

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Genius Sports Ltd.,

Petitioner

v.

SportsCastr Inc. (d/b/a Panda Interactive)

Patent Owner

U.S. Patent No. 11,871,088

Case No. 2:23-cv-00471-JRG

**DECLARATION OF DR. STEPHEN B. WICKER UNDER C.F.R. 1.68 IN
SUPPORT OF PETITIONS FOR *INTER PARTES* REVIEW OF U.S.
PATENT NO. 11,871,088**

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¹ Unless otherwise specified, citations are to the original page, column, and line numbers in exhibits. Brackets ([]) are used to refer to the sequential page numbers added to exhibits pursuant to 37 C.F.R. §42.63(d)(2)(i).

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Exhibit 1022	James F. Kurose & Keith W. Ross, <i>Application Layer</i> , in Computer Networking A Top-Down Approach (Michael Hirsch et al. eds., 4th ed. 2012) (“Kurose I”)
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Exhibit 1024	Mário Marques da Silva, Multimedia Communications and Networking (2012) (“Silva”)
Exhibit 1025	<i>A Brief History of the Internet</i> , ONLINE LIB. LEARNING CENTER. (Feb. 9, 2024), https://www.usg.edu/galileo/skills/unit07/internet07_02.phtml (“Online Library”)
Exhibit 1026	Hisayuuki Ohmata et al., <i>Hybridcast: A new media experience by integration of broadcasting and broadband</i> , 2013 ITU Kaleidoscope: Building Sustainable Communities, April 2013 (“Ohmata”)
Exhibit 1027	Henning Schulzrinne et al., <i>RTP: A Transport Protocol for Real-Time-Applications</i> , DataTracker (January 1996), https://datatracker.ietf.org/doc/html/rfc1889 (“Schulzrinne”)
Exhibit 1028	Brijesh Kumar, <i>Making Sense of Video Streaming Protocols</i> , LinkedIn. (Aug. 11, 2016), https://www.linkedin.com/pulse/making-sense-video-streaming-protocols-dr-brijesh-kumar/ (“Kumar”)
Exhibit 1029	Ian Fette & Alexey Melnikov, <i>The WebSocket Protocol</i> , RFC Editor. (Dec. 2016), https://www.rfc-editor.org/rfc/rfc6455.html .
Exhibit 1030	Marcin Warczygłowa, <i>Real-time Web Application with Websockets and Vert.X</i> (Nov. 10, 2015), https://blog.allegro.tech/2015/11/real-time-web-application-with-websockets-and-vert-x.html .

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Exhibit 1031	Randall Stewart & Chris Metz, <i>SCTP: new transport protocol for TCP/IP</i> , 5 IEEE 64, (2001) (“Stewart”)
Exhibit 1032	Lydon Ong, John Yoakum &, <i>An Introduction to the Stream Control Transmission Protocol (SCTP)</i> , Datatracker. (May. 2002), https://datatracker.ietf.org/doc/rfc3286/ (“Ong”)
Exhibit 1033	Jan Newmarch, <i>Introduction to Stream Control Transmission Protocol</i> , LINUX J. (Sep. 1, 2007), https://www.linuxjournal.com/article/9748 (“Newmarch”)
Exhibit 1034	Kyung-Hoe Kim et al, <i>A transmission control SCTP for real-time multimedia streaming</i> , 54 Computer Networks 1418, (2010) (“Kim”)
Exhibit 1035	High Scalability, <i>How Facebook Live Streams to 800,000 Simultaneous Viewers</i> , ByteByteGo (Jun. 27, 2016), https://blog.bytebytego.com/?utm_source=hs&utm_medium=ann&utm_campaign=top (“ByteGo”)
Exhibit 1036	Hardeep Singh Parmar & Michael C. Thornburgh, <i>Adobe’s Real Time Messaging Protocol</i> , Veriskope. (Dec. 21, 2002) (“Parmer”)
Exhibit 1037	Ilya Grigorik, <i>WebRTC</i> , in High Performance Browser Networking, (2013) (“Grigorik”)
Exhibit 1038	Sam Dutton, <i>Get started with WebRTC</i> , web.dev. (Jul. 23, 2012), https://web.dev/articles/webrtc-basics (“Dutton”)
Exhibit 1039	Andy Salo, <i>MPEG DASH: A Technical Deep Dive and Look at What’s Next</i> , RGB Networks, (2012) (“Salo”)
Exhibit 1040	Jan Ozer, <i>Upstream, Justin.tv, Livestream, and Bambuser: Streaming Unplugged</i> , Streaming Media Magazine., Jun.-Jul. 2012 (“Ozer”)
Exhibit 1041	Christopher Mueller, <i>MEPG-DASH vs. Apple HLS vs. Microsoft Smooth Streaming vs. Adobe HDS</i> , BITMOVIN. (Mar. 29, 2015), https://bitmovin.com/mpeg-dash-vs-apple-hls-vs-microsoft-smooth-streaming-vs-adobe-hds/ (“Mueller”)
Exhibit 1042	Stefan Saroiu et al., <i>An analysis of Internet Content Delivery Systems</i> , ACM SIGOPS Operating System Review, Vol. 36 (Dec. 31, 2002), https://doi.org/10.1145/844128.844115 (“Saroiu”)

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Exhibit 1043	Charles Marion & Julien Jomier, <i>Real-time Collaborative Scientific WebGL Visualization with Websocket</i> , Ass’n Computing Machinery, August 4-5, 2012 (“Marion”)
Exhibit 1044	Mark Sweney, <i>First ads appear on YouTube Clips</i> , The Guardian, Aug. 22, 2007 (“Sweney”)
Exhibit 1045	Richard Sandomir, <i>The Innovation That Grew and Grew</i> , N.Y. Times, June 12, 2014 (“Sandomir”)
Exhibit 1046	Victoria Pimentel & Bradford G. Nickerson, <i>Communicating and Displaying Real-Time Data with WebSocket</i> , 16 IEEE (2012) (“Pimentel”)
Exhibit 1047	Reserved
Exhibit 1048	Claim Listing of U.S. Patent No. 11,871,088
Exhibit 1049	Certified File History of U.S. Patent No. 11,871,088
Exhibit 1050	U.S. PGPub 2018/0367820 (“Abulikemu”)
Exhibit 1051	U.S. Patent No. 9,973,785 (“Yang”)
Exhibit 1052	James F. Kurose & Keith W. Ross, <i>Computer Networking: A Top-Down Approach</i> (Michael Hirsch et al. eds., 6th ed. 2013) (“Kurose II”)
Exhibit 1053	Genius Sports’ proposed <i>Sotera</i> Stipulation to SportsCastr (“ <i>Sotera</i> Stipulation”)
Exhibit 1054	U.S. PGPub 2018/0167427 (“Kedenburg”)
Exhibit 1055	Nick Wingfield, <i>What’s Twitch? Gamers Know, and Amazon Is Spending \$1 Billion on It</i> , N.Y. Times, August 25, 2014 (“Wingfield”)
Exhibit 1056	Luigi Lo Iacono & Silvia Santano Guillen, <i>Web-native Video Live Streaming</i> , WEB 2014: The Second International Conference on Building and Exploring Web Based Environments, April 2014 (“Iacono”)

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Exhibit 1057	SportsCastr's Preliminary Infringement Contentions, Exhibit 8 (September 25, 2024)
Exhibit 1058	Arini, ST, MT, <i>Ch 6 Multimedia Distribution</i> , https://www.slideserve.com/tassos/ch-6-multimedia-distribution (October 11, 2014) ("Arini")
Exhibit 1059	SportsCastr's Second Amended Complaint for Patent Infringement against Genius Sports (September 25, 2024)

I, Dr. Stephen B. Wicker, declare as follows:

I. INTRODUCTION

1. My name is Stephen B. Wicker, Ph.D. I am Professor Emeritus of Electrical and Computer Engineering at Cornell University in Ithaca, New York. I have been retained on behalf of Genius Sports Ltd. to provide my opinions regarding whether claims 1-34 of U.S. Patent No. 11,871,088 (“the ’088”) would have been invalid to one of ordinary skill in the art as of May 16, 2017, in the above-captioned Petitions for *Inter Partes* Review (“IPR”) of the ’088.

2. For time spent in connection with this matter, I will be compensated at my standard billing rate of \$900 per hour. I am being separately reimbursed for any out-of-pocket expenses. My compensation does not depend on the content of my opinions or the outcome of this case.

3. In forming the opinions expressed in this Declaration, I have also relied on my academic and professional experience. I also considered the viewpoint of a person having ordinary skill in the art as of the time of the alleged invention of the ’088. My opinions are based, at least in part, on the following:

- U.S. Patent No. 10,805,687 (“the ’687”) (Ex.1003)
- U.S. Patent No. 10,425,697 (“the ’697”) (Ex.1006)
- U.S. Patent No. 11,039,218 (“the ’218”) (Ex.1009)
- U.S. Patent No. 11,871,088 (“the ’088”) (Ex.1012)

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- U.S. Patent No. 11,871,088 Certified File History (Ex.1049)
- U.S. Patent Pub. No. 2015/0163379 (“Herzog”) (Ex.1015)
- U.S. Patent Pub. No. 2014/0229992 (“Ellis”) (Ex.1016)
- U.S. Patent Pub. No. 2016/0036910 (“Spivey”) (Ex.1017)
- U.S. Patent Pub. No. 2018/0367820 (“Abulikemu”) (Ex.1050)

II. QUALIFICATIONS AND BACKGROUND

A. Education Background and Career History

4. My *curriculum vitae* is attached hereto as Exhibit 1002. It provides an accurate identification of my background and experience.

5. I earned my Bachelor of Science degree in Electrical Engineering from the University of Virginia in 1982. In 1983, I earned a Master of Science degree in Electrical Engineering from Purdue University, and in 1987, I earned a Ph.D. in Electrical Engineering from the University of Southern California. My doctoral studies focused on the theory of sequences and error control codes for digital communication systems.

6. In 1982-1983, I worked for the Network Architecture Research Group of Bell Laboratories, in Columbus, Ohio. While with Bell Laboratories, I worked on digital switching systems for the messages that control the telephone network.

7. From August 1983 through September 1987, I was a System Engineer for the Space and Communications Group of the Hughes Aircraft Company, in El

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Segundo, California. During this time, my primary focus was on the design and development of communication payloads for commercial, military, and NASA spacecraft. My work at Hughes included acting as the Principal System Engineer for new business in advanced satellite systems.

8. From September 1987 through June 1996, I was a member of the faculty of the School of Electrical and Computer Engineering at Georgia Tech.

9. From July 1, 1996, to February 29, 2024, I was a member of the faculty of the School of Electrical and Computer Engineering at Cornell University, where I taught and conducted research in wired and wireless information networks, digital telephony, information theory, and security. Since that time, I have continued to serve Cornell as an Emeritus faculty member, conducting research, advising students and faculty, and giving occasional lectures. Over my time at Georgia Tech and Cornell, I have supervised forty-four Ph.D. students.

10. I have consulted extensively with Motorola, MTel, Lockheed, Integrated Device Technologies, Unisys, Texas Instruments, and other corporations to develop advanced technologies for their products.

11. My current research focuses on wireless and wired information networks, with an emphasis on network security and privacy. I have been particularly focused on client-facing systems such as cellular technology and content

distribution networks. I am particularly interested in the security and privacy issues that arise in streaming systems.

B. Publications and Patents

12. I have written and/or edited six books and roughly 250 journal and conference papers, most of which focus on digital communication systems and information networks. I am the author of *Cellular Convergence and the Death of Privacy* (Oxford University Press, 2013). I am also the author of *Error Control Systems for Digital Communications and Storage* (Prentice Hall, 1995), which has been adopted as a text for courses in over sixty universities in fourteen countries. I am the author of *Reed-Solomon Codes and Their Applications*, published in 1994 by the IEEE Press; *Turbo Coding*, published in November 1998 by Kluwer Academic Press; and *Fundamentals of Codes, Graphs, and Iterative Decoding*, published in 2002 by Kluwer Academic Press.

13. My journal publications include “Ad Blockers: Technology, Ethics, and a Serious Difference of Opinion,” *Communications of the ACM*, October 2017 (with K. Karlsson) and “Digital rights management: The cost to consumers,” in *Proceedings of the IEEE*, vol.103, no.5, pp.726-33, May 2015 (with A. S. Kubesch).

14. I have also contributed chapters to several books, including “Privacy-Aware Design for the Monitoring, Control, and Protection of Critical Infrastructure,” in *Homeland Security Threats, Countermeasures, and Privacy Issues* (ed. Giorgio

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Franceschetti), Artech House, 2010. A complete list of my publications is contained in my curriculum vitae, a copy of which is provided as Ex.1002 to the Petition.

15. I am a named inventor on the following patents.

- Wicker, S.B., “*Private Overlay for Information Networks*”, U.S. Patent No. 9,813,233, 7 November, 2017 - assigned to Cornell University.
- Ober, C.K., O’Rourke, T.D., Spencer, M.G., Turner, J.N., Wicker, S.B., “*Flexible Substrate Sensor System For Environmental And Infrastructure Monitoring*”, U.S. Patent No. 8,701,469, 22 April 2014 - assigned to Cornell University.
- Fontaine, F. and Wicker, S.B., “*Method and Apparatus for Turbo Decoding Block Codes*”, U.S. Patent 7,243,288, 10 July 2007 - assigned to Motorola Inc.
- Wicker, S.B. and Fine, T.L., “*Sensor-Assisted ALOHA Multiple Access*”, U.S. Patent No. 6,404,750, 11 June 2002 - assigned to Cornell University.
- Wang, X.A. and Wicker, S. B., “*Artificial Neural Network Viterbi Decoding System and Method*,” U.S. Patent No. 5,548,684, 20 August, 1996 - assigned to Georgia Tech Research Corporation.

C. Other Relevant Qualifications

16. I have served as an Associate Editor for the *IEEE Transactions on Communications* and the *ACM Transactions on Sensor Networks*. I was twice elected to the Board of Governors of the IEEE Information Theory Society. I have also edited several special issues for a variety of journals and technical magazines and served a three-year term on the Information Science and Technology Panel for the Defense Advanced Research Projects Agency (DARPA). The DARPA panel is

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responsible for technology assessment for the U.S. Department of Defense. My DARPA duties included leading a one-year study on wireless sensor networks.

17. In 2011, I was named a Fellow of the IEEE for contributions to wireless information systems. From 2005 to 2018, I served as the Cornell University Principal Investigator for the TRUST Science and Technology Center - a National Science Foundation center dedicated to the development of technologies for securing the nation's critical infrastructure.

18. In 2014, I briefed the staff of the National Economic Council at the White House on the subject of privacy aware designs for cellular and the smart grid.

19. I have taught communication system theory and design to thousands of students at Georgia Tech and Cornell over the past thirty-seven years. I have been the recipient of four Cornell University College of Engineering faculty teaching awards.

D. Prior Testimony

20. The cases in which I have testified as an expert at trial or by deposition within the preceding five-plus years are as follows:

- Wireless Alliance v. AT&T et al. (for the defendants)
- Touchstream v. Charter (for the plaintiff)
- SEVEN Networks v. Motorola Mobility (for the defendant)
- Ax Wireless v. Lenovo and Dell (for the defendants)
- Identity Security v. Apple (for the defendant)
- Netgear v. TP-Link (for the claimant, ITC)
- Acceleration Bay v. Activision (for the defendant)
- State Farm v. Amazon (for the plaintiff)

- GComm v. Samsung (for the defendant)
- Unisys v. Atos et al. (for the plaintiff)
- Alacritech v. Intel et al. (for the defendants)
- University of Minnesota v. Ericsson and Nokia (for the defendants)
- Viasat v. Adobe (for the defendant)
- KPN v. Ericsson (for the defendant)
- TQ Delta v. DISH (for the defendant)
- AMO Development v. Alcon Vision, LLC (for the defendant)
- Sonrai v. Samsung et al (for the defendants)
- IPCom v. AT&T et al (for the defendants)
- Teradyne v. Astronics (for the defendant)
- Huawei v. Verizon (for the defendant)
- Google v. Sonos (for the defendant)
- Barkan v. Sprint et al. (for the defendants)
- Gigamon v. Apcon (for the defendant)
- Impact Engine v. Google (for the plaintiff)
- Sprint v. Altice et al. (for the plaintiff)
- KAIFI v. AT&T (for the defendant)
- Sprint v. Charter et al. (for the plaintiff)
- Live Person v. 24/7 (for the plaintiff)
- Motorola v. Hytera (for the plaintiff)

III. UNDERSTANDING OF PATENT LAW

21. I understand that prior art to the '088 includes patents in the relevant art that predate the priority date of the '088.

22. I understand that claims in an IPR are construed under the case *Phillips v. AWH Corp.*, 415 F.3d 1303, decided by the Federal Circuit in 2005. I understand that under the rule in *Phillips*, words of claims are given their plain and ordinary meaning as understood by a person of ordinary skill in the art in view of the specification and prosecution history, unless those sources show an intent to depart from such meaning. No terms need to be construed for the purposes of this

declaration. I reserve the right to respond to any constructions offered by the Patent Owner or adopted by the Board.

23. I further understand from counsel that inventors may draft their claims as a means or step for performing a specified function, but that they must also disclose in the specification the structure that performs the function, or that claim is indefinite. I also understand that construing a means-plus-function claim requires identifying the claimed function and determining what structure, if any, disclosed in the specification corresponds to the claimed function. I further understand that a term with a computer-implemented function must have a clearly linked structure in the form of an algorithm. I understand that if I cannot identify such an algorithm, the term lacks a clearly linked structure and is therefore indefinite. I further understand that a general-purpose computer cannot be the structure for a computer-implemented function because this amounts to purely functional claiming.

24. I understand that in IPR a claim is unpatentable if it is anticipated or obvious. Anticipation of a claim requires that every element of a claim be disclosed expressly or inherently in a single prior art reference, arranged in the prior art reference as arranged in the claim. An element is inherent if it is necessarily present in the reference.

25. It is my understanding that a patent claim is unpatentable for obviousness if the claimed invention would have been obvious at the time the invention was made to a person having ordinary skill in the art (POSA).

26. I understand that the following factors are considered: (1) the scope and content of the prior art; (2) the differences between the art and the claims at issue; (3) the level of ordinary skill in the art at the time the invention of the asserted patent was made; and (4) objective evidence of nonobviousness. In order to determine whether claim elements are found in the prior art, it is necessary to compare the properly construed claim language of the patent with the teachings of the prior art.

27. I understand that certain factors—often called “secondary considerations”—may support or rebut an assertion of obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the alleged invention, skepticism of those having ordinary skill in the art at the time of the alleged invention, unexpected results of the alleged invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I further understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention.

28. I further understand that a claim can be found obvious if it unites old elements with no change to their respective functions or alters prior art by mere substitution of one element for another known in the field, with that combination yielding predictable results. While it may be helpful to identify a reason for this combination, common sense should guide, and there is no rigid requirement for a teaching, suggestion, or motivation to combine. When a product is available, design incentives and other market forces can prompt variations of it, either in the same field or different one. If a person having ordinary skill in the relevant art can implement a predictable variation, obviousness likely bars patentability. Similarly, if a technique has been used to improve one device, and a person having ordinary skill in the art would recognize that the technique would improve similar devices in the same way, use of the technique is obvious. I further understand that a claim may be obvious if common sense directs one to combine multiple prior art references or add missing features to reproduce the alleged invention recited in the claims.

29. I also understand the following rationale may support a finding of obviousness:

- a. Combining prior art elements according to known methods to yield predictable results;
- b. Simple substitution of one known element for another to obtain predictable results;

c. Use of known technique to improve similar devices (methods, or products) in the same way;

d. Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

e. “Obvious to try” — choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

f. Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;

g. Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

30. I also understand that it is impermissible to use the claimed invention itself as a blueprint for piecing together elements in the art. In other words, it is impermissible to use hindsight reconstruction to pick and choose among disclosures in the prior art to reconstruct the claimed invention.

IV. DESCRIPTION OF THE TECHNOLOGY

A. Internet Communications in General

31. The Internet allows devices, such as servers, smartphones, and tablets, to communicate by exchanging digital information in the form of packets across a global system of interconnected computer networks. To exchange information reliably and effectively, each device and network must use a standard set of rules, messages, and messaging formats, known as communication “protocols.” Ex.1024, 23, 417.

32. The term “Internet” is a contraction of the phrase “interconnected network.” The Internet is not one network but is instead many interconnected networks. It consists of many groups of networks, including the following examples, interconnected at network access points.

- Backbones (*e.g.*, AT&T, Verizon, and Sprint)
- Regional Networks
- Local Networks (*e.g.*, Cornell computer network)

33. The first piece of the Internet was *ARPANET*. It was built by DARPA in the late 1960s to interconnect research centers, military bases, and government locations of various types. The Defense Communication Agency (DCA) converted ARPANET into a research tool in 1975. ARPANET was split into MILNET (for military bases) and ARPANET (for research centers) in 1983.

34. One of the primary foci of the ARPANET research was the development of interconnection protocols. The first milestone in this area was the

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Network Control Program (NCP - 1969). As a monolithic program, it exhibited scalability problems as the Internet evolved. In the 1970s, NCP was broken up into TCP (the Transmission Control Protocol) and IP (the Internet Protocol). This was the beginning of the suite of protocols that we now referred to as TCP/IP.

35. In 1983 DARPA insisted that all computers wanting to connect to ARPANET use TCP/IP. This was a critical step, as it allowed for different computer technologies to share the Internet.

36. ARPANET was eventually replaced by NSFNET, in part to reflect the increasing prominence of academic research. In 1986, the National Science Foundation (NSF) built a backbone network to interconnect four NSF-funded regional supercomputer centers and the National Center for Atmospheric Research (NCAR). The original architecture consisted of

- backbone
- mid-level networks (regional, discipline-based, and supercomputer consortia)
- campus networks

37. It is important to note that NSFNET traffic was limited to non-commercial use.

38. The first backbone used 56 Kbps leased lines. The second backbone, developed by NSF, Merit, IBM, and MCI and installed in 1988, used 448 Kbps leased circuits to interconnect 13 nodal switching centers. The third backbone (1989)

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began using T1 lines (primarily fiber optic) and has since migrated to T3 (45 Mbps - 1992).

