delivery and hence the playout was continuous, and viewers accepted this tradeoff. This aspect of the inventions is fundamentally different from the prior art in which the server decided which files to send to the client and/or when to send files to the client. Thus, the inventions of the ABR Patents do not suffer from the same server-based limitations to functionality and performance of prior systems.

179. Further, because the video is encoded in this way, simple HTTP can be used to stream, and the use of "[s]imple HTTP protocol transfer of media files from standard Web servers rather than deployment of expensive media servers" reduces cost and complexity. EX2012 at 22. It also

enables rich caching, which results in the following benefits: "1. Scalability to support hundreds or thousands or millions of viewers with little impact on managed infrastructure by utilizing CDN caching servers; 2. Rapid delivery of video to viewer clients; 3. Allows quick switching between live and pre-recorded content; 4. Supports ad insertion and other 'stream assembly' functionality without compromising the viewer experience; 5. The using of caching proxies to filter requests allows for rights management and access control; and 6. The ability to quickly add capacity through CDN peering (expanding the capacity of an existing CDN by connecting it to another CDN through a CDN peering gateway)." EX2012 at 22. What the inventors did was invent how to prepare streaming content so it could be stored and served from anywhere without requiring proprietary or custom server hardware and software. Some of the largest technology companies in the world were trying to push streaming forward using proprietary hardware and software and RTSP technology. Such systems, however, are not as scalable as the inventions of the ABR Patents and thus, had such technology been fully adopted by the market, streaming video over the Internet may never have become as ubiquitous as it is today.

180. Further, "[t]his advanced video storage and distribution is leveraged in the player environment on the client once the content is delivered to the client. The benefits of this distribution model include the intelligence that controls the quality of service residing in the client and the low cost of infrastructure when compared with hardware running media server software that requires a constant session connection with the client." EX2012 at 22. In addition, giving the "client control" provides the benefit of more "rapid adaptive management" for a better end user experience. EX2012 at 22. That is, the inventors moved the intelligence into the client so that the server did not have to track what every client was doing or needed and thereby enable the server to serve more clients.

181. Therefore, the Move Networks system is covered by the inventions disclosed and claimed in the challenged claims. Moreover, the features claimed in the challenged claims that impact the performance of the streaming system, and that led to the inventive aspects of the challenged claims, are present in the Move Networks system. *See, e.g.*, EX2062; EX2010, ¶¶[24-29].

182. As will be apparent from the discussion above regarding the elements of the challenged claims and the particular benefits that arise therefrom, the objective evidence discussed in the sections below is commensurate with the scope of the claims. In other words, the objective indicia of long-felt need, failure of others, unexpected results/skepticism, industry praise, commercial success, and copying were present because of the patented features of the challenged claims, and not present in the prior art. *See, e.g.*, EX2062. Indeed, the objective evidence is not only tied directly to Move Networks' system that practiced the ABR Patents as discussed above, the objective evidence also directly relates to claimed features and benefits that the claims as a whole provide. *See id*.

183. For example, regarding a nexus between the objective evidence of long-felt need and the challenged claims, the objective evidence shows that the claimed features regarding streamlets, offering playback at multiple bitrates, distributing the streamlets based on end-user demand via traditional servers, and putting the end-user environment in control is what "ensures the fluidity of playback and makes it possible for example, to see HD when the capacity is there but lower quality video when someone else taps into your shared wireless connection. It also means people watch longer." EX2038; EX2021 ("Move's trick … is to deliver video as a standard web object, cached in small bits. … Move doesn't use special media servers and adjusts the video quality based on available bandwidth. The streaming is made possible using a small applet. … Benefits to the

viewer: no buffering, no stalling … high quality video"); EX2029 ("Streaming enables users to click and start watching immediately without the delay associated with a download").

184. In addition, not only is the objective evidence tied to specific products that practice the challenged claims, the objective evidence also directly relates to claimed features and the benefits that the claims as a whole provide. For example, regarding a nexus between the objective evidence of failure of others and the challenged claims, the objective evidence shows that the claimed features regarding using standard asynchronous HTTP communication requests were not expected to support streaming video content over the internet. Further, the evidence of commercial success discusses other attempts to develop internet streaming solutions attained so few viewers that, for industry leaders such as AOL, "the company didn't even track it." EX2037. These attempts were incompatible with certain computers and browsers, forcing the companies leading these other attempts to "giv[e] up on their respective attempts at delivering HD quality video online." EX2037. The evidence of commercial success also discusses that existing hardware and software solutions did not support dynamically changing audio or video formats mid-stream and, therefore, could not support adaptive bitrate streaming. EX2033 at 1-4.

185. The objective evidence of surprising results/superior performance also relates to claimed features of the challenged claims, such as the ability to load quickly (fast start) and breaking the video up into streamlets. EX2065. As another example, the objective evidence relating to commercial success also relates to the claimed features, such as segmenting the stream into "small stream loads" (*i.e.*, streamlets/files) to maximize video flow and image quality (especially for live content), the recognized difference over other technologies is that Move's streaming protocol is controlled by the downloaded media player rather than being controlled by a media server (thereby enabling standard HTTP web servers to be used), using HTTP requests to retrieve streamlets, all

of which contributes to having much lower communication overhead that gets more bits delivered. EX2040. Further, the evidence of commercial success also discusses how Move's technology automatically upshifts/downshifts to enable the best streaming experience possible based on the end-user's local computer environment. EX2040; EX2024 (touting the ability to retrieve video at the best possible rate based on the network traffic and unmatched scalability using standard internet protocols). Further, the evidence of commercial success also discusses how Move's technology delivered a "full-screen HD-quality" broadcast that was "shockingly good" and that the writer "was a bit shocked" "to come home one night and find Lost streaming across a 19" flat-screen computer monitor in crisp, clear glory" where the "quality of the picture was better than you got on a traditional TV set just five years ago." EX2065.