39. The migration to gigabit speeds was fueled in part by a surge in commercial activities that began in April 1995, when the U.S. Government stopped its funding of NSFNET and allowed the presence of commercial activity.

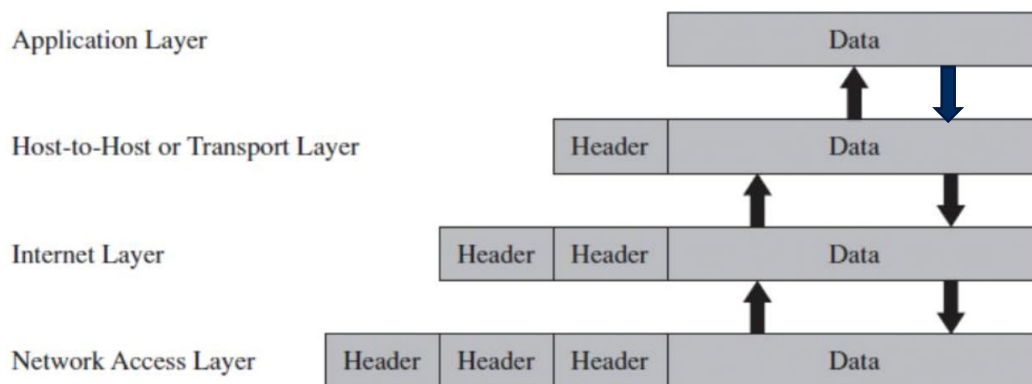
40. The Internet communication technologies used today are based on protocols developed decades ago including the transmission control protocol (TCP) and Internet protocol (IP), the more prominent members of the “TCP/IP” protocol suite (a suite that actually includes dozens of protocols). *See* Ex.1025; Ex.1024, 37.

41. TCP/IP aimed to ensure reliable, low-latency, end-to-end data transmission between network-connected devices by dividing transmissions into “packets” and specifying rules for transmitting, routing, and receiving packetized messages. *See* Ex.1024, 39, 261. Latency, as it relates to live streaming, is the time delay between when an event occurs and when the distributed content related to that event, e.g., video, audio, or other data, is displayed on a user device. *See, e.g.,* Ex.1012, 2:27-31 (“[L]atency,’ *i.e.*, the delay between a first user generating a live video stream for transmission via the Internet and a second user receiving a copy of the live video stream via the Internet for viewing.”).

42. Implementation of TCP/IP communications in operating system software often relies on an application programming interface (API). *See* Ex.1026,

5. APIs expose functions that allow applications to exchange information over the Internet while handling the low-level details of encapsulation, formatting, transmitting, and receiving TCP segments and IP packets. By leveraging APIs, developers can build networked applications that operate on underlying network infrastructure without the need for a sophisticated understanding of lower-level implementation details, which are managed by the “protocol stack” within the operating system. *See* Ex.1024, 377.

43. Generally speaking, packets from higher layer protocols are placed in the information fields of the next lower-layer packets. This process, called “encapsulation,” is depicted below.



44. To access this stack structure, APIs for TCP/IP communication generally rely on abstractions such as “ports” and “sockets”. Ex.1024, 378. A port is a number that is assigned to uniquely identify a connection endpoint and associate

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the connection with a specific process or service in the host software. *Id.* For example, port 80 is uniformly used to represent Hypertext Transfer Protocol (HTTP) connections used on the World Wide Web to serve webpages. *See id.* Sockets are software structures that represent the connection for sending and receiving data across the network. *Id.*

45. An application designed to exchange data over the Internet (*e.g.*, a web browser) will first open a socket with a specific IP address and transport layer port in order to establish a connection with a remote endpoint. *See id.*, 378-379. The application may then read and write to the opened socket using API functions that implement the low-level details of the TCP/IP protocol required to exchange data over the network. *See id.*, 333-335. APIs for establishing and communicating using sockets were developed as early as 1983 with the “Berkeley sockets” API, part of version 4.2 of the BSD Unix operating system. Modern operating systems continue to implement similar APIs based on the Berkeley socket interface.

B. Network Communication Models

46. Communications involving multiple hosts, each with multiple ports (and thus multiple sockets) may take on various topologies, which characterize the relationships between the hosts and/or ports involved in a connection. Ex.1024, 12-15. Possible connection topologies include one-to-one, one-to-many, and many-to-many. *See id.*, 12-15, 270. A one-to-one connection topology exists when only one

source host and one destination host are involved. There, the communication is between one source socket (representing the source host's IP address and port number) and one destination socket (representing the destination host's IP address and port number). *Id.*, 392-395. When multiple destination hosts wish to receive information from the same source host, the connection topology may be one-to-many or many-to-many. *See id.*, 12-15.

47. In a one-to-many topology, the communication may be from the same source socket at the source host to multiple destination sockets (one at each destination host). *See id.*, 1024, 12-15. A web server is a common example, where all users connect to the same socket (using port 80). *See id.*, 378, 435. Content Distribution Networks (CDNs) are another prominent example in which many destinations may be observing the same video event, such as the Olympics. Alternatively, the network topology may be many-to-many, where multiple source sockets are available to transmit information to multiple n sockets. *See id.*, 12-15, 242. In this topology, each destination socket may be assigned its own unique source socket, or multiple destination sockets may share a source socket, with different sets of destination sockets sharing different source sockets. *See id.*, 270.

48. Various protocols have been developed to accomplish one-to-many and many-to-many communications over a network. Examples include multicast addressing using the User Datagram Protocol (UDP) and "IP Multicast," which is

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an extension to the standard IP network-level protocol that enables sources to send a single copy of data to multiple devices that explicitly request the information. Ex.1024, 347, 350, 355. Once an IP Multicast user requests access to a specific multicast, the multicast messages pass to the TCP/IP protocol stack, making them available as input to the user's application (*e.g.*, a video viewer). *Id.*, 7.

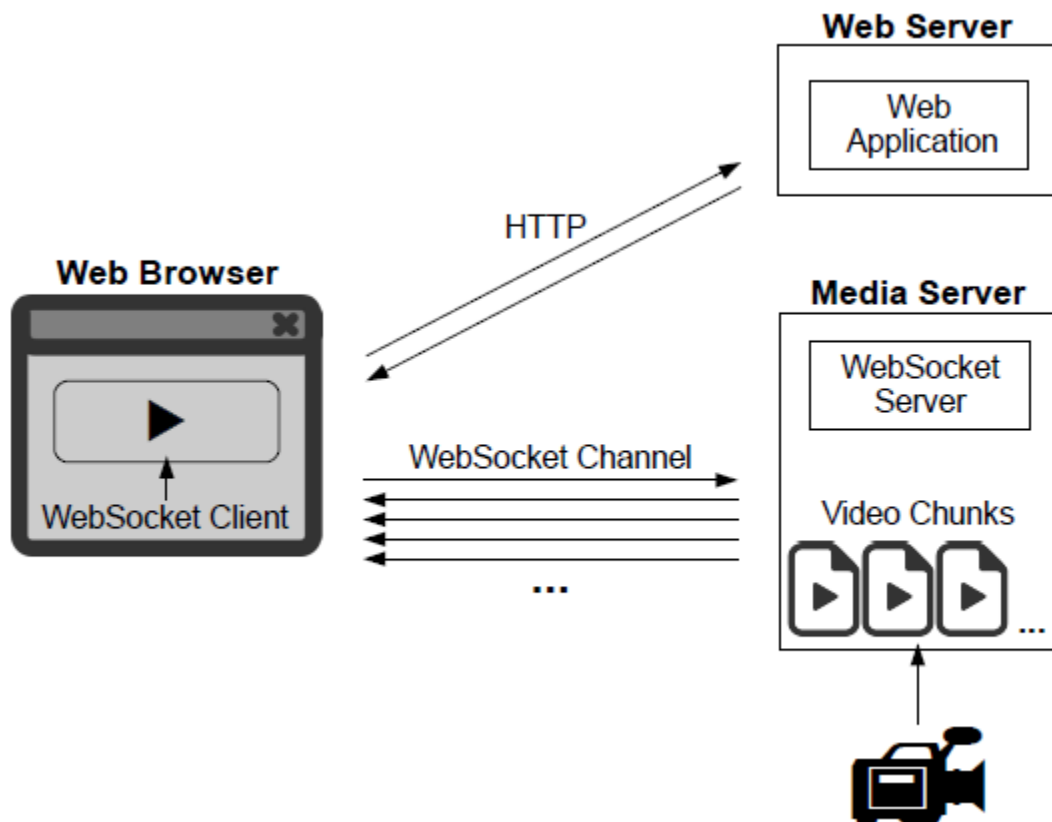
C. Webserver

49. Webservers have been a fundamental component of computer networks for decades. In fact, textbooks on computer networking had described web servers as being one of “the four key components of the Web,” along with HTML, HTTP, and browsers, and been widely available since at least 1993. Ex.1052, 64, 99. In practice, popular web servers included Apache and Microsoft Internet Information Server, for example. Ex.1052, 99.

50. At the most basic level, web servers are servers in a client-server architecture. They are designed to be responsive to HTTP commands, such as GET, POST, and PUT. Web servers can also facilitate communication between clients and servers through HTTP CONNECT. A POSA would have understood that web servers, “which implement the server side of HTTP, house Web objects, each addressable by a URL.” Ex.1052, 99. When a user enters the URL of a web page into the web browser of a client, the client sends a connection request to the

webserver, often in the form of an HTTP GET. The webserver establishes the connection and sends the requested web objects. Ex.1052, 9, 86, 99.

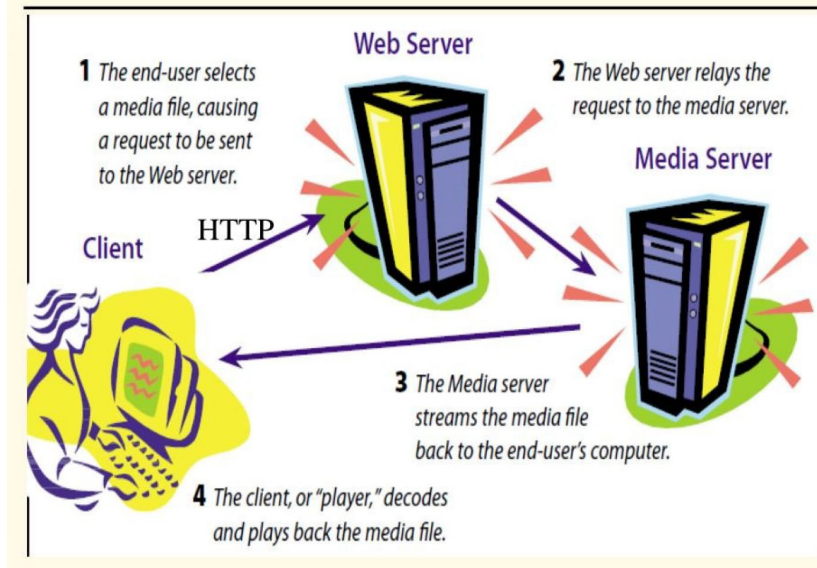
51. Use of webserver specifically between client devices, media sources, and socket servers, was also well-known. For example, Iacono, published in 2014, illustrates that it was known to arrange a webserver in the streaming context to facilitate communication between clients and media servers. Ex.1056, 4.



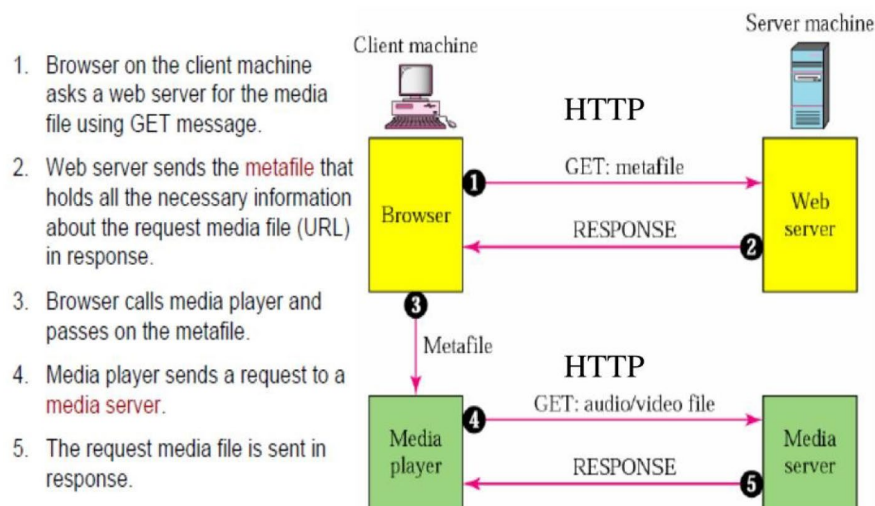
Id., Fig. 2. Specifically, Iacono provides that “the JavaScript code on the Web Appication [sic] will attempt to start the communication via WebSocket with the Media Server.” *Id.*, 4.

52. As another example, a 2014 lecture on basic media distribution architecture similarly illustrates the known arrangement of webservers in the streaming context to facilitate communication between clients and media servers:

B2. Web Server-Media Server Mechanism



B3. Media Server with Metafile Mechanism



Media server can use any of the transport protocols to transfer the media file to the user.

53. Webservers are described in many more references, including, but not limited to, Ellis, Spivey, and Herzog. *See generally*, §VIII. I have been teaching the theory and design of web servers in my computer networking classes for over twenty years.

D. Protocols for Real-time or Low-latency Data Transmission

54. In addition to the TCP/IP protocols described above, before the '088, developers and standard development organizers had created additional protocols to facilitate real-time transport of video and other data over the Internet.

1. Real-Time Transport Protocol (RTP)

55. RTP is a communication protocol originally developed in 1996 that optimizes live audio and video data transmission. *See* Ex.1027; Ex.1028. RTP is commonly used in protocols requiring real-time audio and video data streaming over the Internet, such as the Voice Over Internet Protocol (VoIP). *See* Ex.1024, 400, 402.

2. HTTP Polling

56. HTTP is a protocol that is built on top of TCP/IP. Ex.1024, 392. HTTPS is a secure version of HTTP that uses encryption and verification to protect data. HTTP polling consists of a sequence of request-response messages between a client and a server. Upon receiving a request, the server responds with a new message, if there is one, or with an empty response if no new message is available for that client. After a short time Δ , called the polling interval, the client polls the server again to see if any new messages are available. *See* Ex.1024, 45-46. Various real-time

applications including chat, online games, and text messaging used HTTP polling in the 2016 timeframe.

3. **WebSocket**

57. WebSocket is a client-server communication protocol standardized by the Internet Engineering Task Force in 2011 that is bi-directional, full-duplex, and continuous. *See* Ex.1029; Ex.1030. Real-time web applications commonly feature WebSocket connections to facilitate a persistent stream of data from a backend server to the end client. Ex.1030; Ex.1018 ¶6. Once a WebSocket connection is established between a server and a client, the client receives instant updates from the server without the need to poll. Ex.1030.

58. In any content distribution system, the distribution server needs to transmit data to receiving client devices. If the system uses sockets to communicate, by way of analogy, a transmit server is like a restaurant, and the client devices are all homes, and each buildings' door is a socket. *See* Ex.1022, 87. Food is delivered out of the restaurant's door, *i.e.*, socket, and accepted through each separate homes' door, *i.e.*, individual sockets. *Id.* The roads between the restaurant and homes are the internet's TCP protocol. Moreover, each home can send someone or something to the restaurant--it is not a one-way communication system. *Id.*, 160. This connection is typically established when a client device sends a request to a running server process (live streaming content, *i.e.*, open restaurant) to "initiate a TCP connection

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to the server” (knocks on the door). *Id.*, 160-61. To do so, the client device must be able to specify “the address of the server process, namely, the IP address of the server host and the port number of the server process.” *Id.* Afterwards, the connection can be established at the socket with the identified IP address and port number. Thus, the same server process accepts connections to multiple destination sockets (client devices) which creates a one-to-many topography.

4. **Stream Control Transmission Protocol (SCTP)**

59. SCTP is an IP transport layer protocol adopted in 2001 that provides reliable, in-sequence data transport. *See* Ex.1031; Ex.1032. As a message-oriented communication protocol, SCTP is ideally suited for applications requiring multiple, independent streams of messages to be delivered in parallel—in other words, “multi-streamed”—because the protocol does not require a dedicated socket for each data stream. *See* Ex.1033. SCTP’s multi-streaming capability is particularly useful for controlling congestion in multimedia streaming over the Internet. Ex.1034.

5. **Real-Time Messaging Protocol (RTMP)**

60. RTMP is a low-latency data transmission protocol in use as of at least 2012 that is designed to support live online streaming in social media platforms, streaming platforms, and media servers. *See* Ex.1035, 3; Ex.1036, 1. RTMP data transmission begins with a client-initiated handshake between the client and server. Ex.1036, 7. Once a connection is established between the client and server, RTMP

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operates as a bi-directional multiplexing service over TCP to stream live and on-demand video or audio data from the server to the client device. *See* Ex.1035, 3. The Challenged Patent uses this traditional streaming protocol:

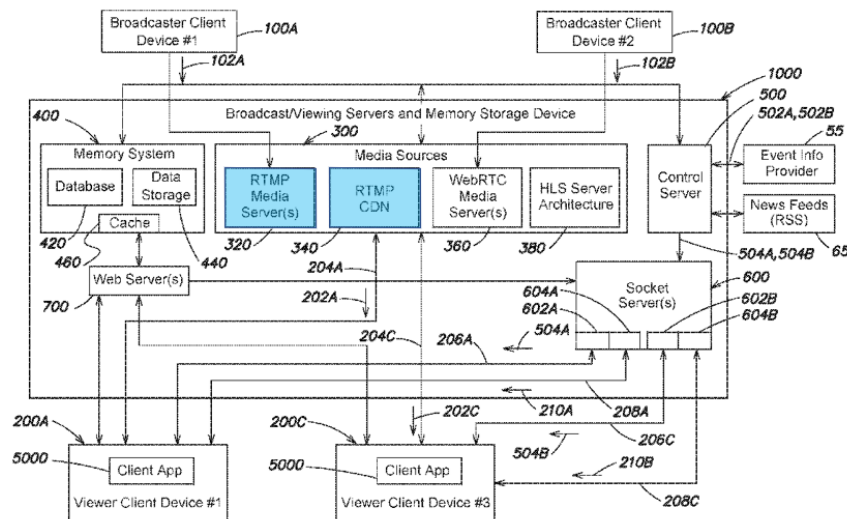


FIG. 2

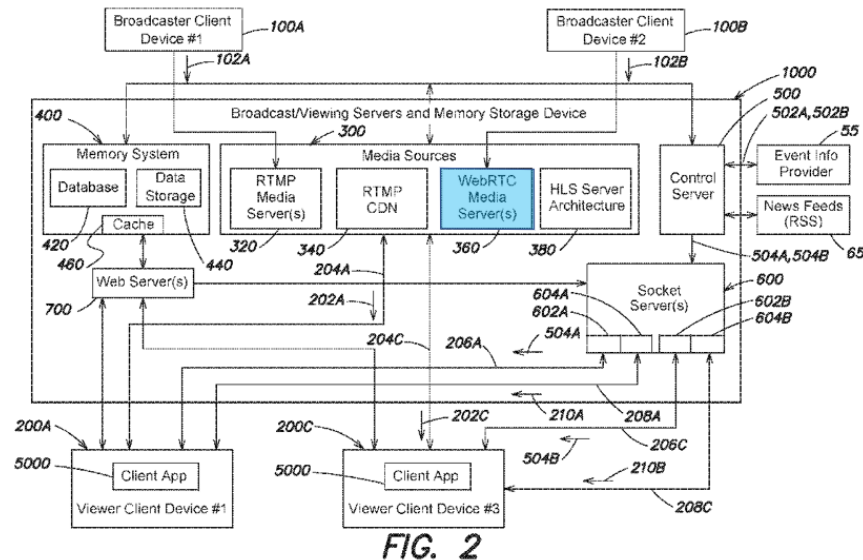
See, e.g., Ex.1012, Fig. 2.

6. Web Real-Time Communication (WebRTC)

61. WebRTC is a technology first implemented in 2011 that enables real-time audio and video streaming within web browsers and mobile applications without an intermediary. Ex.1037, 1; Ex.1038, 3. WebRTC facilitates peer-to-peer communications between mobile device web browsers by creating an `RTCPeerConnection`, a signal through which mobile devices exchange hardware and codec compatibility information. Ex.1037. Once a connection between devices is created, WebRTC offers video calling, video chat, and file-sharing capability with

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minimal plugins. Ex.1038, 3. The Challenged Patent also uses this traditional streaming protocol:



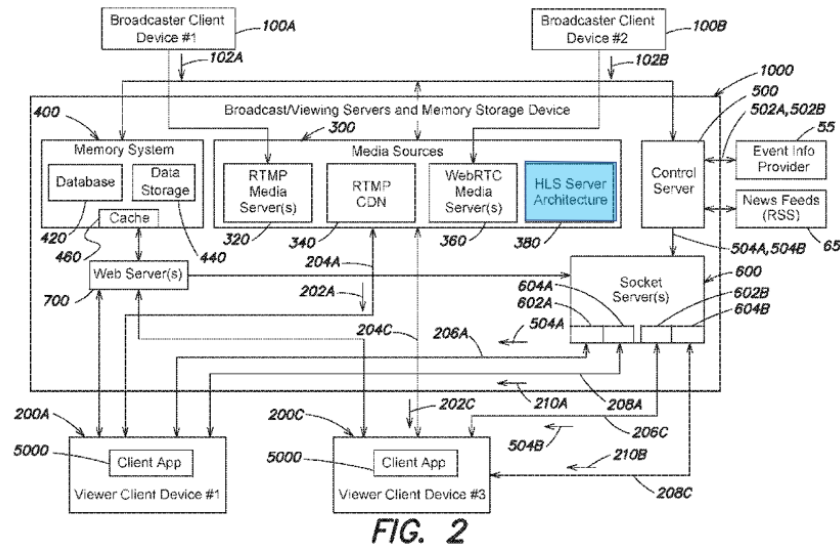
See, e.g., Ex.1012, Fig. 2.