186. The objective evidence of commercial success also relates to claimed features of the challenged claims, such as the "the encoding and use of multiple bit rate 'streamlets' with the same time index; such that the aggregate set of streamlets, stored on standard web servers, independently yield playback of the original full length video. This is accomplished through intelligent requests of successive optimal streamlets sent by a client device." EX2014. The objective evidence of commercial success also discusses that Move Networks was handling "more than a million full episode streams a week and viewership [w]as doubl[ing] every month" and was delivering roughly as much data as YouTube "but more than the Web sites of CNN, NBC, and CBS." EX2024. Additionally, the objective evidence of commercial success discusses that "the full-screen version offered by Move was 'incredibly crisp and clean compared to Flash.'" EX2026 at 2. The objective evidence of commercial success also discusses Move Networks' successful implementations of adaptive bitrate streaming for ABC, Fox, The CW, CBS, the Democratic National Convention, Oprah Book Club, Televisa, CW, Comcast, ProSieben, and ESPN. Further, the objective evidence

of commercial success discusses that Move Networks' technology provided benefits to both users (no buffering, no stalling, and backwards and forwards navigation within high-quality and live streams) and content providers (cheaper, detailed reporting, and high-quality video), resulting in longer Internet video streaming sessions. EX2021; EX2029 ("Streaming enables users to click and start watching immediately without the delay associated with a download"); EX2026. Other objective evidence of commercial success discusses Move Networks was, at one point, adding new viewers at a rate of 100,000 per day. Further objective evidence of commercial success discusses that third parties, such as Level 3, adopted Move Networks' technology, because it could be sure that "viewers of their content will always be able to watch the video stream on whatever computer they happen to be using" and because it enabled Level 3 "to optimize for a more centralized and cost-effective content delivery platform." EX2029. Yet other objective evidence of commercial success discusses how Microsoft was interested and excited about the partnership with Move Networks. *See generally* EX2060. Yet more objective evidence of commercial success discusses demonstrations, including one before Microsoft vice president Scott Guthrie, the-then Corporate Vice President of the Developer Division at Microsoft, and the then-CEO of Disney, Bob Iger, showing Move Networks' plug-in "could shift between different bitrate streams without pausing or freezing" and produced "noticeable changes" in the quality of the video in response to the throttle of bandwidth." EX2010 at ¶¶24-26. Additional objective evidence of commercial success discusses demonstrations at the 2008 National Association of Broadcasters (NAB), MIX08, and Democratic National Convention in August 2008, where the "live, online webcast of the Democratic National Convention was the first large demonstration of the integration of Move Networks and Silverlight," "was a technological success and tremendously popular," and the "highest-quality video experience [Microsoft's customers] have ever seen online." EX2058.

Additional objective evidence of commercial success discusses multiple investments in Move Networks, based on its innovative ABR technology, including $11.3 million investment in its first institutional round of venture funding in February 2007, another $46 million in a round C of venture financing, which included investments from Steamboat Ventures, the venture capital arm of The Walt Disney Company; Hummer Winblad Venture Partners; Comercio Mas, an affiliate of Televisa with whom Move Networks had worked; Comcast; Level 3; and Cisco; and an additional $8 million, including $5 million from Microsoft. EX2048; EX2058.

187. As another example, the objective evidence of copying relates to claimed features of the challenged claims, such as "the encoding and use of multiple bit rate 'streamlets' with the same time index; such that the aggregate set of streamlets, stored on standard web servers, independently yield playback of the original full length video. This is accomplished through intelligent requests of successive optimal streamlets sent by a client device." EX2014. "Following [Move's] market introduction in 2006, practically every major online video provider – including Akami, Apple, Adobe, Limelight, Microsoft, Netflix, Widevine and several others – has deployed an adaptive bit rate architecture inspired by [Move's] invention. EX2014. The objective evidence of copying also discusses that Move Networks brought adaptive bitrate streaming "to the fore" and that "many companies" were "turning toward adaptive bitrate streaming, a technique of detecting a watcher's bandwidth and CPU capabilities in real time and then adjusting the quality of a video stream[t]hat requires encoding a single video at multiple bitrates and switching to the most appropriate one on a moment-by-moment basis. The result: very little buffering, fast start time and a good experience for both high-end and low-end connections. EX2036. Additionally, the evidence of copying states that "Akamai, Apple, Adobe, Limelight, Microsoft, Netflix and Widevine all [] use adaptive bitrate

streaming that was 'inspired' by Move's invention" and that Move Networks disclosed its technology to at least Apple and Microsoft under non-disclosure agreements. EX2055; EX2056.

188. Likewise, the objective evidence relating to industry praise and peer recognition frequently discusses and relates to the claimed features of the challenged claims, such as actively adjusting the video quality to the bandwidth available, allowing greater amounts of data to be transferred by streaming the data from standard HTTP servers, delivering the video as a standard web object that's cached in small bits, all of which provide a "technology advantage" and a "dramatically better viewing experience." EX2023; EX2026. Additionally, the objective evidence relating to industry praise and peer recognition discusses the superiority of Move's technology to its peers and notes multiple awards received, for example, for its "innovation, market potential, customer adoption, media buzz and investor value creation," including the OnHollywood 100, OnMedia 100 Winner, Red Herring 100 Winner, Red Herring Global 100, and a TechCrunchies Finalist. EX2016; EX2017; EX2018; EX2019; EX2020. Further, the objective evidence relating to industry praise and peer recognition discusses Move Networks' technology as "a significant technology enhancement – a true step forward – in the delivery of HD content over the Internet" providing "the highest-quality online video viewing experience we've seen, as demonstrated on ABC.com. Level 3 will be integrating Move's technology and reselling it." EX2029 at 3-4; EX2044. More recently, Sling was recognized as a "pioneer in adaptive bit rate streaming" and received "the Technology & Engineering Emmy Award in the category of "Pioneering Development of Large Scale, Cloud Served, Broadcast Quality, Linear Channel Transmission" at the 71st annual Technology & Engineering Emmy Awards on April 19, 2020 at the National Association of Broadcasters annual conference in Las Vegas." EX2013.

B. Long-felt but unmet need and failure of others

189. The claimed invention solved a long-felt need for streaming live and on-demand content over the Internet. I understand that evidence of a long-felt but unresolved need weighs in favor of the non-obviousness of an invention because it is reasonable to infer the need would not have persisted had the solution been obvious.

190. Prior to the introduction of adaptive bitrate streaming technology, "the quality, fluidity and reliability of most broadband streaming [] rarely ever matched that of typical cable, DBS or terrestrial television." EX2040. There were "well-known problems associated with streaming at high bit rates over TCP networks," including but not limited to high latency, packet loss, and congestion, which were manifested to the viewer as buffering, delays, stalling, and unresponsiveness. EX2029; EX2066; EX2059. Additionally, non-streaming video content had delays as content was downloaded, unlike streaming video which enables users to click and start watching immediately without the delay. *See, e.g.*, EX2011 at 2-3. Typical broadband streaming experiences were "hesitant" and had "freeze-up tendencies." EX2040. Dial-up users using contemporary technology would not "typically attempt video streaming, and broadband users often give up after prolonged waits or unresponsiveness due to regular rebuffering." EX2067.

191. In the absence of Move Networks' ABR technology, many Internet users limited their Internet streaming to only a few minutes or "chunks" of content. EX2024; EX2025. Even in late 2007, "short clips under three minutes still ma[d]e up the vast majority of what people watch[ed]" and industry estimates "placed average video viewing times across the Internet close[] to three minutes." EX2025; EX2026 at 2. One study examined more than 2,400 different Internet video streams showing that "51% of stream viewers were frustrated with the experience; 17% of streams have an immediate fatal error; and 25% take between 5 and 10 seconds to start playing, and stop to rebuffer before the video is finished." EX2067. These experiences, including "jerky, five-

minute productions on YouTube," failed to satisfy "consumer's real, pent-up demand for HD content." EX2024; EX2027.

192. Before the development of Move Networks' ABR technology, it was felt that "HD is not yet ready for primetime, because it consumes a lot more bandwidth and therefore costs more to provide," and due to the high costs of "high end media servers used for traditional Flash and Windows Media encoding." EX2038; EX2029. However, "whoever can solve or bypass these problems [with network bottlenecks and slow connection speeds at people's homes] will become adopted by more video sites as the demand for HD video rises." EX2048.

193. Following the introduction of Move's technology, users began "spending more than an hour per session watching content Move provides." EX2064. Move's technology allowed users to enjoy the high-quality long-form content at the high-quality levels users expected. *Id*. Move's "technology is good enough" that some thought that Move could do what "many in Hollywood and Silicon Valley have so far been unable to do: take Internet video from its YouTube origins to a full-fledged television service with dozens of channels." EX2028.

194. Move Networks was successfully developing its patented ABR technology where others failed. For example, other technologies, such as progressive download, peer-to-peer, and proprietary RTP/RTSP streaming systems requiring specialized servers and dedicated circuits were proposed as alternatives, but could not achieve the same quality of experience as that provided by the patented ABR technology and were ultimately disfavored in comparison to the patented ABR technology. *See* EX2026 at 2. Indeed, several entities developing other means to deliver high-quality long form content over the Internet ultimately abandoned their proprietary systems after years of development and adopted the patented ABR technology designed and developed by Move Networks. In November 2007, both AOL and CBS gave up their attempts to

deliver HD quality video online. "Fred McIntyre, SVP of AOL Video, said the viewership for its two-year-old Hi-Q service was so low, the company didn't even track it." EX2037. CBS Interactive's president, Quincy Smith, stated an issue with its player included limited compatibility with all computers and browsers. *Id*.

195. As shown in EX2037 and EX2024, other companies were offering clearly inferior alternatives or "giving up on their respective attempts at delivering HD quality video online" in view of the technological hurdles that Move ultimately overcame. YouTube offered "jerky, five-minute productions" and other Flash-based implementations offered only "grainy videos," as explained in EX2024 and EX2041. Neither NBC, using a Flash-based solution, nor CBS's Real Player-based solution "provided great visual quality," as stated in EX2043. Ultimately, ABC.com abandoned its use of Flash in favor of Move Networks' adaptive bitrate streaming technology, as shown in EX2034.