7. Dynamic Adaptive Streaming Over HTTP (“DASH” or “MPEG-DASH”) / HTTP Live Streaming (HLS)

62. MPEG-DASH is an adaptive streaming protocol adopted in 2011 that enables segmented multimedia content delivery at different bit rates. Ex.1039, Abstract; Ex.1040, 2. In the MPEG-DASH process, an origin server pushes encoded, segmented stream data to the device over the Internet, as well as manifest files identifying alternative streams available to the player and their corresponding URLs. See Ex.1040, 2. Once the user chooses a stream of the desired bit-rate, a web server transmits the data in the selected bit-rate stream to produce smooth playback on the user’s device. See Ex.1041, 1; Ex.1035, 4. HLS, another adaptive streaming protocol adopted in 2009, functions similarly and can be used in many of the same

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applications as MPEG-DASH. Ex.1041, 1. The Challenged Patent also uses this traditional streaming protocol:



See, e.g., Ex.1012, Fig. 2.

E. Internet Live Video Streaming

63. After the World Wide Web became widely available to the public in 1993, the Internet quickly evolved from a predominantly text-based medium to one that facilitated multimedia content delivery. *See* Ex.1024, 16-17; Ex.1042. In the late 2000s, video streaming services also developed technologies for dynamically combining video streams with relevant text-based data. For example, in 2007, YouTube implemented an “overlay” system that superimposed advertising content relevant to the video onto a video stream without interrupting playback. Ex.1044, 1.

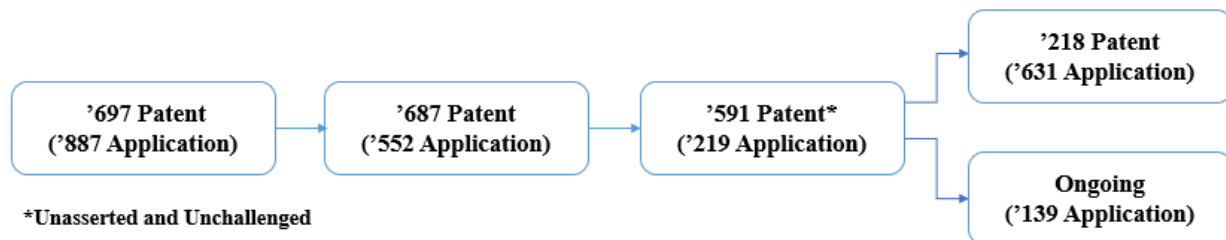
64. Not long after, numerous services developed tools for streaming live (rather than prerecorded) media over the Internet to multiple users in real time. Such

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examples available to the public before the Challenged Patents were filed included Livestream (founded in 2007), Twitch (same), Wowza (same), TikTok (formerly Musical.ly, 2014), Periscope (2015), and Facebook Live (2016). *See* Ex.1012, 1:62-2:18.

V. OVERVIEW OF THE CHALLENGED PATENTS

65. I previously submitted a declaration in IPR2024-01305 and IPR2024-01307 (related to U.S. Patent No. 10,805,687), IPR2024-01308 and IPR2024-01309 (related to U.S. Patent No. 10,425,697), and IPR2024-01310 and IPR2024-01311 (related to U.S. Patent No. 11,039,218). Those patents are continuations, or continuations of continuations of one another. Those patents share a common specification, and the claims substantially overlap. Their family relationship is shown below:



66. The Challenged Patent (the '088) is from a different family than the '687, '697, and '218. The '088 is assigned to the same assignee and lists the same inventors as the '687, '697, and '218. The specification of the '088 is likewise very similar to the specification of the '687, '697, and '218 including most of the same

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description verbatim. Some differences between the '088 specification and the '687, '697, and '218 include the following additions to and omissions from the '088:

- Additions:
 - Ex.1012, 7:7-49 (summary of single screen experience).
 - *Id.*, 9:59-62 (reference to Appendix A which includes a YAML file associated with an API).
 - *Id.*, 12:14-38 (brief description of Figures 28-32).
 - *Id.*, 54:13-63:35 (detailed description of single screen experience).
 - *Id.*, Figures 28-32 (figures related to single screen experience).
- Omissions:
 - Ex.1009, 9:16-10:43 (summary of example system 1000).

A. Alleged Problem in the Art

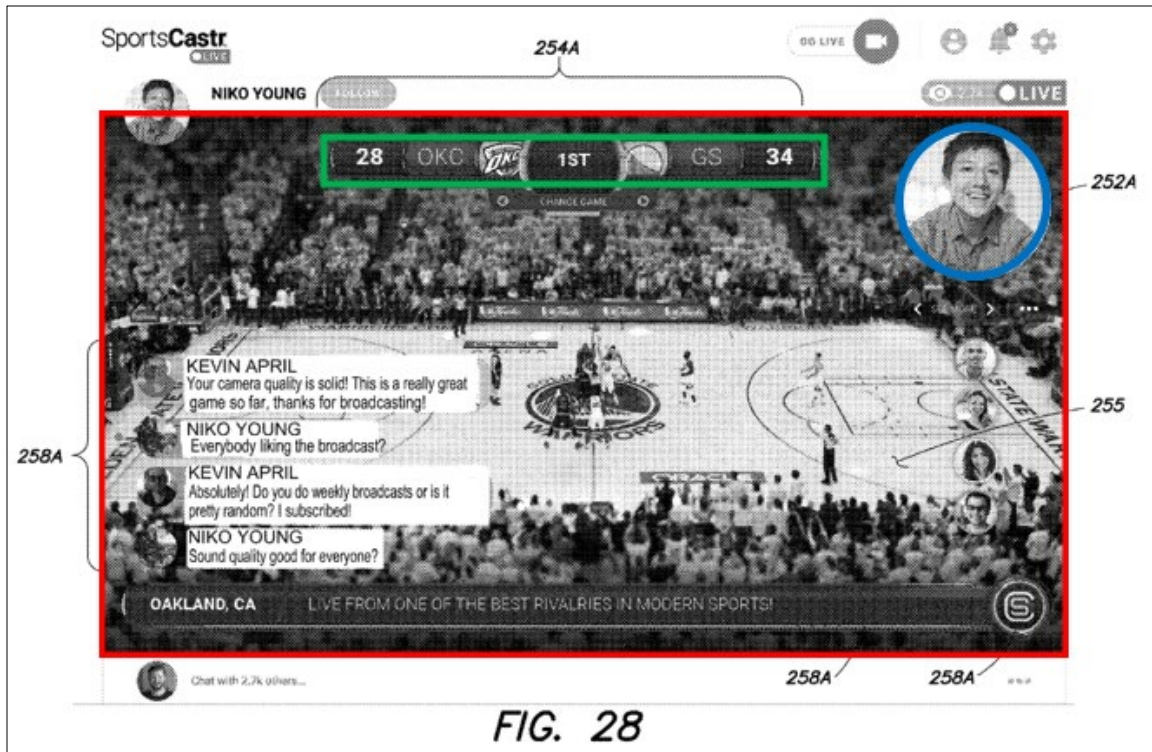
67. According to the '088, there was a need to improve “conventional techniques for transmission of digital content via the Internet” that included a “latency” problem. Ex.1012, 2:22-31. Latency is “the delay between a first user generating a live video stream for transmission via the Internet and a second user receiving a copy of the live video stream via the Internet for viewing.” *Id.* Specifically, “live video streams with relatively high quality (e.g., high definition HD and high bit rate, such as 2 to 5 megabits per second),” may have difficulties “synchronizing such ... copies of a live video stream” amongst a large number of

viewers. *Id.*, 2:34-47. The '088 purports to solve this problem, ensuring a “low-latency viewing experience for significant numbers of viewers” and “appropriate synchronization of event information across all broadcasters of an event and their associated viewers.” *Id.*, 5:19-28.

B. Alleged Invention of the Challenged Patents

68. In my opinion, the '088 is directed to a “server and memory storage architecture” for obtaining, and providing to viewers, (1) an “audio and/or visual feed” including “commentary associated with [a]... live event” and (2) a “separate event data feed including real time information associated with the ... live event.” *Id.*, 2:65-3:11; *see also id.*, 7:50-8:4, Figs. 2, 28.

69. In some embodiments, as a viewer watches the displayed video, they provide their video-based commentary based on the video. *Id.*, 55:1-20, Fig. 28. The viewer’s client device creates a composite outgoing stream of the video and the viewer’s commentary and transmits this integrated stream to a media server, to which other users can receive copies of the integrated stream. *Id.*



Id., Fig. 28.

70. A block diagram of the system is shown in Figure 2, which depicts viewer client devices, media sources, web servers, a control server, a socket server, event sockets, an event information provider, and a memory system.

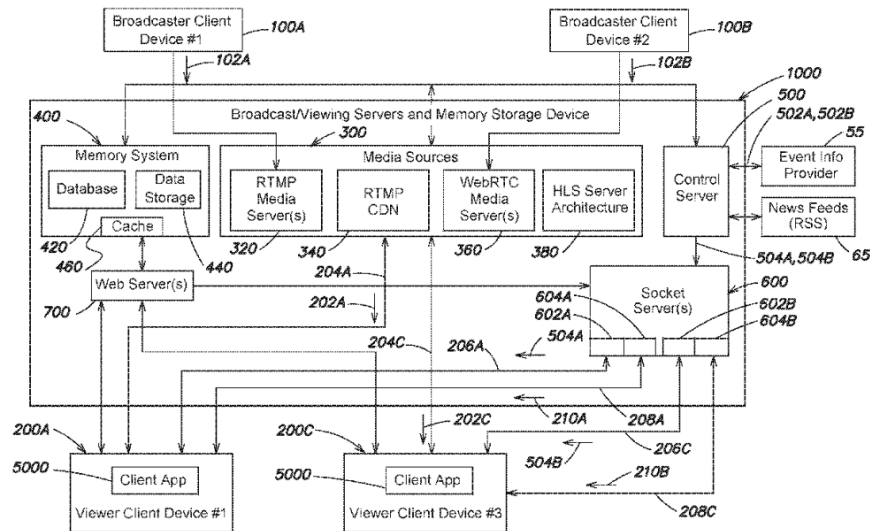


FIG. 2

Id., Fig. 2. I address how the '088 describes certain components relevant to the claims below.

71. The '088 describes media sources as generic “computer servers” comprising known components such as “processors, memory, and ... communication interfaces.” *Id.*, 18:55-61, 65:15-25. Although in some implementations, the media sources may include media servers directed to specific known protocols, such as RTMP and HLS, the media sources’ purpose is to “receive a live stream of video-based commentary from a given broadcaster client device and provide copies of the live stream of video-based commentary to one or more viewer client devices.” *Id.*

72. The '088 describes a control server as generic server equipment comprising one or more processors, memory devices, and communication interfaces, *id.*, 65:15-25, that retrieves “event information” from an “event information

provider” to pass to the socket server, discussed below. *Id.* 19:22-29, 21:18-33. The event information is “germane to” a particular “live sporting event,” *e.g.*, the event’s score information. *Id.* 21:18-33.

73. The ’088 describes a web server as a generic server designed to facilitate communications “between the servers/memory storage devices [] and one or more mobile broadcaster/viewer client device executing the client app.” *Id.* 18:26-35. According to the ’088, “much of the instructive communication between the client devices and the servers/memory storage devices [] occurs via the web server(s).” *Id.* 18:35-38. The webserver also facilitates communications “to and from web-based client devices (that access the web server(s) via a web portal at a particular URL).” *Id.* 18:33-35. The web server accomplishes this, in one implementation, by “select[ing] a particular media server of the media sources [] to which a given broadcaster connects to provide the broadcaster’s live stream of digital content” *Id.* 19:8-18.

74. The ’088 describes socket server(s) as generic servers. *Id.* 65:15-25. The socket server’s purpose is to “facilitate communication” of “synchronized event information retrieved by the control server” between the control server and the viewer client devices. *Id.* 19:48-59. The socket server uses “one or more sockets ... dedicated to the particular event” allowing viewer client devices “to establish an event information channel with the socket server.” *Id.* 19:53-59. The socket server

then shares event information in “event messages” via the event information channel “in a synchronized manner” to all viewers “following the particular event.” *Id.* The socket server may facilitate communication of “chat messages” in a similar manner. *Id.* 19:60-20:25.

75. The '088 explains that the “connections between a given client device and a particular socket of a socket server are persistent authenticated connections (e.g., with IP-based fingerprint identifiers for anonymous users)” and that “event messages” among other data carried on a channel between a client and a socket are “data packets including,” e.g., “event information.” *Id.* 20:26-29, 20:35-42. Each event socket has a corresponding “event identifier” (either an “EventID” or “StreamID”) that the viewer client device “uses ... to connect to the [] socket,” e.g., by using a “URL including the ... EventID in a path of the URL.” *Id.* 21:34-54. Like known servers before the alleged invention of the '088, messages carried on channels between sockets of the “socket server” use traditional IP mechanisms, e.g., data packets, and each “socket” is uniquely addressable, e.g., by using an identifier that may be contained, e.g., in a URL. *Id.* 20:26-42, 21:34-54.

76. According to the '088, a “‘communication channel’ refers to a physical or logical connection over a transmission medium to convey information signals from one or more senders to one or more receivers,” which the '088 notes “would be readily appreciated in the relevant arts.” *Id.*, 5:29-36. As examples of Internet

communication channels, the '088 describes generic Internet communication channels between a sender and receiver: (1) a “video” channel between a media server and a viewer client device to convey video-based commentary, (2) an “event information” channel between a socket and the client device to convey event information, and (3) a “chat/system event” channel between another socket and the client device to convey chat and other information. *Id.* 5:36-55.

77. Although the '088 claims that the foregoing server architecture and its functionality are “inventive,” as explained in more detail herein, there is a reasonable likelihood that the prior art discloses or renders obvious every limitation of at least one the Challenged Claims.

VI. LEVEL OF ORDINARY SKILL IN THE ART

78. I understand that a POSA is a hypothetical person presumed to have the skill and experience of an ordinary worker in the field at the time of the alleged invention.

79. I understand that there are multiple factors relevant to determining the level of ordinary skill in the pertinent art at the time of the alleged invention. These factors include the education of active workers in the field, the sophistication of the technology, the type of problems encountered in the art, and the prior art solutions to those problems. I further understand that the POSA can embody the knowledge and experience of multiple individuals with different educations and backgrounds.

80. In determining the characteristics of a hypothetical POSA of the Challenged Patent at the time of the claimed invention, I considered several things, including the type of problems encountered in this field, and the rapidity with which innovations were made. I also considered the sophistication of the technology involved, and the educational background and experience of those actively working in the field, and the level of education that would be necessary to understand the Challenged Patent.

81. Finally, I placed myself back in the relevant period of time and considered the state of the art and the level of skill of the engineers working in this field at that time.

82. In my opinion, a POSA at the time of the alleged invention described in the '088 would have at least a Bachelor's degree in electrical engineering, computer engineering, or a related field, as well as a basic understanding of live streaming technology, and at least four years of experience with researching, designing, implementing, or testing live streaming technology. Additional education or experience in related fields could compensate for deficits in the above qualifications. By this definition, as of August 2005 I exceeded these qualifications.

VII. CLAIM CONSTRUCTION

A. The '088

83. For purposes of this declaration, I have been asked to apply Patent Owner's apparent understanding of the terms as reflected in its infringement contentions. *See* Ex.1057. I reserve the right to respond to any specific construction proposed by Patent Owner that may depart from its apparent understanding of the claims as reflected in its infringement contentions. However, my ultimate opinions of invalidity of the Challenged Claims would not change under any reasonable construction of the claims, to the extent that the claims can be understood by a POSA.

84. The fact that I have applied Patent Owner's apparent understanding of the terms does not mean that I necessarily agree that a POSA would have understood the terms in the same manner, nor does it mean I necessarily agree that a POSA would have found the scope of the claim terms definite.

VIII. SUMMARY OF THE PRIOR ART

A. U.S. Patent Pub. No. 2015/0163379 ("Herzog")

85. Herzog is a U.S. Patent Publication that was published on June 11, 2015. Herzog is generally directed to a content delivery system and network architecture that delivers live video and audio streams of sporting events to users while also providing meta-data associated with the sporting event to a user over a separate feed, where the video/audio stream and meta-data are synchronized. *See* Ex.1015, Abstract, ¶¶3, 18.

86. Herzog states that “a need exists for improved technologies for synchronizing information (for example, HLS video and meta-data) that is published and processed at different rates.” *Id.* ¶4. Herzog explains that it “may be desirable to provide a mobile device, such as a tablet” with a “video that is streamed live from the Internet to a client player using HTTP Live Streaming (also known as HLS)” while also providing “additional information related to the HLS video,” such as meta-data. *Id.* ¶3.

87. Herzog uses an “Indianapolis Car Race” as a primary example illustrating how its system transmits live “video, audio, and meta-data ... from a sports venue via different communication paths,” to a client device, but notes its system can be applied to any live sporting event. *Id.* ¶¶16, 45, 83. Herzog’s Figure 4, shown below, depicts an illustrative streaming network:

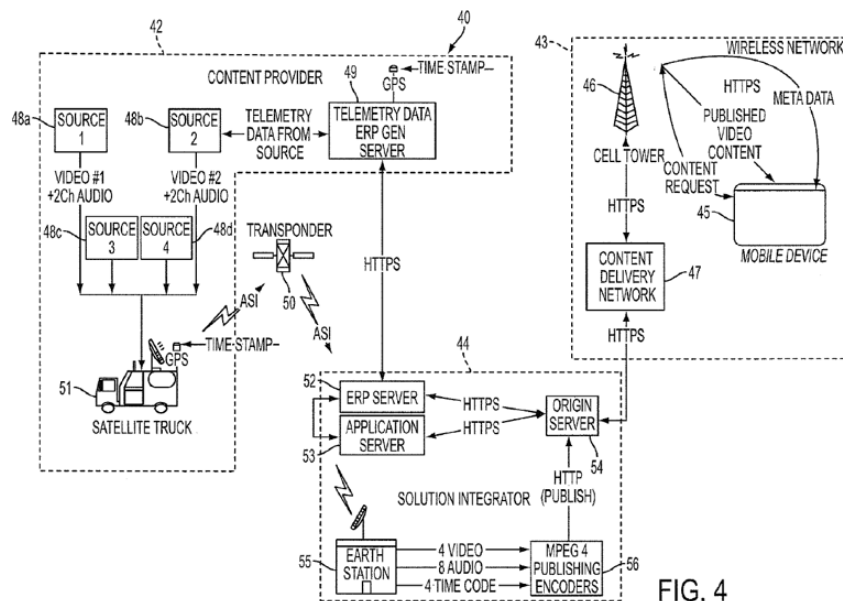


FIG. 4

Id., Fig. 4.

88. Herzog's Figure 4 shows a content provider, a solutions integrator, and a wireless network. *Id.* ¶¶43, 45. The content provider "is configured to provide video and audio data of an event occurring in real time and provide telemetry data (meta-data) including several parameters changing during the event." *Id.* ¶45. The meta-data "provides additional information related to the HLS video" and in the context of a car race, such as the example shown in Figure 4, "may include varying parameters regarding the status of each car and driver in the race" including "lap number, car speed and acceleration, tire pressure, etc." *Id.* ¶¶3, 45. Video and audio data includes "multiple video/audio streams of race cars and drivers, as they are imaged at different locations on the race track." *Id.*

89. Figure 4 shows "four video/audio streams provided from four different imaging sources, namely sources 48a-48d." *Id.* ¶46. "As shown, each source provides one video stream and two channels of audio" *Id.* These channels are transmitted to an Enhanced Result Protocol (ERP) generator server configured to provide telemetry data in HTTPS format to the solutions integrator. *Id.* ¶47. The solutions integrator is depicted in another embodiment below in Figure 6:

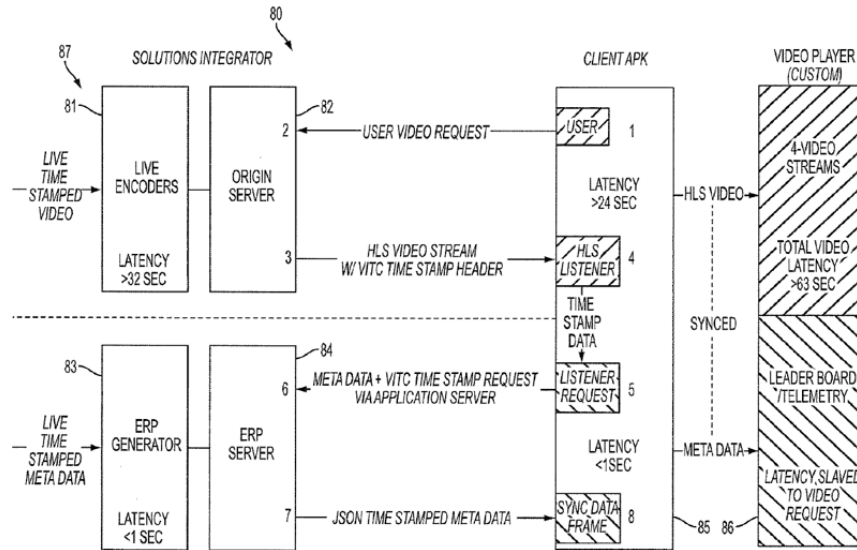


FIG. 6

Id., Fig. 6.

90. Once live encoders receive “time stamped video/audio data and convert the same into an MPEG stream with a VITC time stamp header,” they then send the data to an origin server to “publish[] the data as an HLS video stream with a VITC time stamp header.” *Id.* ¶67. In parallel, the ERP generator extracts various parameters from the live time stamped meta-data, then sends those parameters to the ERP server for publishing “in an HTTPS communications format,” such as a .JSON time stamp. *Id.* ¶¶67-68. At this point, the data is ready to be streamed to a client device upon request by a client application package (APK).