196. After failing to develop their own solutions, practically every major online video provider has deployed an adaptive bitrate architecture that was inspired by the patented ABR technology.

197. Move Networks began sharing its technology with Microsoft in April 2007. At that time, Microsoft's MCPC hardware and its software, including its Silverlight browser plug-in, did not support dynamically changing audio or video formats mid-stream and, therefore, could not support adaptive bitrate streaming. EX2032. In its initial meetings, Move Networks frequently faced skepticism that its technology, which included asynchronous communication protocols, such as standard HTTP communication requests, could support high-definition video streaming when existing solutions, including for example, progressive download or service-side technologies, RTF, ESP, flashes, [and Microsoft] media server, weren't working well. *See, e.g.*, EX2031 at 1-2

("[W]hy are the current streaming protocols broken? There is enough bandwidth but they [competitors] cannot get the results you [Move] do.").

C. Surprising results and superior performance

198. The introduction of Move Networks' ABR technology led some to suggest that "someday you'll be able to ditch your cable or satellite provider and get your content from cheaper sources that also happen to be legal" and make "online streaming HD downloads a legitimate competitor to traditional media." EX2022; EX2027.

199. The comments indicate a substantial amount of surprise. ABC.com's Move Networks'-powered content streaming as a "full-screen 'HD-quality'" broadcast was "shockingly good." EX2022. ABC.com's player was deemed one "of the most spectacular online video players" because it "shows remarkable, full-screen high quality" content and "loads quickly." EX2065; EX2072; EX2073; EX2074.

200. In February 2008, one user, who previously "thought we would be waiting years to see viable streaming HD technology," stated he "was a bit shocked" "to come home one night and find Lost streaming across a 19" flat-screen computer monitor in crisp, clear glory" and that the "quality of the picture was better than you got on a traditional TV set just five years ago." EX2027. He further stated he couldn't "remember the last time that technology actually surprised [him] by arriving before [he] expected it" but "[j]udging from the ABC site, the Move Networks stuff really works." *Id*.

201. Additionally, ABC's online player "clearly deliver[ed] a better, sharper picture" using Move Networks' technology than NBC's player, which "relie[d] on Adobe's Flash to stream their video" and "clearly doesn't come close to the quality that ABC is offering." EX2039. Additionally, unlike Adobe Flash, where the brains of the operations were located at the server, the key to Move Networks' technology "is in the plugin," which "can determine the best end-user

experience intelligently." EX2038. "Move's adaptive protocol means that the plugin can determine the best encoding profile for a user based on available bandwidth." *Id*. "This ensures fluidity of playback and makes it possible for example, to see HD when the capacity is there but lower quality video when someone else taps into your shared wireless connection. It also means people watch longer." *Id*. Additionally, unlike "BitTorrent and Joost, Move delivers its video as a standard web object that's cached in small bits—making its service infinitely more ISP-friendly than traditional streaming technology. Move also doesn't use special media servers, and adjusts the video quality based on available bandwidth. This means no buffering, no stalling, and backwards and forwards navigation within a live stream while you're watching." EX2026 at 2.

202. Move's technology was also regarded as superior to previous streaming solutions. For example, it was noted that Move's streams "looked better than the flash based full-screen grainy videos" and "Move Networks player stream videos at an adaptive rate, which means the quality of the video depends on your CPU and bandwidth, as opposed to Flash videos that look the same no matter how good your resources are." EX2041. "CBS' InnerTube system uses Real Player, while NBC's video content is flash based" and "[n]either provides great visual quality. ABC uses a player by Move Networks, which offers a much clearer picture quality" – "it's clear that ABC has the superior product." EX2043 at 1.

203. Others also noticed the Move Networks player on ABC.com, noting that "[o]ne of the most spectacular online video players" and "had attracted quite a bit of attention. The player shows remarkable, full-screen high quality. And, it loads quickly." EX2074. After a demonstration of Move's technology to Level 3, a senior vice president at Level 3 asked Move personnel "why are the current streaming protocols broken? There is enough bandwidth but they cannot get the results you [Move] do." EX2031.

204. Adopters of Move's technology noted that "[n]ot only is Move's technology superior to others we have used, but their ability to manage large scale setup and operations with flawless delivery is unmatched." EX2042.

D. Commercial Success

205. There is a substantial amount of real-world evidence that shows, in my opinion, that Move's product that embodied the Asserted Claims was commercially successful from a number of perspectives.

206. In EX2024, it was recognized that Move Networks, and its ABR technology, was "at the forefront" of internet streaming. This article explained that "Move does for video what voice over Internet networks did for telephone calls: it breaks up the video into bits and efficiently reorganizes them over the network so there's no need for the special computer servers and dedicated transmission lines required on streams using Flash." The commercial result of Move's technology, as this article reflects, is that Move Networks was handling "more than a million full episode streams a week and viewership [w]as doubl[ing] every month." In May 2007, Move Networks was delivering roughly as much data as YouTube "but more than the Web sites of CNN, NBC, and CBS." EX2024.

207. In April 2007, ABC turned away from Adobe's Flash, which was then used by many large media companies, and launched on ABC.com a new broadband video player using Move Networks' technology that permitted users to watch shows such as "Lost," "Dancing with the Stars," "Grey's Anatomy" and "Desperate Housewives" in a full-screen format, as shown in EX2073. Notwithstanding that Move was a new company, "ABC was astounded by the video quality we were able to deliver online and said we need to have this for our customers," as is stated in EX2034.