91. To begin streaming, a client device “initiates a video request of one or more channels of video/audio for viewing a live event on the device display.” *Id.* ¶70. The origin server receives the request and begins “streaming HLS video of the live event with the VITC time stamp header to the client application.” *Id.* ¶¶71-72.

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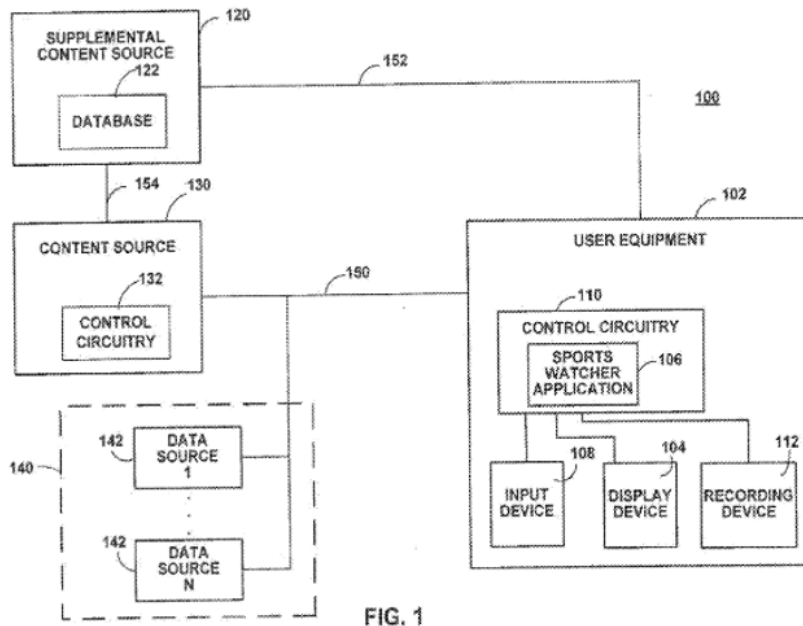
Upon viewing a video of the live event, a user can “initiate[] a request” to the ERP server “for meta-data that is associated with the VITC time stamp of a particular video channel on the display of the video player.” *Id.* ¶¶74-75. In response, the ERP server transmits synchronized, .JSON-time-stamped meta-data to the client application for display on the video player. *Id.* ¶77. As shown above in wireless network 43, the meta-data is then provided through the origin server to the user device “through one or more networks.” *Id.* ¶¶3, 27, 51. At the user device, “all the data may be displayed ... in correct time sync” because the “video and audio data and the meta-data are both time stamped with consistent (e.g., GPS) timing protocols.” *Id.* ¶18.

92. Herzog also discloses that a general server can be substituted for several servers used to execute a specific function. *Id.* ¶66 (describing a “solutions integrator” as “more generally, a server capable of receiving two types of signals, namely RF video/audio signals and HTTPS signals ...”).

B. U.S. Patent Pub. No. 2014/0229992 (“Ellis”)

93. Ellis is a U.S. Patent Publication that was published on August 14, 2014. Ex.1016, Cover. Ellis is generally directed to systems and methods that enhance “sports-related media content access and display.” *Id.*, Abstract. Ellis discloses an interactive system for watching sports content, including “wagering and fantasy league support.” *Id.*

94. Ellis identified the need for current delivery systems to provide “a custom set of features and functionality for specific types of media content, such as sporting events” *Id.* ¶4. Ellis explained that the current systems “fail to take full advantage of today’s high-end user equipment devices.” *Id.* ¶5. To solve the above problems, Ellis discloses broadcasting systems and methods for “enhanced sports-related media content access and display.” *Id.*, Abstract. Ellis’s Figure 1 is an illustrative media system:



Id., Fig. 1.

95. As depicted, Ellis’s system contains a content source, a supplemental content source (“SCS”), data sources, user equipment, and a sports watcher application. *Id.*, Fig. 1. Even though the content source, SCS, and data sources “are shown in Fig. 1 as separate elements,” their “functionality may be combined into a

single mechanism” provided “from a single system at a single facility” or “their functionality may be provided by multiple systems at multiple facilities.” *Id.* ¶47.

96. Ellis describes how users connect to available video feeds by selecting a live event corresponding to a “source identifier (e.g., channel identifier),” as shown in Figure 2B:

220		230		
222	224	232	234	236
Tuner	Primary Source ID	Source ID	Type	Profile Score
1	<sourceid_2>	<sourceid_1>	Game	90
2	<sourceid_1>	<sourceid_2>	Game	95
3	<sourceid_8>	<sourceid_3>	Commentary	45
4	<sourceid_4>	<sourceid_4>	News	75
		<sourceid_5>	Movie	25
		<sourceid_6>	Movie	35
		<sourceid_7>	Highlights	65
		<sourceid_8>	Game	80

Id., ¶63, Fig. 2B.

97. Then, the content source distributes the live-event streams to multiple user devices over separate communication paths 150. *Id.* ¶¶39-40, Fig. 1. The content source can be “any suitable source of media content, such as, [an] ... Internet or network media/web server, or any other suitable ... system for originating or distributing passive or interactive content to user equipment 102.” *Id.* ¶40. User equipment includes “any equipment suitable for presenting media content to a user” including “computer equipment.” *Id.* ¶48. Communication path 150 may be a satellite, fiber-optic, cable, or any suitable wired or wireless path. *Id.* ¶45. For example, Ellis discloses IPTV, where the user may receive the content “on a

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particular network address (e.g., multicast address) on which an IP socket is currently joined.” *Id.* ¶74.

98. While the system provides the video feed over communication path 150, the SCS further provides real-time information over a separate communication path 152. *Id.* ¶¶41-42, Fig. 1. The SCS can be “any suitable content source configured to provide real-time sports scores and game summary information, ... spread and wagering data, and any other sports-related information to user equipment 102.” *Id.* ¶41. Communication path 152 may be a satellite, fiber-optic, cable, or any suitable wired or wireless path. *Id.* ¶45. Ellis explains that “in some embodiments, this sports-related information is provided to user equipment 102 as a plurality of real-time data feeds” where each “data feed may be individually accessed or subscribed to” *Id.* ¶41.

C. U.S. Patent Pub. No. 2016/0036910 (“Spivey”)

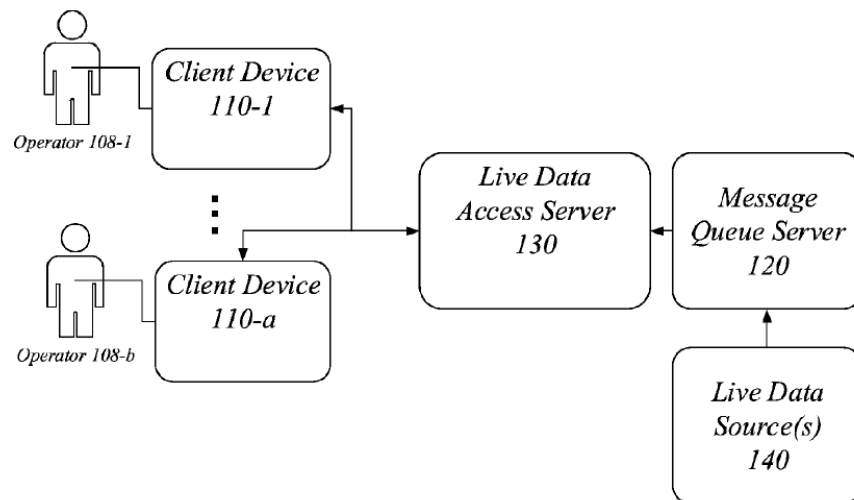
99. Spivey is a U.S. Patent Publication that published on February 4, 2016. Ex.1017, Cover. Spivey is directed to a live event data delivery system that can “broadcast live event data in real-time,” including live data of ongoing sporting events. *Id.*, Abstract, ¶27.

100. Spivey identifies the problem of increased demand for “live event data in real time.” *Id.* ¶2. As demand increased, “content providers may encounter obstacles to providing the data ..., in real-time, and with minimal delays.” *Id.*

Conventional techniques “may cause latency or a delay from the time the data is received by the live event data content provider to when the client receives the data.”

Id. ¶28.

101. Spivey addressed the above problem and disclosed an apparatus and methods that “increase the speed at which live event data (e.g. sports scores and breaking news), are broadcast ... using topic queues and open duplex communication connections, among other innovative techniques.” *Id.* ¶27. Spivey reduced real-time data delay from over 30 seconds to “an order of milliseconds.” *Id.* ¶28. Spivey Figure 1 “illustrates an embodiment of a system for broadcasting live event data:”



Id., ¶3, Fig. 1.

102. Figure 1 depicts live data source(s), a message queue server, a live data access server, and client devices (110-1...110-a). *Id.*, Fig. 1. Client devices (110-a) “may include, without limitation, ... a computer, ... digital television, ... or any

combination thereof.” *Id.* ¶¶35, 39 (“Client device 110 may include any electronic device as described above.”). The message queue server “may comprise one or more electronic devices capable of receiving, processing, and sending information for the system 100.” *Id.* ¶ 35 (detailing possible examples including “a server, a server array or server farm, a web server, a network server, [and] an Internet server” among others).

103. The live data source(s) “may include data feeds, generated by computing devices associated with a live event ...” *Id.* ¶37. Also, “human observers of a live event” may gather and enter data into “an interface that communicates the gathered data to message queue server 120 as live data.” *Id.*

104. In one embodiment, the message queue server 120 communicates directly with client devices (110-1...110-a) without the use of a live data access server. *Id.* ¶¶36, 38, 53. This embodiment, which divides the message queue server into at least two components, 450 and 410, is shown as operating environment 400, in Figure 4:

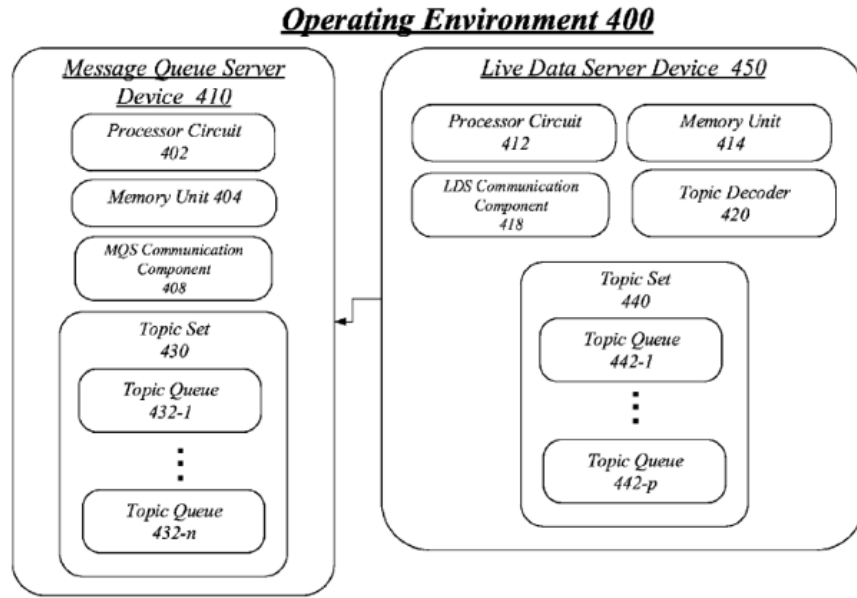


FIG. 4

Id. ¶53, Fig. 4.

105. In order to provide real-time data with reduced latency, LDS communication component receives “live data ... payloads.” *Id.* ¶55. The payloads include score information as well as “a player injury, an error, a record, a substitution, [or] statistic[s]” *Id.*, Claim 11, Fig. 10. Live data server device (“LDSD”) sorts the data, using attached topic labels. *Id.* ¶¶47, 49. A topic label could be a text string, “gamecenter.nfl.ravenssteelers,” indicating to the live data server to place the attached data payload in the topic queue for the Ravens/Steelers game. *Id.* ¶66. The LDSD then provides the data to the message queue server device (“MQSD”), which stores the data into the appropriate topic queues. *Id.* ¶¶47, 54-56.

106. Spivey describes topic queues as an event information storage location that “may be a queue data structure, ... where data payloads are placed” *Id.* ¶51.

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Topic queues are locations that “may be hierarchically related.” *Id.* ¶52. For example, “‘gamecenter.nfl’ may apply to all data about the National Football League,” and a dependent topic may be “‘gamecenter.nfl.ravenssteelers’ which may relate to a specific game between two NFL teams.” *Id.* “A third topic may be ‘gamecenter.nfl.ravenssteelers.stats’ which may relate to statistics about the specific game.” *Id.* ¶52.

107. Multiple topic queues for multiple different types of data (*e.g.*, statistics and plays) can exist for the same live event. *Id.* ¶¶52, 104 (“If there were a fourth topic queue ‘gamecenter.nfl.ravenssteelers.plays’, *i.e.* a topic at the same hierarchical level as gamecenter.nfl.ravenssteelers.statistics, the data payload for gamecenter.nfl.ravenssteelers.statistics would not be placed in this fourth topic queue.”).

108. Additionally, Spivey discloses “a plurality of aggregator components.” *Id.* ¶108, Fig. 14. The aggregator components (1460-m) may subscribe to any of the topic queues as discussed above, for example, “gamecenter.nfl.ravenssteelers.plays.” *Id.* Among other features, the aggregator component (1460) may consolidate data from multiple topic queues “into an aggregated topic” which is then published and can be created “by an operator of the content provider entity for use by subscribing operators” or “subscribing operators may be permitted to suggest or create their own aggregated topics.” *Id.* ¶108.

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Aggregator components also may provide data storage, operate as a backup publisher, and determine if the incoming real-time data has “updated.” *Id.* ¶¶115, 116, 118, 122.

109. User devices connect to the system using an “address,” which “may resemble a uniform resource locator (URL), for example ‘torq.cbssports.com/torq.’” *Id.* ¶82, Fig. 8. Additionally, Figure 9 below shows that users can select “topics of live data to subscribe to” from a list of “topics available from a message queue server in a topic selection list 902:”

UI 900

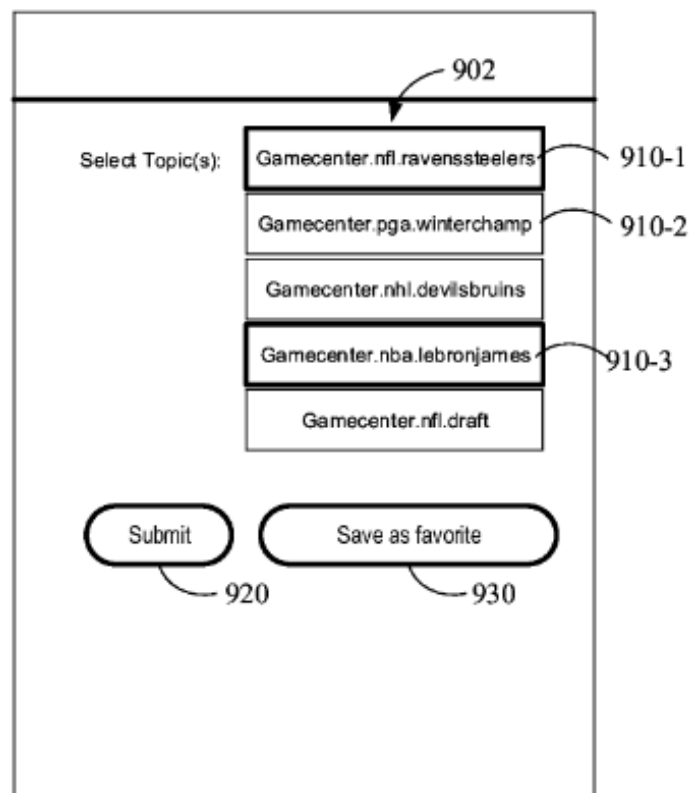


FIG. 9

Id., ¶84, Fig. 9.

110. Spivey discloses that the connections between the system and the user are “full-duplex connection[s], such as a websocket connection” or that a “half-duplex connection[] may be utilized as well.” *Id.* ¶61. A websocket connection “typically comprises a two-way connection between two entities, where each of the two entities can send and receive data simultaneously.” *Id.* A POSA would have understood that—in implementing such a “websocket connection”—the MQSD content distribution server would constitute a socket server. Finally, data is sent to connected and subscribed user devices from the topic queues. *Id.* ¶46 (“MQS communication component 308 ... may push data from topic queues 332-1, 332-n to the subscribers of the topics corresponding to those topic queues.”).

D. U.S. Patent Pub. No. 2018/0367820 (“Abulikemu”)

111. Abulikemu is a U.S. Patent Publication that published on December 20, 2018. Ex.1050, Cover. Abulikemu was filed on December 8, 2015. Abulikemu is directed to a broadcasting system and method “that allows incorporation of user-generated content such as user videos of a live event and user commentary (audio and/or video) about the live event.” *Id.*, Abstract.

112. Abulikemu identifies the problem of traditional broadcasting methods “not allow[ing] the viewers to participate in the filming, editing, or any other part of broadcasting the event.” *Id.* ¶¶2, 9. As Abulikemu explains, “[t]raditionally, live

video of an event such as a soccer game is provided by a single broadcasting company. . . . [wherein] [t]he broadcasting captures the live action onsite using its camera systems, transmits the captured information to a central server, where the information is edited to produce a live streaming signal to be transmitted over a network (e.g., satellite or internet) to the viewers tuning in to watch the program.”

Id.

113. Abulikemu addressed the above problem by expanding the way users can view and participate in broadcasts of live events. *Id.* ¶10. Abulikemu teaches a live streaming system configured to provide live video content about an event to multiple users over the internet. *Id.* ¶¶1, 11-16, 23-24, Abstract, Fig. 1.

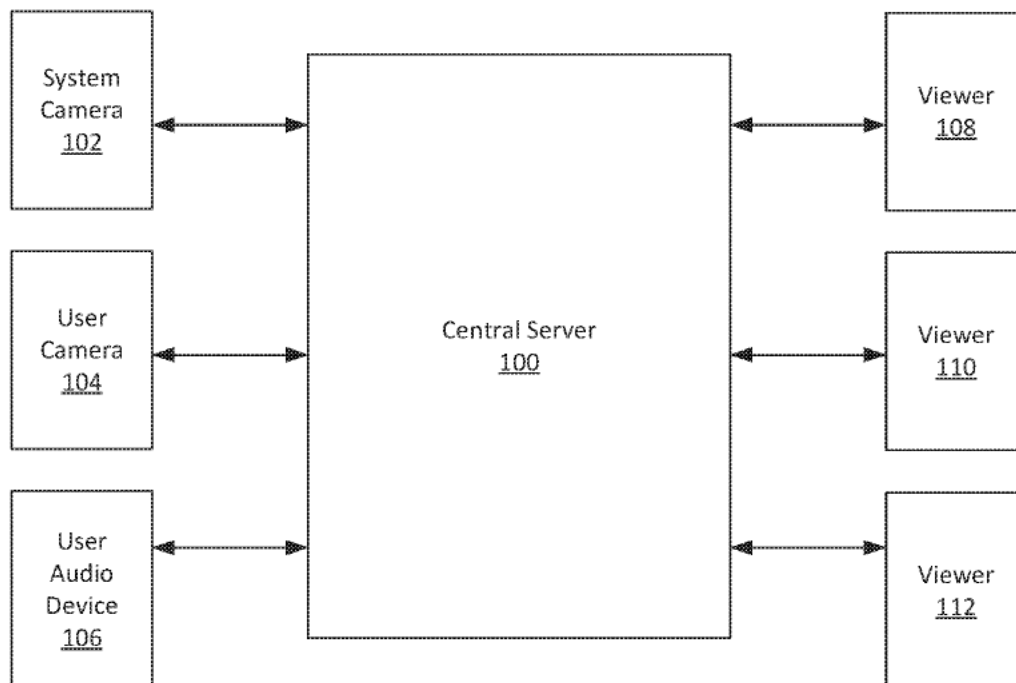


FIG. 1

Id., Fig. 1.

114. To expand users' involvement, Abulikemu's system "provide[s] a way for a viewer to customize the video/audio feed of an event rather than having no choice but to accept the feed provided by the broadcasting company." *Id.* ¶10.

115. Abulikemu's system includes a central server 100 (*e.g.*, a "media source") that receives a live audio/video stream of an event from a system camera 102. *Id.* ¶¶11-16. The central server 100 provides copies of the live audio/video stream to multiple viewers 108, 110, 112. *Id.* ¶¶11-16. Any viewer receiving the stream may then provide their own video/audio commentary and send it back to the central server. *Id.* ¶¶11-16, 21-24, Fig. 2. The central server compiles the live stream and the user's commentary then streams the compiled stream to any viewer that chooses to receive the compiled stream. *Id.* ¶¶11-16, 21-24, Fig. 2.

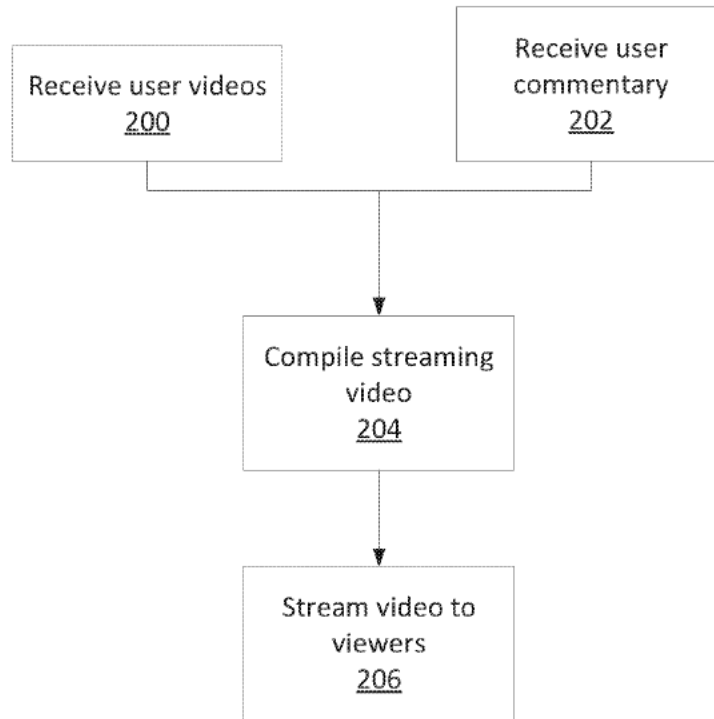


FIG. 2

Id., Fig. 2.

116. Figure 2 of Abulikemu depicts an exemplary method of streaming video of a live event wherein “an electronic device (e.g., a central server 100 or another electronic device, such as a computer, a mobile device, and/or a smartphone) . . . compile[s] (204) a streaming video based on the user videos and/or the user commentary.” *Id.* ¶¶20-21. Abulikemu explains that “the electronic device can pair the selected one or more videos with audio from the first commentary.” *Id.* ¶21. “[C]ompiling the streaming video may include generating a new video including portions of a first video and a second video of the plurality of videos.” *Id.* “In the new video, portions of the first video and the second video may be shown

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concurrently (e.g., in a split screen format), and/or portions can be shown one after the other in series.” *Id.* Thus, in my opinion a POSA would understand the disclosure of Abulikemu to disclose compiling of a composite stream incorporating user-generated information and display that information concurrently with the video of the live event.

IX. A POSA’S MOTIVATION TO COMBINE PRIOR ART REFERENCES WITH A REASONABLE EXPECTATION OF SUCCESS

A. Ellis in View of Spivey

1. Socket Server (*Spivey*)

117. In my opinion, a POSA would have been motivated to combine the teachings of Ellis and Spivey. As described above in Section VIII.B, Ellis is generally directed to systems and methods that enhance “sports-related media content access and display.” Ex.1016, Abstract. Ellis discloses an interactive system for watching sports content, including “wagering and fantasy league support.” *Id.* More specifically, Ellis is directed to a two-part delivery method/system comprising transmitting a **video stream** originated by a **content source** (*i.e.*, “media source”) over communication path (150) and transmitting a **data stream** originated by a **SCS** over a separate communication path (152), as shown below:

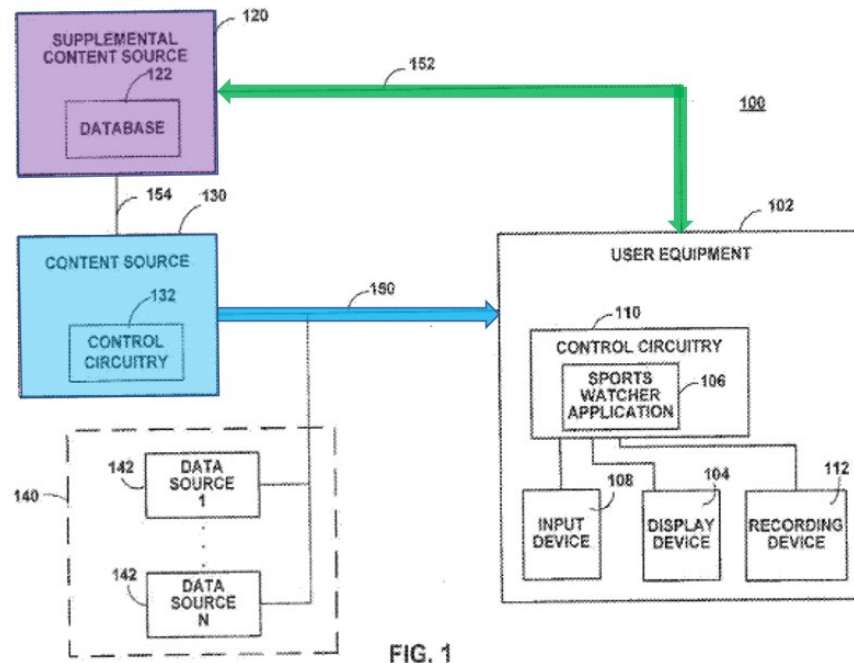


FIG. 1

Id., Fig. 1. Ellis teaches that the SCS “may be any suitable content source” that provides live data feeds containing “score, play, and up-to-date game summary information to user equipment.” *Id.* ¶¶41, 155. Although Ellis discloses the claimed functionality of delivering live video and real-time supplemental content data over separate channels, Ellis does not explicitly disclose the backend architecture/process flows for delivering the supplemental content data.

118. As I explained in Section VIII.C, Spivey provides details relating to backend server architecture supporting a live-event data delivery system. Spivey explains that some live-event data delivery systems, such as the system disclosed in Ellis, can suffer from latency issues. Spivey improves on those systems by teaching the use of a control server and a socket server to provide live-event data to any number of customers in milliseconds. Ex.1017 ¶¶27-28.

119. In my opinion, a POSA—looking to improve Ellis’s latency issues—would have been drawn to a system such as Spivey and would have recognized the potential in combining these references to achieve full-duplex communications between a client and a remote host while minimizing latency. *See* Ex.1046 at 46, 49-52. After evaluating Ellis and Spivey as a whole from the perspective of a POSA, I conclude that it would have been well within the purview of a skilled artisan to integrate the websocket server into Ellis’ digital content delivery system. A POSA would have been motivated to do so for the purpose of enabling the digital content delivery system described by Ellis with while minimizing latency between consumers.

120. A POSA would have understood that socket servers were well-known components for implementing real-time data delivery, such as in Ellis, with reduced latency. §VIII.C, *supra*; Ex.1017 ¶¶96 (describing pushing a data payload from the message queue server device, *i.e.*, a socket server, to the client device “with a time delay of 100 milliseconds or less”), 35 (broadly describing a message queue server as “one or more electronic devices capable of receiving, processing and sending information to the system,” including a wide range of exemplary devices). For example, a POSA would have appreciated Spivey’s teaching that network components—specifically the [Live Data Server Device \(LDSD\)](#) (*i.e.*, “control server”) and [Message Queue Server Device \(MQSD\)](#) (*i.e.*, “socket server”)—are

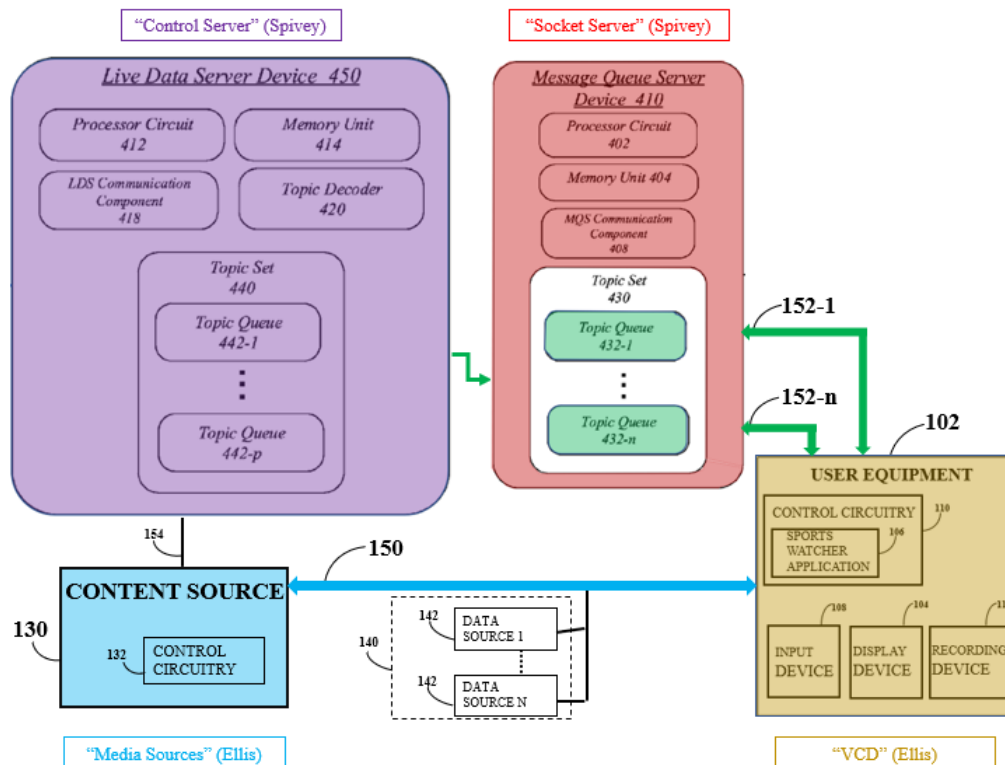
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useful in a data delivery system because they help dramatically reduce latency.

Ex.1017 ¶¶28 (disclosing a system designed to reduce delay “to an order of milliseconds”), 43 (disclosing that a client device may request and participate in a websocket connection), 96 (reciting pushing digital content to a client device “substantially simultaneously ... *e.g.*, with a time delay of 100 milliseconds or less ...”).

121. Websockets protocol was an emerging technology that offered particular benefits for low-latency streaming when compared to the existing communication protocols. In my opinion, a POSA would have appreciated the benefits associated with the websocket connection that Spivey’s socket server makes it possible to communicate with viewer client devices, including convenient and efficient full-duplex communications between a client and a remote host with low latency. *See id.* ¶¶43, 61, 74, 92; Ex.1046 at 46. This is particularly true where Ellis’s data delivery system does not specify a communications protocol. Thus, a POSA would have been motivated to integrate Spivey’s LDSD and MQSD into Ellis’s data delivery system to reduce latency to a time period “at least two orders of magnitude shorter than conventional time periods of legacy devices,” as taught by Spivey and to obtain additional benefits associated with websocket communications. Ex.1017 ¶96.

122. I believe that a POSA seeking to achieve the above-described results would have done so by implementing Spivey into Ellis's current **data** delivery system by replacing Ellis's SCS with Spivey's **LDSD** (*i.e.*, "control server") and adding Spivey's **MQSD** (*i.e.*, "socket server") to achieve a predictable result of decreased latency data delivery, as illustrated below in the annotated, combined flow chart of Ellis Figure 1 and Spivey Figure 4 that I created for illustrative purposes:



See Ex.1016 ¶¶39, 41, Fig. 1 (recreated); Ex.1017, Fig. 4 (recreated) (combined as explained above). The combined system would maintain the video content delivery system and upgrade the supplemental content data delivery system by including a socket server to provide real-time data with reduced latency.

123. It should be noted that a socket server is a fundamental element of Internet design - it allows for the design of applications without the concern and technical detail of incorporating the lower layers of an Internet communication system. It cuts to the heart of an Internet communication system, as it allows for creativity at the application layer without having to incorporate the details of the transport, network, data link, and physical layers.

124. In my opinion, a POSA would have been motivated to modify Ellis in view of Spivey because both references relate to the same technical subject matter—content delivery for real-time events. *Cf.* Ex.1016, Abstract, *with* Ex.1017, Abstract. Both Ellis and Spivey describe methods and/or systems for streaming video and/or event data to one or more users, such that video and/or event data are transmitted simultaneously. *See, e.g.,* Ex.1016 ¶156; Ex.1017, Abstract. Further, I believe a POSA would have also combined Ellis and Spivey because the references solve the same or similar problems, namely, providing video and/or event data to multiple users over the Internet quickly to multiple users.

125. Implementing certain portions of Spivey's system into Ellis's system would have been obvious because doing so would have required only the simple substitution of known elements for another to obtain predictable results. For example, Ellis discloses compatible hardware and software components to act as a source for event information to be transmitted to users. *See, e.g.,* Ex.1016 ¶47

(“Content source 130, supplemental content source 120, and data sources 140 are shown in FIG. 1 as separate elements” but “[i]n practice, their functionality may be combined into a single mechanism and provided from a single system at a single facility, or their functionality may be provided by multiple systems at multiple facilities.”). Predictably, therefore, a POSA would have simply substituted portions of Ellis’s SCS with Spivey’s LDSD and MQSD. For example, it would have been obvious to substitute any of Ellis’s elements with any combination of Spivey’s LDSD, MQSD, and/or Live Data Source(s), which are similarly involved in transmitting live event data to users and may be configured in any manner.

126. In my opinion, a POSA would have been further motivated to combine Ellis with Spivey because Spivey provides a complementary solution describing the details of the backend architecture for transmitting event data to multiple users. Ex.1017, Abstract. Resultingly, a POSA would have had a reasonable expectation of success in integrating Spivey’s control server and socket server into Ellis’s data delivery system. Understanding the compatibility of these similar systems, I believe a POSA would have had a reasonable expectation of success in integrating Spivey’s system of “topic queues and open duplex communication connections” employing websockets to transmit “data from a live event (e.g., news event, a gaming event, sporting event, etc.)” to multiple users “in real-time” based on my knowledge and experience in the field. *Id.* ¶27.

B. Ellis in View of Spivey and Known Webserver

1. Webserver

127. The motivation to combine Ellis with Spivey is discussed above. *See* §IX.A. Although the combination of Ellis and Spivey discloses a webserver, generally, *see, e.g.*, Ex.1016 ¶40 (a content source may be “any suitable source of media content, such as, ... a[n] ... Internet or network media/web server”); Ex.1017 ¶35 (“Message queue server 120 may comprise one or more electronic devices capable of receiving, processing, and sending information for the system 100. Examples of an electronic device may include ... a web server ...”), to the extent the combination does not disclose a webserver implemented specifically to facilitate communication between a client device and socket server, as well as a client device and media sources, in my opinion, a POSA would have utilized a known webserver to facilitate such communication.

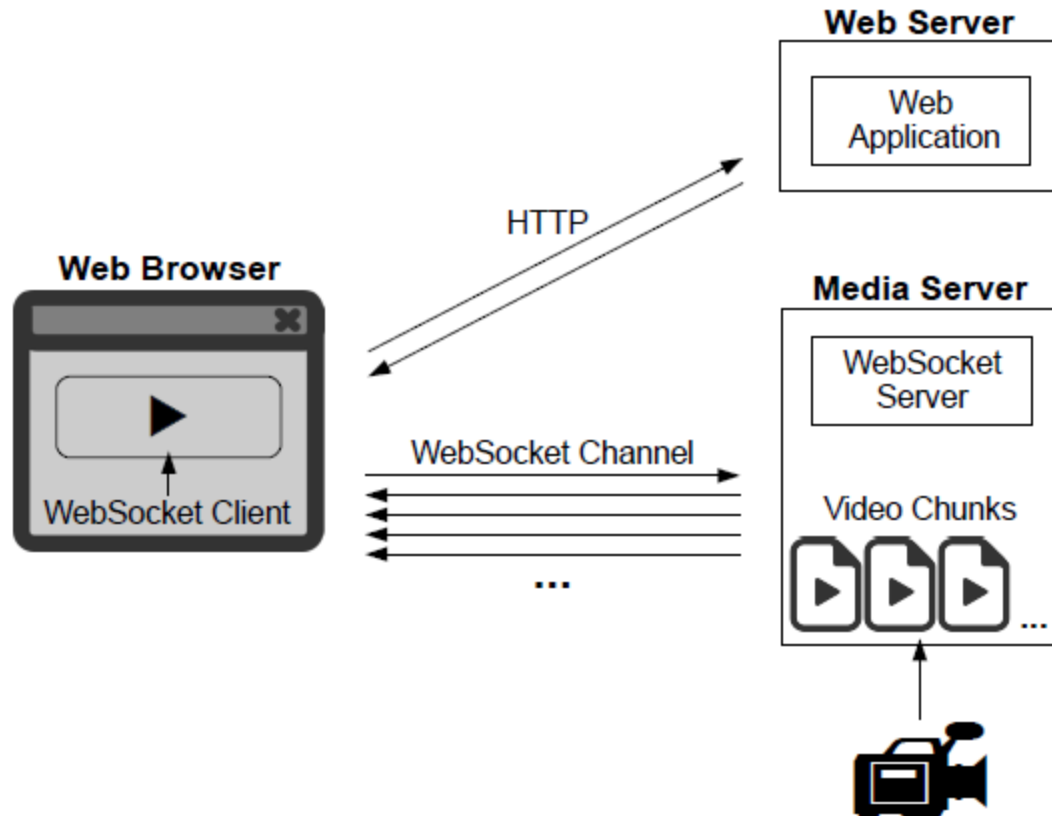
128. In my opinion, a POSA would have understood that webserver were well-known components in streaming systems that were useful for facilitating communication between **client devices** and **socket servers**, and **client devices** and **media sources**. As an initial matter, in my opinion, a POSA would have understood that webserver had been a fundamental component of computer networks for decades. In fact, textbooks on computer networking had described webserver as being one of “the four key components of the Web,” along with HTML, HTTP, and

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browsers, and been widely available since at least 1993. Ex.1052, 64, 99. The ubiquitous nature of web servers in the art is underscored by both Ellis and Spivey's disclosures of web servers, as noted above. In practice, popular web servers included Apache and Microsoft Internet Information Server, for example. *Id.*, 99.

129. A POSA would have understood that web servers, "which implement the server side of HTTP, house Web objects, each addressable by a URL." *Id.*, 99. When a user enters the URL of a web page into the web browser of a client, the client sends a connection request to the web server, the web server establishes the connection and sends the requested web objects. *Id.*, 9, 86, 99.

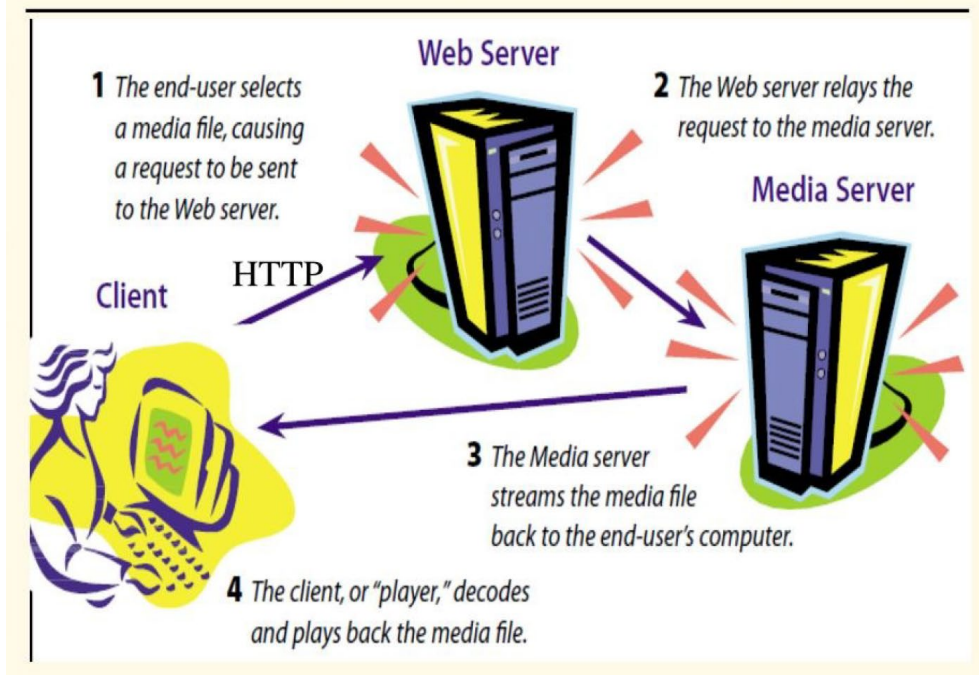
130. Use of web servers specifically between client devices, media sources, and socket servers, was also well-known. For example, Iacono, published in 2014, illustrates that it was known to arrange a web server in the streaming context to facilitate communication between clients and media servers. Ex.1056, 4.



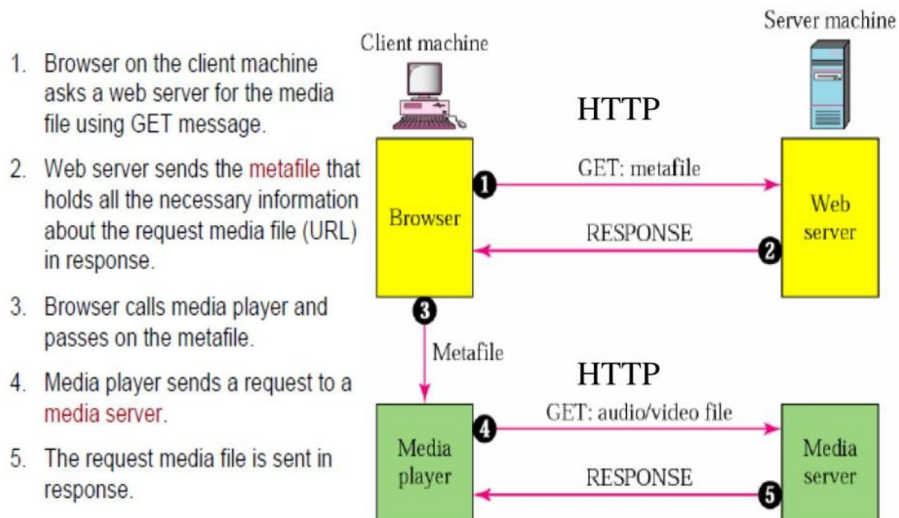
Id., Fig. 2. Specifically, Iacono provides that “the JavaScript code on the Web Appication [sic] will attempt to start the communication via WebSocket with the Media Server.” *Id.*, 4.