208. ABC's employees said publicly, such as ABC's vice president of digital media, Alexis Rapo, stated in EX2034 and EX2026 (Move Over Joost) at 2 that "the full-screen version offered by Move was 'incredibly crisp and clean compared to Flash' and only had minimal buffering at the beginning of the stream," which she hoped would "lead to a better viewing experience for users, which in turn, should boost the effectiveness of the commercials that advertising are placing within the streams." Rapo also stated that "Move's type of streaming 'allows the network to dramatically improve the user experience and operational efficiency' on the newly available player for streaming 'long form' (full episodes) of TV series." It appears ABC was right. Bloggers "raved about ABC's new player," as shown in EX2034. And as shown in EX2035 (Disney ABC Throws Down), others saw "the recent launch of streamed HD shows on the ABC.com website" as evidence that Move Networks was removing "technical barriers to delivering online HDTV." In addition, after moving away from Adobe's Flash, and adopting Move Networks' technology, ABC's website, ABC.com, delivered "clear and smooth streamed images" whose quality was "good, no question." EX2024; EX2040.

209. In my opinion, the success of Move Networks' technology was at least partially attributable to its unique design. For example, and pertaining to the technological features of Move's technology, it was explained in EX2040 that "[r]ather than streaming being controlled by a media server, in [Move's] solution the server is just a standard http Web server [because Move's] delivery protocol is based on http—the same that's used to serve up a page of any other online content." Mr. Rapo of ABC also believed that Move Networks' streaming protocol enabling long-form content would "lead to increased viewing by users and to improved economics for our streaming product." EX2040 at 2.

210. Another portion of Move Networks' successful technology was attributable to the software prompting "each computer to adjust the streaming at its fullest potential—depending on a variety of variable conditions that will be different with each desired viewing (*i.e.*, online traffic, broadband connection, computer speed, type of content, etc.)," as shown in EX2040. This article also recognizes that Move Networks' software also optimized "the video for playback," by cutting it "up into small stream loads" or streamlets and "dealing with much smaller files to maximize video flow and image quality." *Id.* Additionally, it states at page 2 that Move's "streaming software [did] not require any significant additional technical commitment on ABC's part, nor [did] it cause any stress on [the] Web site's infrastructure." *Id.* at 2. Another article summarized the impact of Move's technology appropriately, in stating that "Move's success in attracting viewers since its launch proves that if you offer Internet viewers high quality, full-screen video content, they just might sit still and watch an hourlong program." EX2026 at 2.

211. By mid-May 2007, Move's commercial success is reflected by the fact that it was already working with ABC, Fox, The CW, and CBS to support ABR streaming solutions, as shown in EX2024.

212. The evidence shows that people were adopting Move's product was because of the technology, for example, Move Networks' ABR technology "dramatically improve[d] the viewing experience." EX2040; EX2026 at 2. Early experiences with Move Networks' technology reviewed the quality of its streaming content as "most excellent" and "actually watchable." EX2021. Its technology was demonstrating that it could "do what many in Hollywood and Silicon Valley have so far been unable to do: take Internet video from its YouTube origins to a full-fledged television service with dozens of channels." EX2028.

213. Move Networks' technology provided benefits to both users (no buffering, no stalling, and backwards and forwards navigation within high-quality and live streams) and content providers (cheaper, detailed reporting, and high-quality video). EX2021; EX2026 at 2; and EX2029. For example, "Fox, which tested Move Networks' technology on the Web sites of 24 of its affiliates last year, plan[ned] to expand to 200 affiliates" in the summer of 2007. EX2024. This article also notes that "[a]nother broadcaster, which was paying $1 million a month to deliver jerky versions of its shows, expects those costs to drop up to 85% with Move." *Id*. Fox executives saw the benefit of Move Networks' technology as enabling increased advertising revenues and supporting consumption of additional content. Ronald Berryman, senior vice president at Fox Interactive Media noted that its customers, who were now enjoying the benefits of Move Networks' ABR technology, were now watching "22 minutes a session, compared with 3 or 4 minutes," so we "can increase the advertising and deliver long-form content," which was reported in EX2024.

214. Additionally, EX2024 states that "[u]nlike YouTube-style Flash video, which fetches streamed bits in a series of requests sent from a set of servers at the sender's end, Move gets bits from the closest storage cache … and brings them back to the screen at the best streaming rate based on the network's traffic load. It uses standard internet protocols, which means it can take advantage of the many server farms around the world that offer up Web pages. Both ABC and Fox say there is nothing else that can stream at this scale."

215. It is recognized that "Move helped paved the way for HD video" in EX2076. By November 2007, Move Networks was providing "high-quality streaming video platforms to media companies like ABC" such that "more than twice as many people are using its platform than in August" of 2007. EX2075; EX2077. "In absolute terms, more than six million people watched long-form video using Move in October [2007] and Move [was] adding new viewers at a rate of 100,000 per

day." EX2075. Around the same time, Level 3 announced a collaboration with Move Networks. EX2029. This article states that "Level 3's Move-enabled streams will dynamically adapt to changing network and end-user computer conditions. If bandwidth availability is constrained for any reason, or if computing power is limited, the Level 3 stream will reduce its bit rate automatically, without buffering. 'It is a graceful transition – up and down – that most users will not even notice,' said Level 3's Rafuse. 'With the Move Media Player, customers know in advance that viewers of their content will always be able to watch the video stream on whatever computer they happen to be using.' This technology will enable Level 3 to optimize for a more centralized and cost-effective content delivery platform. … Utilizing Move's technology, Level 3 will be able to provide a very large amount of capacity, immediately, for its customers who may have very large audiences." *Id*.