131. As another example, a 2014 lecture on basic media distribution architecture similarly illustrates the known arrangement of webservers in the streaming context to facilitate communication between clients and media servers:

B2. Web Server-Media Server Mechanism

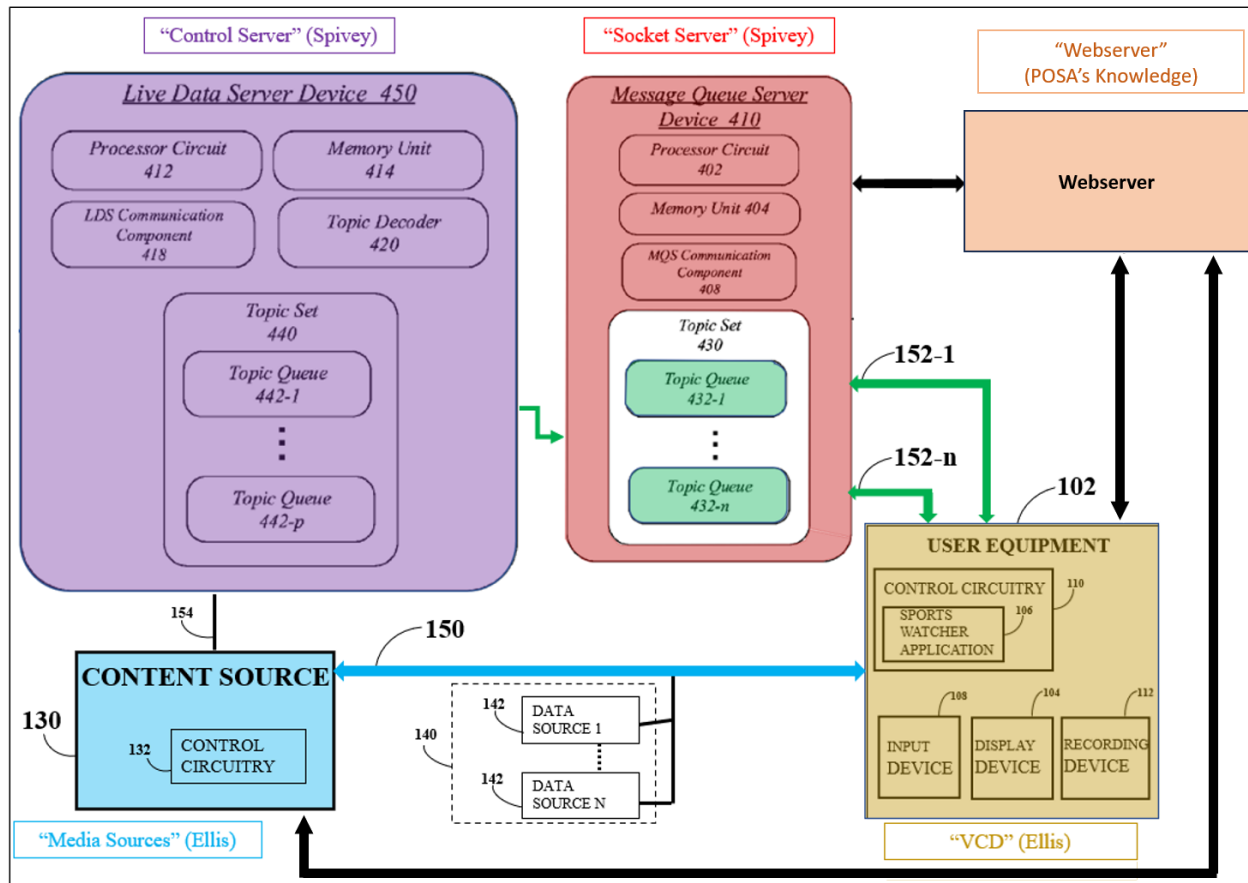


B3. Media Server with Metafile Mechanism



Media server can use any of the transport protocols to transfer the media file to the user.

132. As another example, Herzog teaches that its **application server** (*i.e.*, “**webserver**”) “provide[s] ancillary functions in support of the communication services and/or application services provided through [the] network” Ex.1015 ¶26. I believe a POSA would have understood that using an **application server** such as Herzog’s was advantageous because its ancillary functions reduce latency by “satisf[ying] time synchronization requirements between a client application residing in mobile device 45 and the solution integrator 44,” which includes an origin server (*i.e.*, socket server). *Id.* ¶51. A POSA would have appreciated that a webserver such as Herzog’s **application server** accomplishes this synchronization and latency reduction by “receiv[ing] the request from the client application software and [] sending the meta-data with [a] .JSON time stamp via the ERP server [*i.e.*, the control server]. . . .” *Id.* ¶58. Resultingly, a POSA would have been motivated to integrate a webserver into the Ellis/Spivey combination by placing it in between Ellis’s client device, Ellis’s media sources, and Spivey’s **MQSD** (*i.e.*, socket server), as depicted by the annotated figure below that I created for illustrative purposes:



See Ex.1016 ¶¶39, 41; Fig. 1 (recreated); Ex.1017, Fig. 4 (recreated) (combined as explained above). Based on my review of the references, placing a known webserver in Ellis's system as shown above would enable the webserver to facilitate communication between the client device and the media sources/socket server by receiving a request and in turn establishing a connection between the client device and media sources/socket server to allow transmission of video/event data. Specifically, for example, I believe a POSA would have understood that a webserver "receiving the request" from the client device and sending back synchronized, time-stamped meta-data via the MQSD, would solve "latency issues." Ex.1015 ¶56. In

my opinion, a POSA would have understood that—by integrating a known webserver—the new system would benefit from “synchroniz[ing] two different types of data, for example, video/audio data and meta-data . . . so that they display appropriately on a mobile device in correct time synchronization.” *Id.* ¶64.

133. It is my opinion that a POSA would have had a reasonable expectation of success in integrating a known webserver into Ellis and Spivey’s data delivery system. For example, Spivey’s Message Queue Server (MQS) functions as an intermediary between live data sources and client devices by “process[ing] live data to provide live data quickly to the client devices” Ex.1017 ¶36. Spivey teaches that the MQS may comprise a wide array of devices, including “a webserver,” so long as a single apparent criterion is met: the device must be “capable of receiving, processing, and sending information for the system.” *Id.* ¶35. Therefore, a POSA would have appreciated that Spivey’s robust framework could easily be integrated with a known webserver to facilitate client device communication because Spivey broadly claims that nearly any electronic device can serve that purpose. In my opinion, a POSA would have understood that a webserver was “capable of receiving, processing, and sending information for the system” and, therefore, held a reasonable expectation of success in integrating the webserver into Spivey’s network. *Id.*

134. Accordingly, I conclude that it would have been obvious to implement a known webserver in the claimed manner.²

C. Ellis in View of Spivey and Abulikemu

1. Composite Outgoing Stream (*Abulikemu*)

135. The motivation to combine Ellis with Spivey is discussed above. *See* §§IX.A, IX.B.1. It is my opinion that a POSA would have been further motivated to combine Ellis and Spivey with Abulikemu.

136. In my opinion, the idea of a composite stream is merely an obvious and well-known implementation of the combination of Ellis and Spivey. As such, in my opinion, a POSA would have been motivated to configure Ellis and Spivey's system

² Unlike system claims 1-7 and 24-34, method claims 8-23 do not recite a webserver. As such, for the method claims, Ellis/Spivey need not be modified to include a webserver, as the combination already provides video communication channels between the media source and the viewer client device, and event information communication channels between an event socket of the socket server and the viewer client device, §§IX.A.1, X.A.1.a, and a POSA would have known that these communication channels would have been established using a known webserver, which transmits instructions to the viewer client device to establish the connections and allow for the flow of data in the claimed manner. *See* §IV.C.

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to enable the delivery of composite outgoing streams. A POSA would have been motivated to do so for the purpose of improving the way end-users can view and participate in broadcasts of live events. Ex.1050 ¶¶9-10. Like Ellis, Abulikemu teaches a live streaming system configured to provide live video content about an event to multiple users over the internet. *Id.* ¶¶1, 11-16, 23-24, Abstract, Fig. 1.

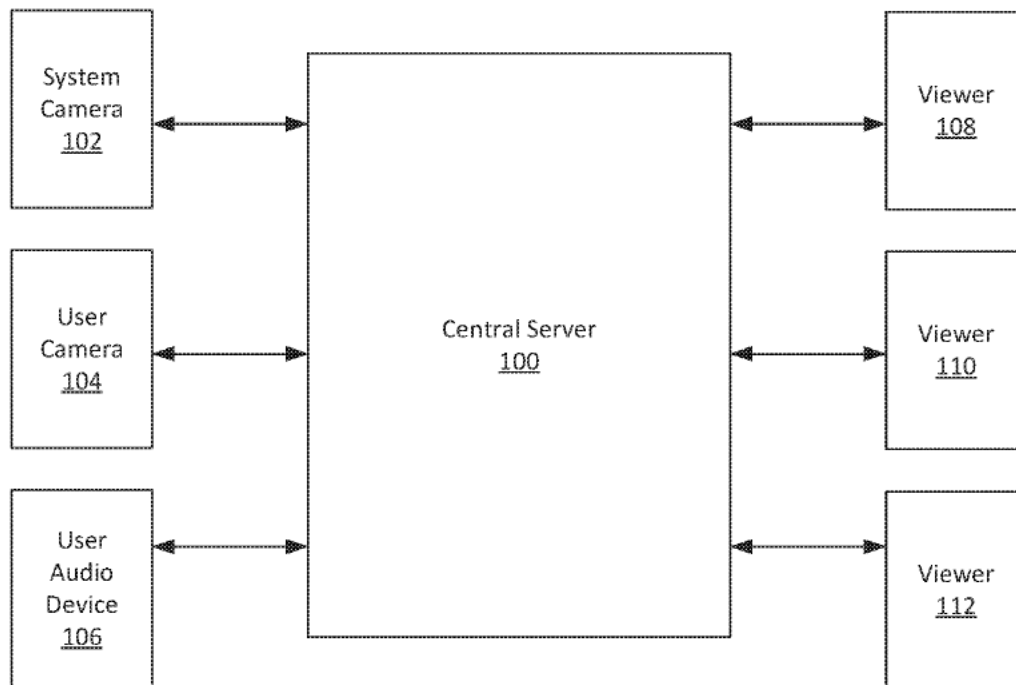


FIG. 1

137. Abulikemu states that “[t]raditionally, live video of an event such as a soccer game is provided by a single broadcasting company,” which “does not allow the viewers to participate in the filming, editing, or any other part of broadcasting the event.” *Id.* ¶2. To expand the way users can view and participate in broadcasts of live events, Abulikemu configured its broadcasting system to “allow[]

incorporation of user-generated content such as user videos of a live event and user commentary (audio and/or video) about the live event.” *Id.* ¶10. This feature “provide[s] a way for a viewer to customize the video/audio feed of an event rather than having no choice but to accept the feed provided by the broadcasting company.” *Id.*

138. Specifically, Abulikemu’s system includes a central server 100 (*e.g.*, a “media source”) that receives a live audio/video stream of an event from a system camera 102. *Id.* ¶¶11-16. The central server 100 provides copies of the live audio/video stream to multiple viewers 108, 110, 112. *Id.* Any viewer receiving the stream may then provide their own video/audio commentary and send it back to the central server. *Id.* ¶¶11-16, 21-24, Fig. 2. The central server compiles the live stream and the user’s commentary then streams the compiled stream to any viewer that chooses to receive the compiled stream. *Id.* ¶¶11-16, 21-24, Fig. 2.

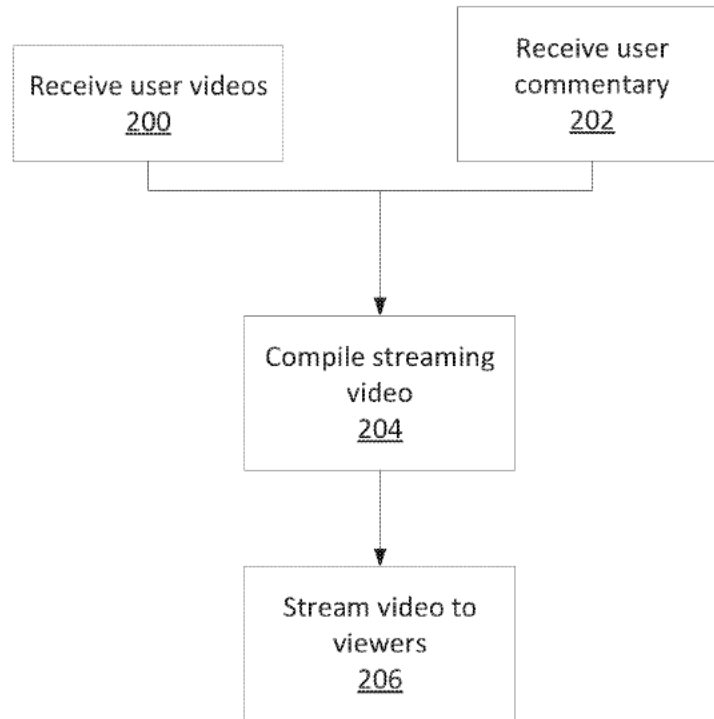


FIG. 2

139. In my opinion, a POSA would have been motivated to configure Ellis/Spivey to provide for and implement composite outgoing streaming, as taught by Abulikemu. For one, a POSA would have appreciated that Ellis itself recognizes the value of user interactivity and engagement during the live stream process. Ex.1016 ¶¶5, 11, 13, 38, 40. A POSA would have also understood the technological environment at the time. By 2017, advanced smartphones—equipped with high-speed Internet, cameras, and social media applications such as Twitch and the like—were ubiquitous. *See, e.g.,* Ex.1012, 1:46-2:18. At this time, crowd-sourced commentary about events was not only technically possible, but widespread. *Id.; see also, e.g.,* Ex.1055; Ex.1035; Ex.1054. Further, a POSA would have understood that

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providing composite outgoing stream functionality to a system such as Ellis/Spivey, which already provides all the system architecture allowing multiple live streams to be sent to clients, applies a known technique to a known device that was ready for improvement to yield a predictable result. I am further of the opinion that a POSA would have had a reasonable expectation of success in providing composite outgoing stream functionality because Ellis already provides the necessary underlying system architecture, and programming the existing structures to obtain this functionality would have been a simple engineering task well-within the skill of a POSA. The programming task is relatively simple; the goal is to cause the rendering engine to fill two different portions of a page using two different streams. It is a common coding problem. *See* §VIII.B.

D. Herzog in View of Spivey

1. Socket Server (*Spivey*)

140. Herzog discloses methods and systems for viewing multiple videos related to the same sporting event in addition to live information about the event (meta-data). For example, Herzog's Figure 7 shows "four different **videos** of a live event and **meta-data** of multiple parameters" from which a user can select:

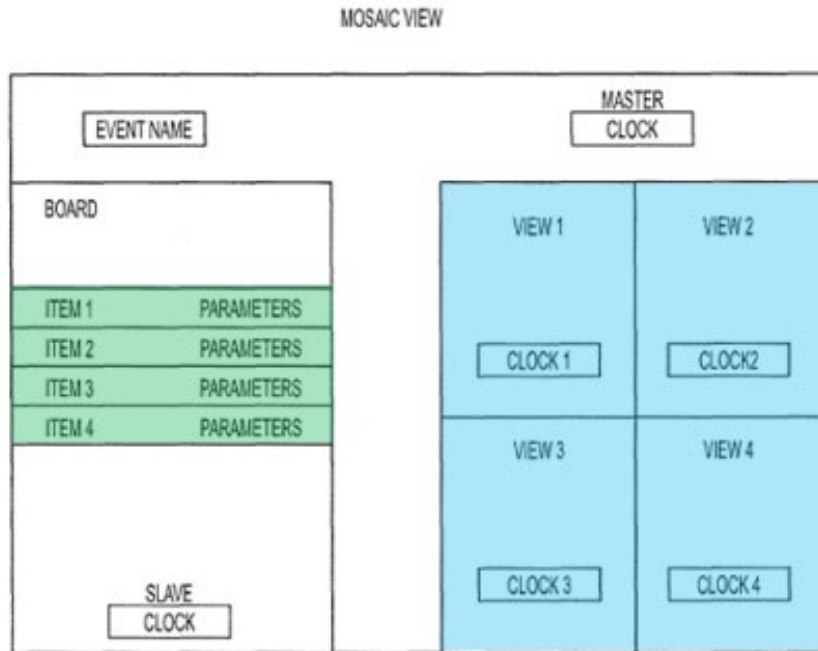


FIG. 7

Ex.1015 ¶¶12, 80-81, Fig.7. Herzog provides these video and data streams over separate connections:

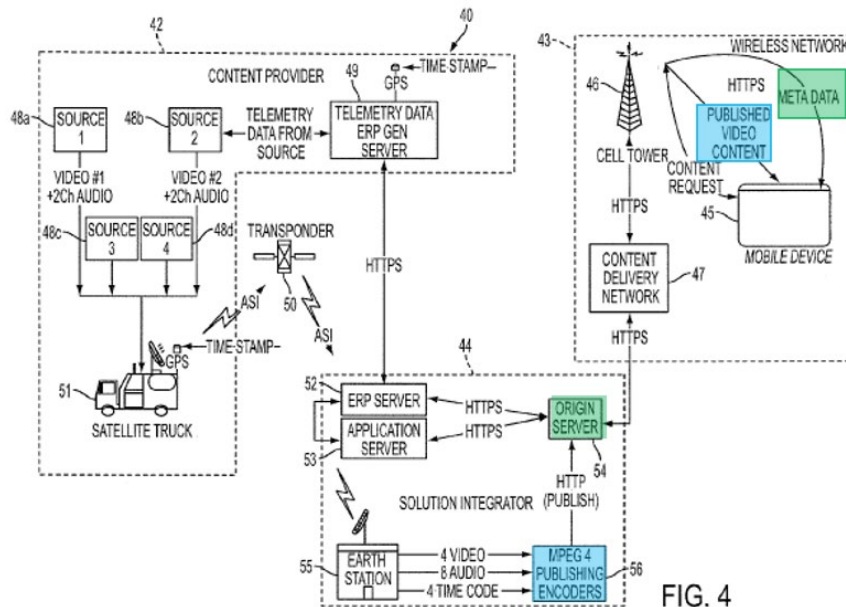


FIG. 4

Id. ¶¶48-52, 67, Figs. 4, 6.

141. Herzog does not specifically disclose some backend server architecture supporting the data distribution—the claimed socket server. However, it is my opinion that a POSA would have known that the websocket client-server communication protocol employed by Spivey was an alternative to the HTTP polling used by Herzog. *See* Ex.1046 at 46-47. Resultingly, a POSA would have found it obvious to implement Herzog’s Origin Server as a websocket server—as taught by Spivey—to achieve full-duplex communications between a client and a remote host with low latency. *Id.* at 46 (observing that a websocket protocol provided a three-to-one reduction in latency as compared to half-duplex HTTP polling).

142. As noted above, it is my opinion that a POSA would have understood that socket servers were well-known components for implementing real-time data delivery, such as in Herzog, with reduced latency. *see* §IX.A.1, *supra*; Ex.1017 ¶¶35, 96. A POSA also would have appreciated the benefits associated with Spivey’s MQSD (*i.e.*, “socket server”) which establishes websocket connections with client devices, including convenient and efficient full-duplex communications between a client and a remote host with low latency. Ex.1017 ¶¶27-28, 43, 61, 74, 92, 96; Ex.1046 at 46; §IX.A.1. Resultingly, a POSA, looking to improve Herzog’s latency issues, would have looked to implement a system such as Spivey.

143. In my opinion, a POSA would have looked to improve Herzog’s latency issue by incorporating Spivey into Herzog’s current data delivery system by

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implementing Spivey's MQSD at Herzog's Origin Server to achieve a predictable result of decreased latency data delivery. *See* Ex.1015 ¶¶50-51, Fig. 4; Ex.1017, Fig. 4. The combined system would maintain Herzog's video content delivery system and upgrade the data delivery system to reduce latency.

144. In my opinion, a POSA would have been motivated to combine Herzog with Spivey for many of the same reasons that a POSA would have been motivated to combine Ellis with Spivey. First, Herzog and Spivey relate to the same technical subject matter—content delivery for real-time events. *See* Ex.1017, Abstract; Ex.1015, Abstract. Both references describe methods and/or systems for streaming video and/or event data to one or more users, such that video and/or event data are transmitted simultaneously. *See, e.g.,* Ex.1017, Abstract; Ex.1015, Abstract. Second, the references solve the same or similar problems, namely, providing video and/or event data to multiple users over the Internet quickly. *See, e.g.,* Ex.1017 ¶27; Ex.1015 ¶¶3, 19, 51.

145. As such, a POSA would have had a reasonable expectation of success in combining Herzog with Spivey because Spivey contemplates being implemented in a digital content delivery system such as Herzog, stating that it can be used with “any well-known communication techniques and protocols, such as techniques suitable for use with packet-switched networks (e.g., public networks such as the Internet, private networks such as the enterprise intranet, and so forth)” Ex.1017

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¶155. In my opinion, a POSA would have been motivated to combine Herzog with Spivey because Spivey provides a complementary solution describing the details of the backend architecture for organizing and transmitting event data to multiple users. *Id.*, Abstract.

146. Combining certain portions of Herzog and Spivey would have been obvious because doing so would require only the simple substitution of known elements for another to obtain predictable results. Herzog encourages this flexibility, stating that it encourages “modifications ... in various forms and examples, and that the teachings may be applied in numerous applications.” Ex.1015 ¶90. To a POSA, it would have been obvious to substitute any of Herzog’s meta-data distribution elements with any combination of Spivey’s LDSD, MQSD, and/or Live Data Source(s), which are similarly involved in transmitting live event data to users and may be configured in any manner. *See* Ex.1017 ¶34.

E. Herzog in View of Spivey and Abulikemu

147. The motivation to combine Herzog with Spivey is discussed above. *See* §IX.D.1. A POSA would have further been motivated to combine Herzog and Spivey with Abulikemu.

1. Composite Outgoing Stream (*Abulikemu*)

148. The motivation to combine Herzog with Spivey is discussed above. *See* §IX.D.1. In my opinion, a POSA would have further been motivated to combine

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Herzog and Spivey with Abulikemu, for the same reasons I described above with respect to the Ellis/Spivey/Abulikemu combination. *See* §IX.C.1.

149. As I explained above, given that the idea of a composite stream is merely an obvious and well-known implementation of the combination of Herzog and Spivey, I am of the opinion that a POSA would have been motivated to configure Herzog and Spivey's system to enable the delivery of composite outgoing streams to improve the way end-users can view and participate in broadcasts of live events. Ex.1050 ¶¶9-10; §§VIII.D, IX.C.1.

150. As I explained, Abulikemu configured its broadcasting system with composite outgoing video stream functionality to "provide a way for a viewer to customize the video/audio feed of an event rather than having no choice but to accept the feed provided by the broadcasting company." Ex.1050 ¶10; §§VIII.D, IX.C.1. Abulikemu employs a central server 100 (*e.g.*, a "media source") that receives a live audio/video stream of an event from a system camera 102 and provides copies of the stream to multiple viewers 108, 110, 112. Ex.1050 ¶¶11-16. Any viewer receiving the stream may then provide their own video/audio commentary and send it back to the central server. *Id.* ¶¶11-16, 21-24, Fig. 2. The central server compiles the live stream and the user's commentary then streams the compiled stream to any viewer that chooses to receive the compiled stream. *Id.* ¶¶11-16, 21-24, Fig. 2.