216. In October 2008, ESPN relaunched its "360 online video player, and it's really pretty groundbreaking." EX2030. "[P]owered by Move Networks, the player offer[ed] the first instance of live streaming using Move's technology, promising a better live video experience for fans than that currently offered by any other service," also reported in that article. And even "on a slow wireless connection," a user could "get a relatively good looking picture and more importantly, an entirely fluid stream." *Id*.

217. Move Networks also successfully collaborated with BYU Television to live stream the October 1, 2005 General Conference for the Church of Jesus Christ of Latter Day Saints (the "2005 General Conference"). EX2010 at ¶23; EX2051. Notably, the streaming of the 2005 General Conference was wildly successful, both for Move and for BYU Television. *See* EX2051 at 6-7; EX2010 at ¶23.

218. Move Networks demonstrated the benefits of its ABR technology to Microsoft and was working with Microsoft to integrate that technology into Microsoft's Silverlight software. Further, these emails show that computer hardware at this time was such that displaying an HD stream required hardware acceleration. Given these limitations,

220. Move's business continued to grow in late 2007 and early 2008. By March 2008, users watching content provided by Move Networks were averaging 50 minutes or more per session and

numbered more than 34 million, substantially more than the 20 million unique viewers it had achieved in November 2007, as reported in EX2064; EX2026 at 2.

221. [redacted] Further, EX2045 and EX2079 show that in March 2008 at MIX08, Microsoft's web developer and designer conference for showcasing upcoming web technologies, Microsoft also discussed announcing its relationship with and investment in Move Networks, and then invited Move Networks to attend Advance, Microsoft's internal tradeshow directed to advertising, business, entertainment, and communication, in mid-May 2008.

222. The press reported that Move Networks and Microsoft collaborated to support streaming of the Democratic National Convention in August 2008, with support from Level 3, which earned praise from the media and Microsoft, as shown in EX2060 at 49-51, EX2058.

223. For example, as shown in EX2081, several praised the HD "online video feed" at DemConvention.com, which used Move Networks' plugin, labeling it as "the most awesome (I have probably never used that word in seven years of this site) online video feed." In fact, Microsoft published a question-and-answer session between Scott Guthrie and its own PressPass discussing the successful collaboration between Move Networks and Microsoft in support of the 2008 Democratic National Convention, as shown in EX2060 at 49-51. Guthrie also explained in EX2060 at 50 that the "live, online webcast of the Democratic National Convention was the first large demonstration of the integration of Move Networks and Silverlight" and "was a technological success and tremendously popular." Guthrie noted that "visitors to the official convention Web site view[ed] more than 350,000 hours of video" and "experience[d] the convention online like

never before." He also reported it was the "highest-quality video experience [Microsoft's customers] have ever seen online," as shown in EX2060 at 50.

224. Scott Guthrie of Microsoft also discussed Microsoft's "strategic investment in Move Networks Inc., as the two companies continue to work together to deliver high-quality, skip-free Internet television programming over HTTP-based networks" in EX2060. Guthrie went on to repeat that, in August 2008, "Microsoft took an equity stake in Move Networks, a leader in HTTP-based video delivery" because Move had "developed an adaptive streaming technology that seamlessly adjusts image quality to fit available bandwidth on each viewer's Internet connection, creating a high-quality Internet television viewing experience. This investment builds on a strategic partnership we announced with Move Networks in March of 2008" in EX2060 at 50, and also as shown in EX2082 at 4-5. Guthrie also explained that "Move Networks' technologies allows users to experience high quality, skip-free Internet television programming" in EX2060 at 50. With this investment, Microsoft not only recognized Move as the "leader in HTTP-based video delivery", but it also saw so much value in the success of the patented ABR technology that it worked with Move to integrate its Silverlight product with the Move Media Player. EX2079.

225. The success, and successful adoption, of Move Networks' ABR technology was recognized by investors as well as other media companies. EX2048 reports that Move Networks "becoming one of the preferred video streaming partners for many major media sites, including ABC.com, Discovery.com, ESPN.com, and Fox.com" led to investments in a multiple series of venture funding. EX2047 reports that Move Networks received a $11.3 million investment in its first institutional round of venture funding in February 2007. Move Networks also received $46 million in a round C of venture funding in April 2008, as shown in EX2048 and EX2058. Investors in this round of funding included major players like Steamboat Ventures, the venture capital arm of The

Walt Disney Company; Hummer Winblad Venture Partners; Comercio Mas, a Televisa affiliate; Comcast; Level 3; and Cisco; and it later included an additional $8 million in investments, including $5 million from Microsoft. *See* EX2048; EX2058.

226. Content delivery networks were also interested in Move Networks' technology. Brady Rafuse, president of Level 3's Content Markets Group, stated that "Level 3 believes that Move's service is a significant technology enhancement -- a true step forward -- in the delivery of HD content over the Internet" in EX2029 at 3-4. Level 3 believed, as reflected in that document, that "higher bitrates, and subsequently higher viewing quality, encourage people to watch longer. Clearly, longer session times increase potential advertising revenue when compared to lower-quality streaming solutions. We believe that this raises the potential for our customers to actually make more money from HD than at the lower bit rates."

227. By September 2010, Move Networks' customers also included Oprah Book Club, Televisa, CW, Comcast, and ProSieben, as shown in EX2014.

228. DISH's licenses for the Asserted Patents with ViacomCBS and Univision Communications mentioned in EX2053 further evidence the commercial success of the Asserted Patents. EX2053 at 23, n.100. DISH has also licensed Peloton, lululemon, and iFit. EX2083; EX2084; EX2085.

229. Ultimately, because of the impact of the 2008 financial collapse, Move's business was put up for sale and acquired by EchoStar. *See* EX2010, ¶[18]; EX2080. Move Networks was acquired by EchoStar, and its technology was used to create and build Sling TV, a successful Internet streaming television platform. *See, e.g.*, EX2010, ¶¶[19-21]; EX2080.

E. Copying

230. The objective evidence suggests that competitors copied Move's technology. I understand that copying, particularly by competitors, can indicate that the inventions in a patent are non-obvious. I also understand that copying can be established by showing that an accused copier had

access to the patented invention and that the accused system shared substantial similarities with the patented invention.

231. By summer 2009, after "adaptive bitrate streaming [was] brought to the fore by Move Networks," many companies turned "toward adaptive bitrate streaming, a technique of detecting a watcher's bandwidth and CPU capabilities in real time and then adjusting the quality of a video stream. That requires encoding a single video at multiple bitrates and switching to the most appropriate one on a moment-by-moment basis. The result: very little buffering, fast start time and a good experience for both high-end and low-end connections," as stated in EX2036 and shown in EX2026 at 2.

232. In September 2010, Move Networks announced the approval of its application for "a fundamental patent on adaptive streaming." EX2014; EX2086. The industry recognized that "Move Networks just got a lot more valuable on the intellectual property front, as it has just been granted a patent for its HTTP-based adaptive streaming technology. The awarding of the patent also means that it could pose a threat to Adobe, Microsoft, Apple and many other companies that have rolled out adaptive streaming technology of their own." EX2052. This article also provides the context that "Move Networks was an early proponent of HTTP-based adaptive streaming technology for delivery of video streams that adjust to the amount of bandwidth that is available to the end user. Since the introduction of Move's technology and the filing of the patent in question, a number of video providers have followed its example with similar technologies of their own." *Id*. It was reported that "Akamai, Apple, Adobe, Limelight, Microsoft, Netflix and Widevine all [] use adaptive bitrate streaming that was 'inspired' by Move's invention." *Id*.

233. Similarly, after Move Networks disclosed its technology to Apple under a non-disclosure agreement shown in EX2055 and EX2056, Apple "embraced adaptive bitrate streaming over

HTTP at its developer conference" in June 2009, announcing that it would "be available with the new iPhone OS 3.0 on June 17 and in September with the new version of QuickTime for Mac OS X Snow Leopard," as reported in EX2036. Like Move Networks' technology, "Apple's new HTTP streaming" supported "live and on-demand" streaming video content. EX2036 at 2. Dave Ericson also testified that the HLS video streaming standard, created by Apple in 2009, is "very similar to what Move had developed and was using as a proposed standard" and explained that "it's a very similar proposed standard to what [Move] developed" in EX2063.

234. Move Networks worked closely with Microsoft based on my review of emails between Move Networks' CTO at the time and Microsoft. For example, a meeting between Move Networks and Microsoft occurred in June 2007, when Microsoft invited John Edwards, who at the time was the President and CEO of Move, and Greg Smith to meet with Microsoft personnel to discuss how the adaptive bitrate streaming technology could benefit each group "from both a business and technology" perspective. EX2032. Following that meeting, Greg Smith worked with Microsoft on a plug-in for Microsoft's Silverlight. EX2032. Following an investment by Microsoft into Move (EX2050), Microsoft used the patented ABR technology in collaborations including the streaming of the 2008 Democratic National Convention. EX2060. However, despite the successful collaborations, Microsoft decided to implement its own version of adaptive bitrate streaming technology, Smooth Streaming, [redacted]

[redacted]

F. Industry praise and peer recognition

235. Move and its technology received a substantial amount of praise and recognition in the industry at all levels from users, content distributors, content providers, and industry-wide organizations.

236. Move Networks was recognized as "especially impressive" given that "the quality of content Move delivers is higher than that offered on platforms like Hulu or any of the standard players like Flash." EX2023. That article also states that "Move Networks blends into the inconsistent landscape of users' different download speeds by actively adjusting its video quality to the bandwidth available. It delivers pieces of content progressively via a piece of software downloaded and installed through the browser — importantly, users don't need to open any separate program." *Id*.

237. Users recognized that Move Networks' technology took advantage of "your CPU and bandwidth, as opposed to Flash videos that look the same no matter how good your resources are" to provide an "improved high-quality player" that "looked better than the flash based full-screen grainy videos" and is "well worth your time." EX2041. They also compared it to other technologies. EX2043. This article notes that "CBS' InnerTube system uses Real Player, while NBC's video content is flash based. Neither provides great visual quality. ABC uses a player by Move Networks, which offers a much clearer picture quality" and "looks awfully nice." *Id*. To the industry, that article states that "[I]t's clear that ABC has the superior product." *Id*. In addition, the industry focused on why Move was superior, noting that in contrast with Flash, which required specialized Flash Media Servers, "Move's system allow[ed] for greater amounts of data to be transferred by streaming the data from standard HTTP servers" and enabled ABC to be a

"frontrunner in providing quality content to their consumers over numerous devices." *Id*. As noted above, in 2007, the broadcast delivered by ABC's full-screen HD-quality video player was declared "shockingly good." EX2022.