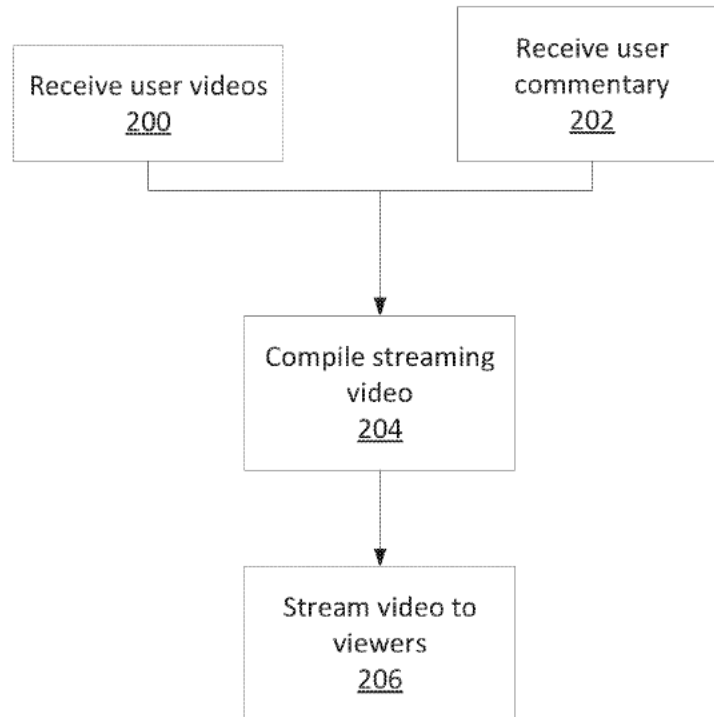


FIG. 2

151. In my opinion, a POSA would have been motivated to configure Herzog/Spivey to provide for and implement composite outgoing streaming, as taught by Abulikemu. As I explained, a POSA would have appreciated that Herzog itself recognizes the value of user interactivity and engagement during the live stream process. Ex.1015 ¶39. A POSA would have also understood the technological environment at the time. By 2017, advanced smartphones—equipped with high-speed Internet, cameras, and social media applications such as Twitch and the like—were ubiquitous. *See, e.g.,* Ex.1012, 1:46-2:18. At this time, crowd-sourced commentary about events was not only technically possible, but widespread. *Id.; see also, e.g.,* Ex.1055; Ex.1035; Ex.1054. Moreover, a POSA would have understood

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that providing composite outgoing stream functionality to a system such as Herzog/Spivey, which already provides all the system architecture allowing multiple live streams to be sent to clients, applies a known technique to a known device that was ready for improvement to yield a predictable result. In my opinion, a POSA would have had a reasonable expectation of success in providing composite outgoing stream functionality because Herzog already provides the necessary underlying system architecture, and programming the existing structures to obtain this functionality would have been a simple engineering task well-within the skill of a POSA. The programming task is relatively simple; the goal is to cause the rendering engine to fill two different portions of a page using two different streams. It is a common coding problem. *See* §§VIII.D, IX.C.1.

X. GROUNDS

152. It is my opinion that the Challenged Claims of the Challenged Patent are invalid. I understand that in IPR proceedings, a petitioner may challenge the claims of a patent only on the basis of lack of novelty or obviousness based on patents and printed publications. Nothing in this Declaration should be construed as expressing any position or opinion as to whether the claims constitute patentable subject matter under 35 U.S.C. §101, or whether they satisfy the definiteness, enablement, or written description requirements of 35 U.S.C. §112. I reserve the right to opine on other matters of invalidity in other proceedings, including in

addition to anticipation and obviousness, lack of written description, lack of enablement, indefiniteness, non-patentable subject matter, and improper inventorship.

153. For convenience, I have summarized the various grounds of invalidity discussed in this Declaration below:

Ground	Basis	Claims	References
1A	§103	1, 4-8, 11, 12	Ellis in view of Spivey
1B	§103	2, 3, 9, 10, 13-34	Ellis in view of Spivey and Abulikemu
2A	§103	1, 4-8, 11, 12	Herzog in view of Spivey
2B	§103	2, 3, 9, 10, 13-34	Herzog in view of Spivey and Abulikemu

A. Ground 1A: Claims 1, 4-8, 11, and 12 Are Obvious Over Ellis in View of Spivey

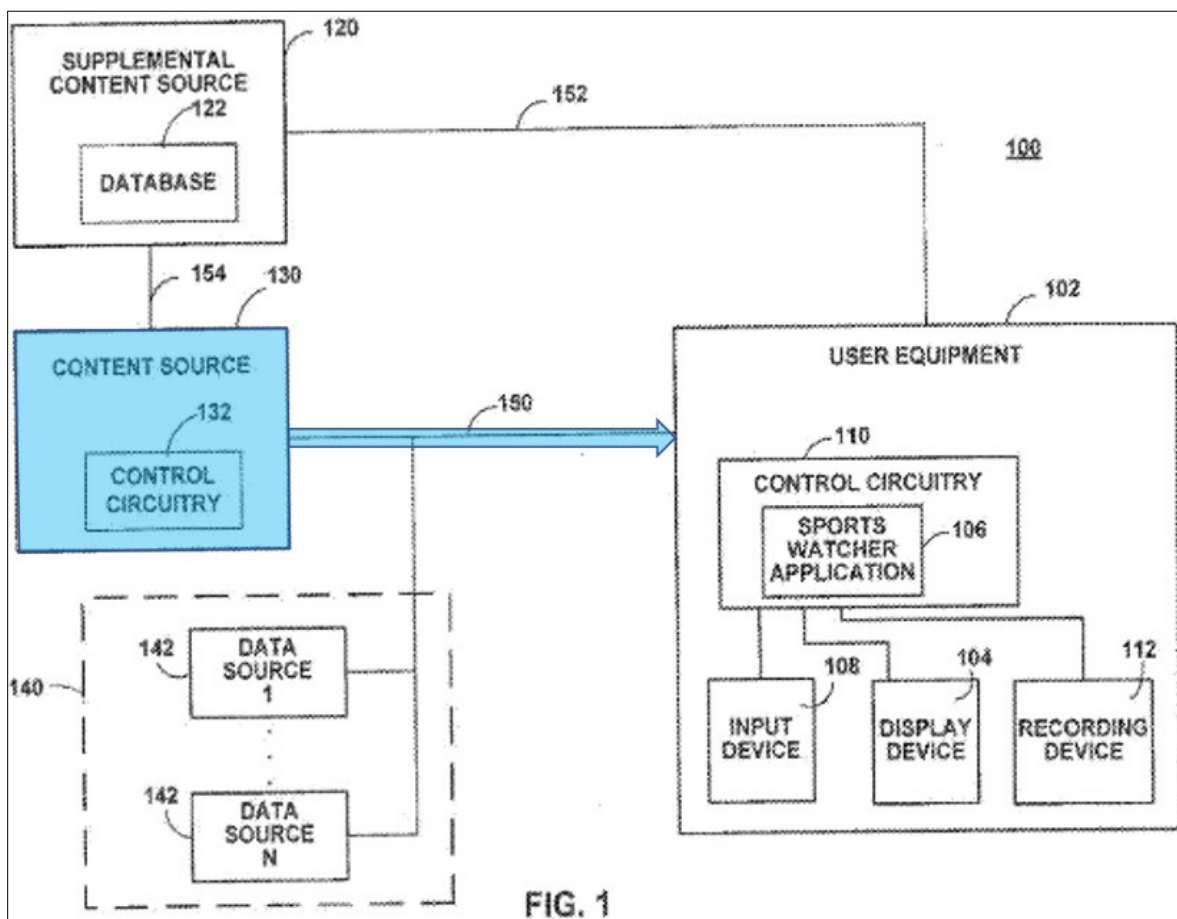
154. For the reasons stated in Sections IX.A.1 and IX.B.1, above, it is my opinion that a POSA would have been motivated to combine the teachings of Ellis and Spivey to arrive at the claimed invention with a reasonable expectation of success.

1. Independent Claim 1

- a. **Limitations 1.0-1.1³: “A system, comprising: at least one media source to receive an audio/video feed of a live event and provide a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source; and”**

155. Ellis’s disclosure relates to broadcasting systems and methods for “enhanced sports-related media content access and display.” Ex.1016, Abstract.

Figure 1 depicts an exemplary media system:



³ Ex.1048 is a claim listing that enumerates each claim element.

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Id. ¶15, Fig. 1 (annotated). As shown, Ellis’s system includes content sources 130 (*i.e.*, “media sources”), which are “any suitable source of media content” such as an “Internet or network media/web server, or any other suitable facility or system for originating or distributing passive or interactive content to user equipment 102.” *Id.* ¶40. Ellis’s content sources receive a broadcast of a live event and distribute video content to users 102 by way of communications paths 150. *See id.* ¶¶39-41, 45, 47. Ellis also discloses multiple content sources, *i.e.*, a plurality. *Id.* ¶39. The content sources provide multiple streams of digital content, including “broadcast programming” and live sporting events. *Id.* ¶¶40, 45, 74. Ellis also states that a user may “actively watch one or more sporting events,” and the user “may change or swap primary and/or secondary sporting events at any time.” *Id.* ¶¶61-62. Thus, in my opinion, Ellis discloses content sources that receive multiple live streams of digital content. Furthermore, in my opinion, anyone who had streamed live events before 2017 would have understood that Ellis’s broadcasts of live events would obviously, if not inherently, include audio and video.

156. Although Ellis does not specifically use the word “endpoint,” in my opinion, the audio/video feed of the live sporting event that is distributed from content sources 130 to users 102 via communication paths 150 necessarily leaves the content sources from an endpoint. This is plainly evident from Figure 1, for example, which shows a junction between 130 and 150. Ex.1016, Fig. 1, ¶74. To the

extent Ellis does not specifically describe media source endpoints, in my opinion, a POSA would have understood that such endpoints were present in Ellis's system which delivers audio/video feeds from the media sources to the client devices. This would have been easily understood by a POSA because Ellis uses the Internet Protocol, meaning it necessarily uses Internet addresses/endpoints (*i.e.*, Internet address such as 130.24.20) to designate the location from which client devices can receive requested digital content.

b. Limitation 1.2: "a webserver configured to:"

157. As I explained above, in my opinion, a POSA would have found it obvious to integrate a known webserver into Ellis and Spivey's data delivery system and configure it in the claimed manner. *See* §IX.B.1.

c. Limitation 1.3: "transmit first instructions to a first client device that includes at least one first display, the first instructions transmitted by the webserver enabling the at least one first display of the first client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted by the webserver cause the first client device to:"

158. In my opinion, a POSA would have understood that the known webserver integrated into the combination of Ellis and Spivey would achieve its purpose of facilitating communication between the viewer client devices and the media sources and event sockets of the socket server, respectively, by transmitting the information needed for communication between the given viewer client device

and media source/socket server. In my opinion, a POSA would have understood that video communication channels between the media source and the viewer client device, and event information communication channels between an event socket of the socket server and the viewer client device, are established when the known webserver transmits instructions to the viewer client device. As I explained above, *see* §IV.C, IX.B.1, it was widely-known before 2017 that webserver could advantageously be arranged in media streaming systems to facilitate communication between clients, media servers, and socket servers, and doing so includes the step of transmitting instructions.

159. In my opinion, Ellis's viewer client device includes a display that can render video relating to the live event as well as first event information relating to the live event that the viewer client device receives from the video communication channels 150 and the event information communication channels 152. *See, e.g.*, Ex.1016, Abstract (disclosing broadcasting systems for “enhanced sports-related media content access and display”); Figs. 4-5 (displaying video and online gaming information); ¶132 (“game commentary from a variety of sources may also be displayed to the user”).

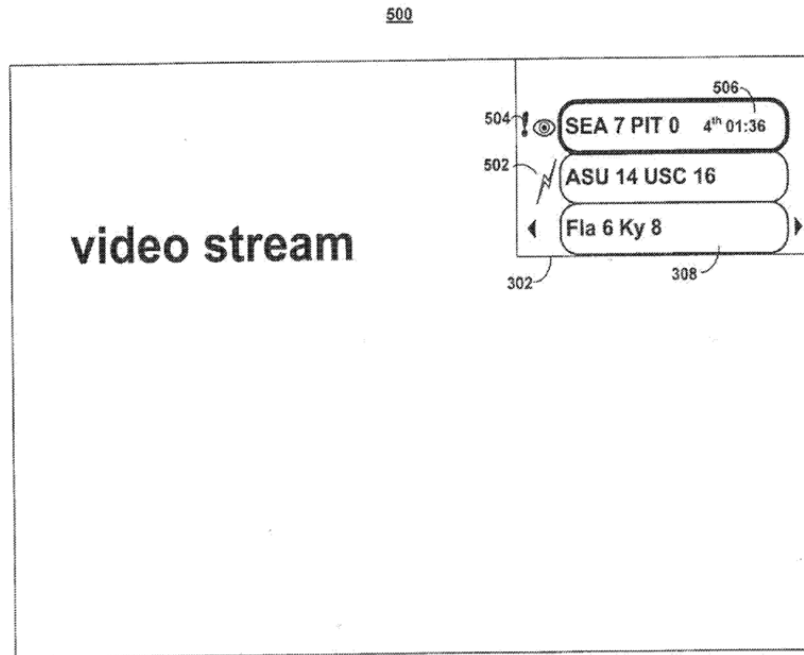


FIG. 5

- d. **Limitation 1.4: “connect to the first media server endpoint of the at least one media source to receive, on a first communication channel between the first media server endpoint and the first client device, the first copy of the audio/video feed of the live event;”**

160. As I explained above, I am of the opinion that the webserver integrated into Ellis and Spivey’s combined system transmits instructions to the viewer client device to establish a video communication channel between the media source and the viewer client device. *See* §§X.A.1.a, IX.B.1, X.A.1.c. The video communication channel connects a specified media server endpoint of the media source to the viewer client device. *See* §X.A.1.a.

- e. **Limitation 1.5: “connect to a first socket of a socket server to receive, on a second communication channel between the first socket and the first client device,**

first digital content corresponding to the first event information;”

161. In my opinion, Ellis in view of Spivey discloses this limitation. Figure 1 of Ellis illustrates that the SCS transmits “sports-related information” to user equipment 102 over communication path 152. Ellis teaches that the SCS may be any suitable content source configured to provide real-time sports information. Ellis, however, does not specify that the SCS is a “socket server” which transmits the sports-related information to the viewer client device.

162. However, Spivey’s system is based on providing “live event data in real time.” Ex.1017, Abstract. For example, according to Spivey, viewer client devices “may request and participate in a websocket connection,” which “typically comprises a two-way connection between two entities.” *Id.* ¶¶43, 61. In my opinion, a POSA would have known that a websocket connection is between a socket server and at least one client.

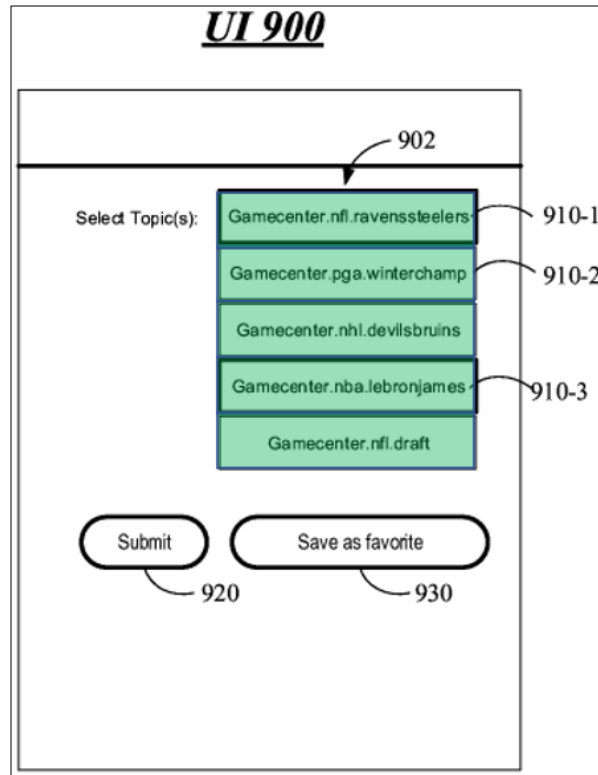
163. The ’088 explains that a socket server contains “one or more first event sockets [] dedicated to the first event information.” Ex.1012, 21:29-33. The first event socket has a corresponding EventID that the viewer client device “uses ... to connect to [the] socket,” *e.g.*, by using a “URL including the ... EventID in a path of the URL.” *Id.*, 21:34-46. Thus, it is my opinion that a POSA would have understood a “socket” to be a uniquely addressable communication endpoint on a server where first event information is provided to a viewer client device. *Id.*, 20:26-

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42, 21:34-54. A first event socket corresponding to the first event information is simply a socket where information about one sporting event is provided to viewer client devices. *Id.*

164. Spivey's **topic queues** are "where data payloads are placed" that, for example, "relate to a specific game." Ex.1017 ¶¶51-52. The data payloads, "[w]hen the live event is a sporting event," include, "for example, a score, a play, ..., and so forth." *Id.* ¶48. Topic queues have a corresponding "topic label" which is used "to identify a topic queue." *Id.* ¶49. "A topic label may be, for example" a "text string such as gamecenter.nfl.ravenssteelers." *Id.* ¶66.

165. Viewer client devices use these topic label text strings to connect and subscribe to MQSD's topic queues. First, viewer client devices "request a live data connection" with the MQSD by "select[ing] or enter[ing] the address or connection information to a particular" MQSD. *See id.* ¶¶81-82. This "address may resemble a uniform resource locator (URL)." *Id.* ¶82. Second, as shown in Figure 9, viewer client devices can use the topic labels to select "the topics available from [the MQSD] in a topic selection list" and "subscribe to" those topic queues:



Id. ¶¶83-84, Fig. 9. Third, “the data payload” may be pushed to the subscribed connected devices that requested that topic. *Id.* ¶96. Thus, it is my opinion that a POSA would have understood that Spivey’s topic queues disclose first event sockets corresponding to the first event information.

166. Furthermore, as I explained above, the webserver integrated into Ellis/Spivey transmits instructions to the viewer client device to establish an event information communication channel (*i.e.*, communication channel 152 in Ellis Figure 1, which is separate and distinct from communication channel 150 that transmits copies of the audio/video feed) between an event socket of the socket server and the viewer client device. *See* §§IX.A, IX.B.1, X.A.1.c.

- f. **Limitation 1.6: “render, on the at least one first display of the first client device, at least some of the first event information as at least one first user-interactive feature overlaid on or adjacent to the first video relating to the live event; and”**

167. Ellis discloses rendering first event information on a display of a viewer client device as a user-interactive feature overlaid on or adjacent to the first video relating to the live event. Ex.1016 ¶¶69, 72, 93, Figs. 3, 6.

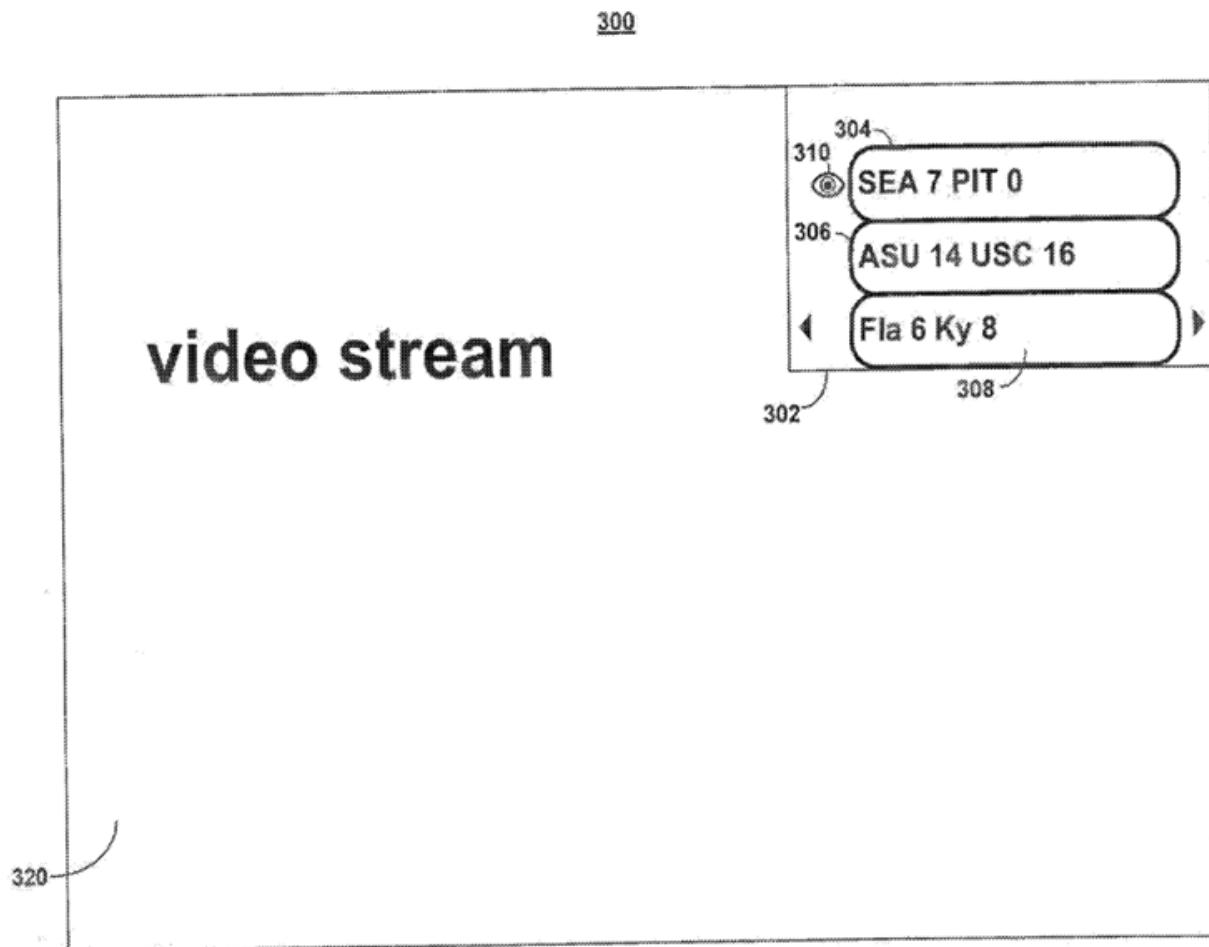


FIG. 3

168. For example, Ellis discloses a “game information screen” with a “flip banner” that the user can not only toggle but customize with digital sports content.