238. Others also praised Move Networks' technology by identifying "Move's bottom-line technology advantage" as "its service is profoundly more efficient and less expensive, and it provides a dramatically better viewing experience. Move's technology also lets advertisers target users and offers excellent analytics and reporting." EX2026. Or to put it less formally, users commented that "Boy, does this rock! It's sharp and clear – does full-screen video. Lost is stunningly beautiful on it. Demonstrates that on YouTube or iTunes we sure aren't getting anywhere close to the full experience that is possible today." EX2070.

239. At the content distributor level of the industry, Level 3's Rafuse also praised Move Networks' technology. "Level 3 believes that Move's service is a significant technology enhancement – a true step forward – in the delivery of HD content over the Internet." EX2029; EX2044.

240. At the content provider level of the industry, ABC and ESPN and other content providers praised Move's technology, as I stated above. Others also praised Move Networks' technology thusly: "Move's bottom-line technology advantage: its service is profoundly more efficient and less expensive, and it provides a dramatically better viewing experience. Move's technology also lets advertisers target users and offers excellent analytics and reporting." EX2026 at 2. Or to put it less formally: "Boy, does this rock! It's sharp and clear – does full-screen video. Lost is stunningly beautiful on it. Demonstrates that on YouTube or iTunes we sure aren't getting anywhere close to the full experience that is possible today." EX2070.

241. Outside of the U.S., Move Networks received similar praise. Tony Rallo, the then-vice president of Technology Strategy for Televisa, stated that "Move has proven to be an excellent technology partner for Televisa time and again. … Not only is Move's technology superior to others we have used, but their ability to manage large scale setup and operations with flawless delivery is unmatched," as shown in EX2042.

242. Move Networks' ABR technology also earned multiple industry-wide awards. For example, Move Networks was recognized in June 2008, over 1000 other peer-nominated entries identified by leading venture capitalists, investment bankers, and industry analysts, in AlwaysOn's OnHollywood 100 for its commercial success based on "innovation, market potential, customer adoption, media buzz and investor value creation," as reported in EX2016 (OnHollywood 100) and EX2017 (OnHollywood 100 Winner). EX2016 also recognized that "Move Networks Internet television platform delivers the highest quality content and a preeminent viewing experience of online television while providing both publishers and advertisers with the ability to meet the demands of scalability and profits at the same time. By combining scalability with meaningful reporting and analytics, Move Networks has created the industry's first online television business model that focuses on revenue generation for its content providers while distributing their content to millions of viewers simultaneously worldwide. Currently, Move Networks is used to deliver HD video content online by leading media companies such as ABC, FOX, ESPN, HARPO and many others." *Id*.

243. In addition, Move Networks was also an OnMedia 100 Winner, as reported in EX2018 (OnMedia 100 Winner). Move was also a Red Herring 100 Winner, an award given to the top 100 private technology companies based in North America, in May 2007 and a Red Herring Global 100 in December 2007 based on evaluations "made on both quantitative and qualitative criteria

such as financial performance, innovation, management, global strategy, and ecosystem integration, because it gave "content publishers the ability to deliver broadcast-quality streaming video to viewers. EX2019. This high-quality experience, coupled with comprehensive viewer metrics, and the delivery of highly relevant ads, enable content publishers to attract and capture the attention of today's viewer that demands access to premium content anytime, anywhere." EX2020; EX2019.

244. In 2007, Move Networks was also a TechCrunchies Finalist for Best Technology Innovation, selected as one of five companies from 82,000 nominations, as reported in EX2020 (Move Networks TechCruchies Finalist). More recently, Sling was recognized as a "pioneer in adaptive bit rate streaming" and received "the Technology & Engineering Emmy Award in the category of "Pioneering Development of Large Scale, Cloud Served, Broadcast Quality, Linear Channel Transmission" at the 71st annual Technology & Engineering Emmy Awards on April 19, 2020 at the National Association of Broadcasters annual conference in Las Vegas", which was reported in EX2013 (Sling TV Granted Prestigious Tech).

245. In sum, the objective indicia of non-obviousness or secondary considerations discussed above further support my opinions that the Challenged Claims are not invalid as obvious; Ogdon expressly teaches away from video streaming; and the proposed combinations with Allen and SMIL 2.0 fail to address Ogdon's central flaw or otherwise disclose or suggest the limitations they are relied upon to teach.

X. Conclusion

246. I reserve the right to add to or modify this expert report in the event that inaccuracies or omissions are discovered or if new or additional information is provided to me. I also reserve the right to make any such other changes as may be deemed necessary or appropriate.

247. I have not yet developed all demonstratives or illustrations to illustrate my opinions and the bases for those opinions; however, I reserve the right to present any and all such demonstratives or illustrations at trial or a hearing.

248. I reserve the right to supplement and/or amend my analyses and opinions expressed herein in response to any new positions taken by Petitioner's experts or witnesses in reports, declarations, affidavits, or testimonies whether in response to my report herein or in amendment to their previous reports and testimonies to the extent such positions are relevant to the subject matter I have addressed in my report herein.

249. I declare under I declare under penalty of perjury that the foregoing is true and correct.

Signature: _____
Kevin Jeffay, Ph.D.

Executed On July 22, 2024 at Chapel Hill, NC