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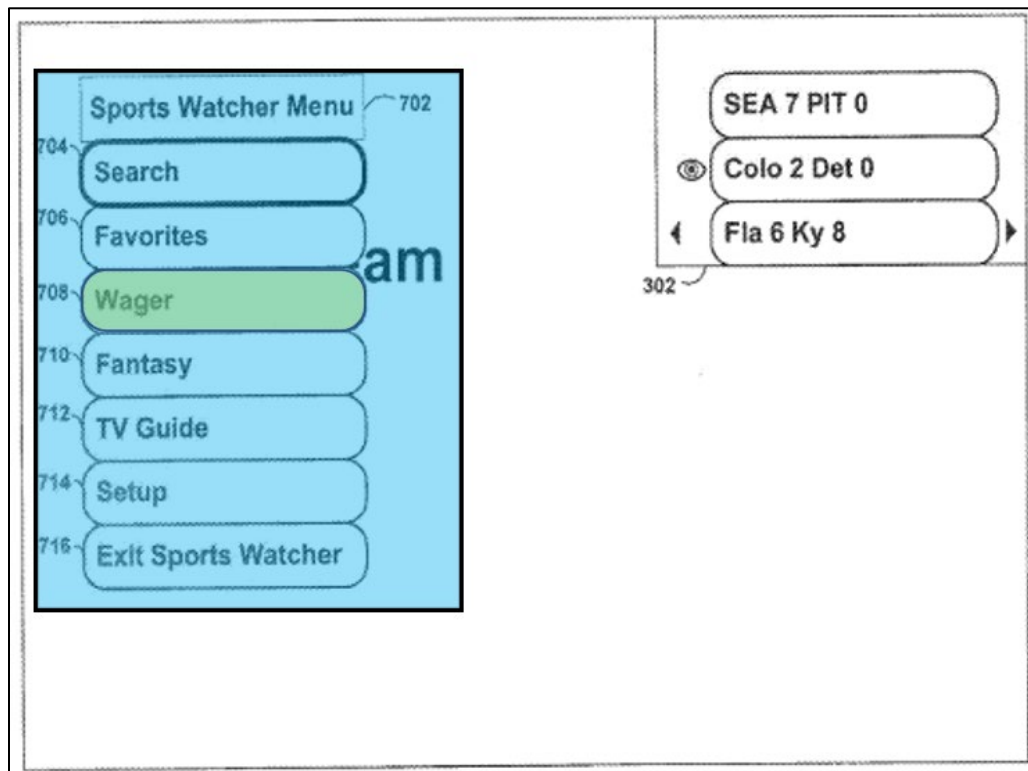
Ex.1016 ¶72. Ellis also discloses a “wager” option in the flip banner that a user can select to display a “custom wagering interface” that allows the user to “wager on the game, to modify a previous wager on the game, or to view a wager previously made on the game, including any results.” *Id.* ¶98.

169. Furthermore, as I explained above, the webserver integrated into Ellis/Spivey transmits instructions to establish a communication channel that provides the event information between the socket server and viewer client device. *See* §§X.A.1.a, IX.B.1, X.A.1.c, X.A.1.e.

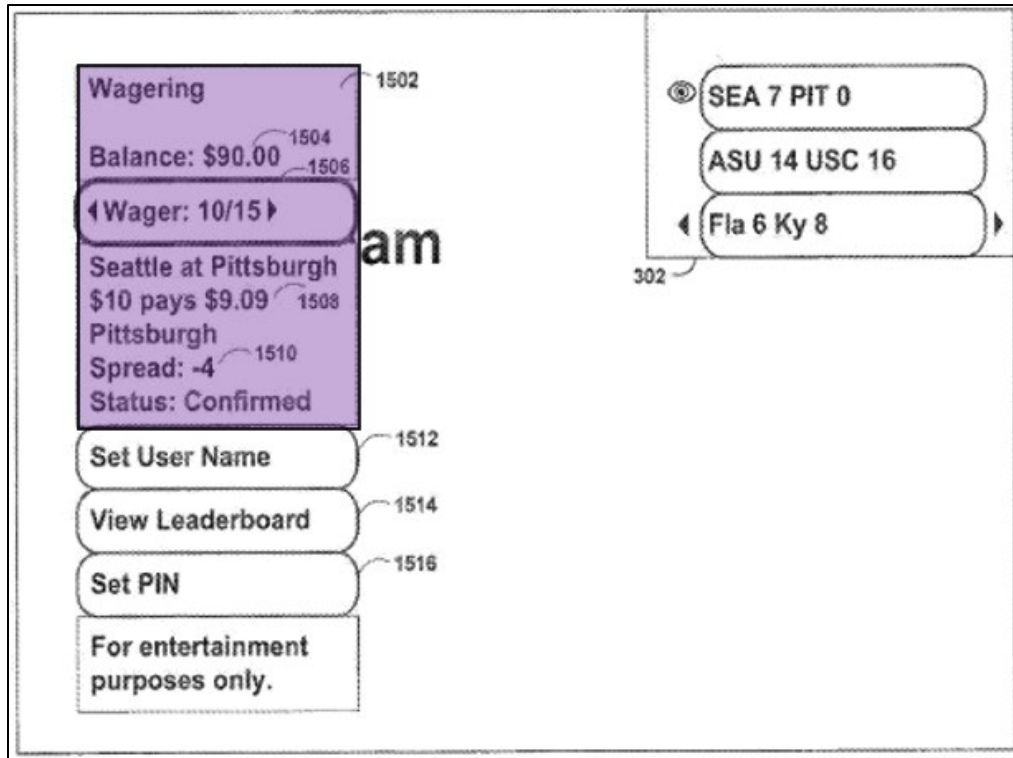
g. Limitation 1.7: “obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature; and”

170. In my opinion, Ellis discloses this limitation. Ellis discloses obtaining access to first additional information relating to the live event and redirecting to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature. For example, Ellis discloses a “wager” option in the flip banner that a user can select to display a “custom wagering interface” that allows the user to “wager on the game, to modify a previous wager on the game, or to view a wager previously made on the game, including any results.” *Id.* ¶98.

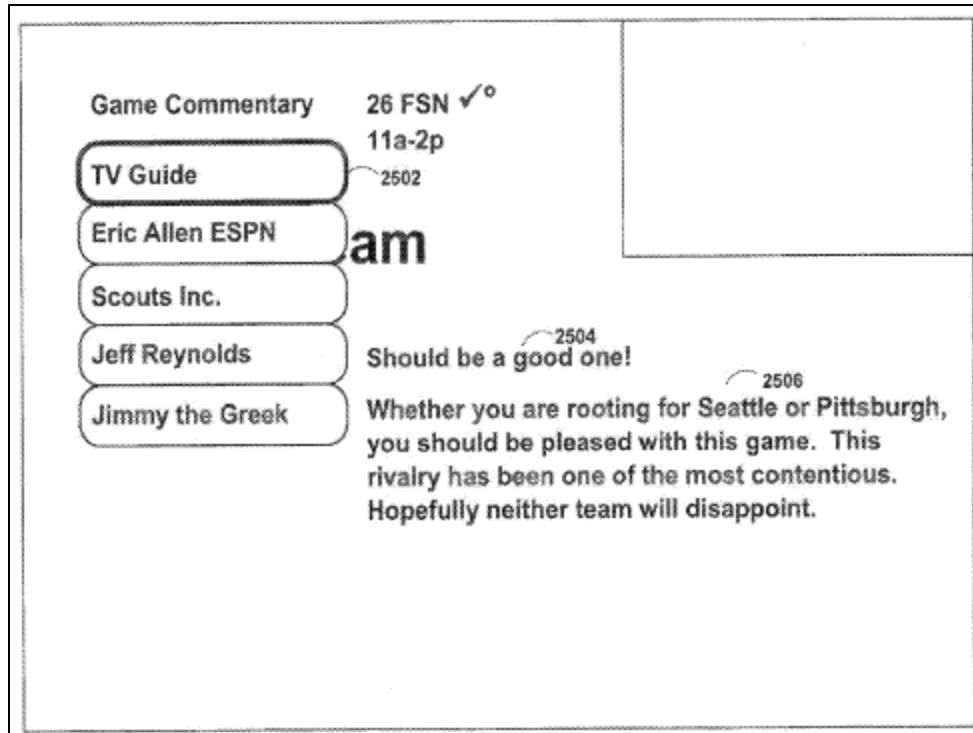
171. As a further example, when a user of Ellis selects the “TV Guide” option, an “[interactive media guidance application main menu](#)” appears on the display, presenting the user with several options to further engage with sporting event information. *Id.* ¶103. Figure 7, below, illustrates the options available to the user:



Id., Fig.7 (annotated). For example, “display screen 1500 (FIG.15) may be displayed after a user selects [wagering option 708](#).” *Id.* ¶103. Figure 15, displaying [wagering information](#) related to a first sporting event, is shown below:



Id., Fig. 15. Additionally, Ellis discloses displaying a screen that allows a user to “select any commentary option to be presented” relevant to a sporting event. *Id.* ¶132. Game commentary “may include text, graphics, video, and interactive elements (e.g., interactive playbooks, polls, and discussion forums).” *Id.* Figure 25, below, illustrates the game commentary menu:



Id., Fig. 25. By selecting any option presented above, a user can obtain access to the associated sports-related commentary and be redirected. *Id.* ¶132; *see also id.* ¶72 (disclosing user’s ability to obtain access to additional information relating to the live event by way of a “game information screen” with a “flip banner” that the user can not only toggle but customize with digital sports content).

- h. Limitation 1.8: “transmit second instructions to a second client device that includes at least one second display, the second instructions transmitted by the webserver enabling the at least one second display of the second client device to also render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the second client device to:”**

172. In my opinion, this limitation is substantially the same as Limitation 1.3, except that it provides that the webserver transmits *second* instructions to a

second client device that includes a *second* display, and that the second instructions also render the first event information relating to the live event. For the same reasons that I explained above with respect to Limitation 1.3 and the first instructions, first client device, and first display, and because Ellis discloses transmitting multiple streams of digital content to multiple different users, I conclude that Ellis discloses this limitation. *See* §X.A.1.c; Ex.1016 ¶¶39, 94.

- i. **Limitation 1.9: “connect to the first socket of the socket server to receive, on a third communication channel between the first socket and the second client device, the first digital content corresponding to the first event information so that the first digital content received at the first client device and the second client device is synchronized and client-by-client latency between the first client device and second client device to render the first event information is thereby mitigated or significantly reduced;”**

173. As I explained above with respect to Limitation 1.5, the combination of Ellis, Spivey, and a POSA’s knowledge discloses a webserver configured to transmit instructions to a viewer client device to cause the viewer client device to connect to a first event socket of a socket server to receive, on an event information communication channel between the first event socket and the viewer client device, digital content corresponding to the first event information. *See* §X.A.1.e. In my opinion, Limitation 1.9 is substantially the same as Limitation 1.5 but requires another connection between the same first event socket of the socket and a *second* viewer client device, such that the digital content corresponding to the first event

information received by the first viewer client device and the second viewer client device is synchronized and client-by-client latency between the two viewer client devices to render the first event information is mitigated or significantly reduced.

174. For the same reasons I provided above as to Limitation 1.5, and because the combination of Ellis and Spivey enables multiple viewer client devices to connect to any number of event sockets, I conclude that this limitation is met. *See* §§X.A.1.e; X.A.1.c; Ex.1016 ¶¶39, 94; Ex.1017 ¶¶78, 81-82.

175. To the extent the synchronization and client-by-client latency mitigation limitation is not met simply by virtue of the Ellis and Spivey combination satisfying all the structural limitations of the claims, in my opinion, a POSA would have understood that the Ellis and Spivey combination nonetheless share the first event information in a synchronized manner between viewer client devices that mitigates client-by-client latency. Spivey, for example, discloses this because it teaches that “the embodiments discussed herein may reduce [] delay to an order of milliseconds (ms) (e.g., 100ms) or less, providing a significant advantage over the conventional practices.” Ex.1017 ¶28. Spivey also teaches that digital content “may be pushed to the subscribed connected client devices substantially simultaneously with . . . a time delay of 100 milliseconds or less.” *Id.* ¶96. Further, according to Spivey, “‘substantially simultaneously’ means that the set of actions execute within

the same defined period of time. The defined period of time may be of any length as suitable for a given implementation.” *Id.*; *see also* Ex.1043, 48.

j. Limitation 1.10: “render, on the at least one second display of the second client device, at least some of the first event information as at least one second user-interactive feature; and”

176. This limitation is substantially the same as Limitation 1.6, except that it requires the first event information to be rendered as a user-interactive feature on the display of the *second* viewer client device. In my opinion, this limitation is met for at least the same reasons as explained for Limitation 1.6. *See* §X.A.1.f, *supra*. For the reasons I stated above, Ellis discloses a plurality of different communication channels facilitating digital content transmission. *See* Ex.1016 ¶¶39, 94; §§IX.A.1, X.A.1.a, *supra*.

k. Limitation 1.11: “obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app when a second user selects at least a portion of the rendered at least one second user-interactive feature.”

177. This limitation is substantially the same as Limitation 1.7, except that it requires obtaining the claimed access when a user of the *second* viewer client device selects a portion of the rendered *second* user-interactive feature. This limitation is met for at least the same reasons that I explained above for Limitation 1.7. *See* §X.A.1.g, *supra*. Ellis discloses a plurality of different communication

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channels facilitating digital content transmission for the reasons I stated above. *See* Ex.1016 ¶¶39, 94; §§IX.A.1, X.A.1.a, *supra*.

2. **Dependent Claim 4**

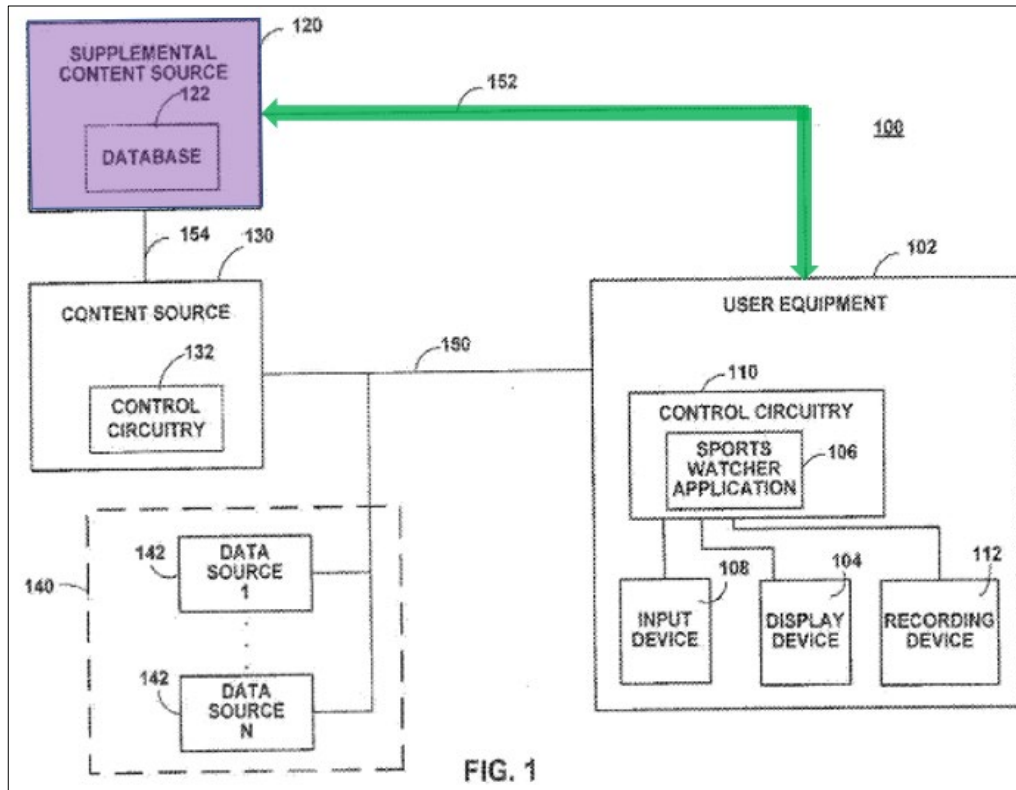
a. **Limitation 4.0: “The system of claim 1, further comprising the socket server.”**

178. In my opinion, Spivey discloses the socket server. *See* §§IX.A.1, X.A.1.e.

3. **Dependent Claim 5**

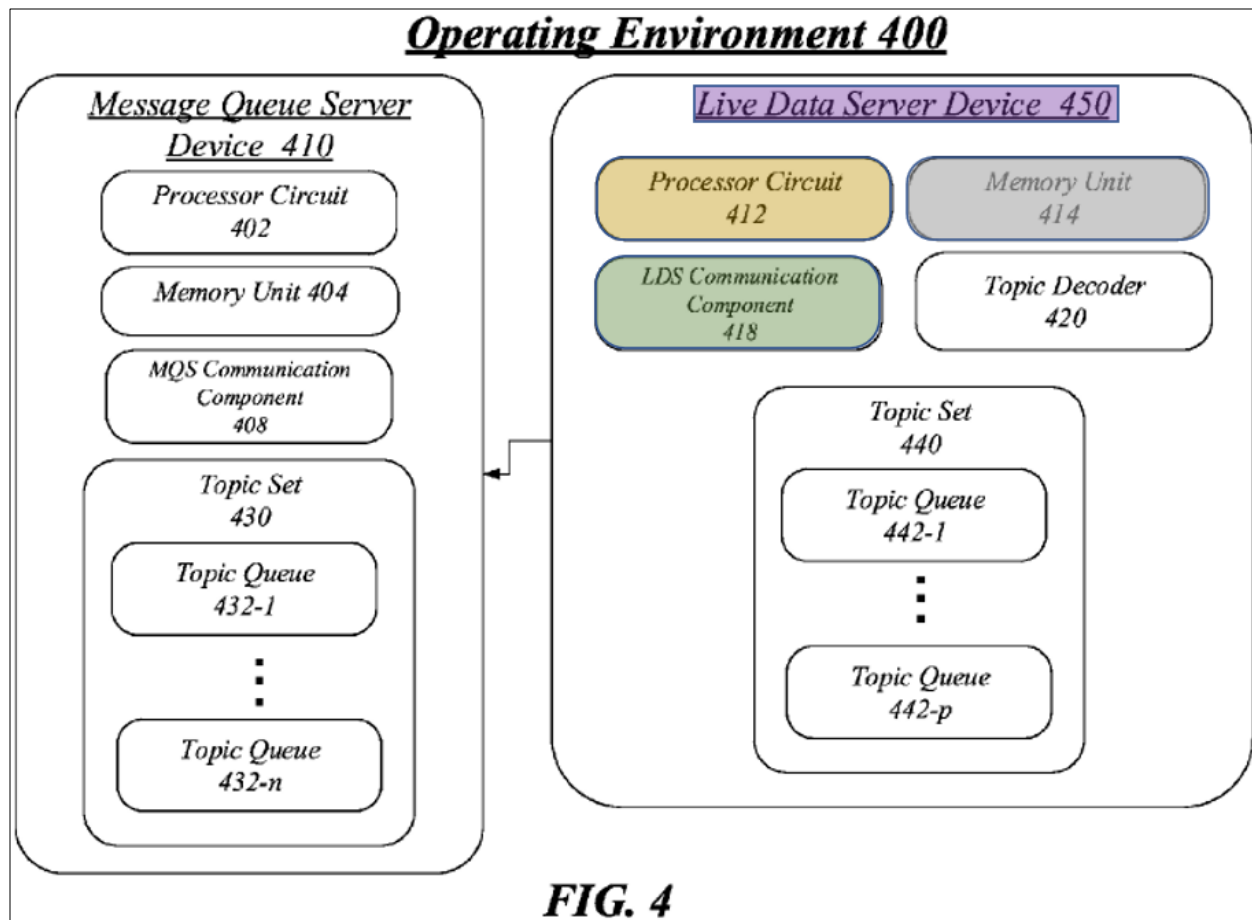
a. **Limitations 5.0-5.1: “The system of claim 4, further comprising: a control server, coupled to the socket server, to provide the first digital content corresponding to the first event information to the socket server.”**

179. Ellis discloses **SCS**, which are “any suitable source of media content” such as an “Internet or network media/web server, or any other suitable facility or system for originating or distributing passive or interactive content to user equipment.” Ex.1016 ¶¶40-41 (defining a SCS as “any suitable content source configured to provide real-time sports scores and game summary information ... and any other sports-related information to user equipment 102.”); *id.* (defining a content source). Ellis’s **SCS** receive a live event broadcast and distribute real-time sports content to users via communications paths. *See id.* ¶¶39-41, 45, 47. Figure 1 shows a **SCS** distributing digital content to users over communication path 152:



Ex.1016 ¶¶39-41; Fig. 1. These communication paths facilitate Internet data transmission from content sources “configured to provide real-time sports scores and game summary information” to viewer client devices via “a satellite path, a fiber-optic path, a cable path, or any other suitable wired or wireless path.” *Id.* ¶¶41, 45.

180. To the extent Ellis’s **SCS** does not inherently contain a control server, Spivey’s **live data server device (“LDSD”)**, as shown in Figure 4, contains the same basic components as the ’088’s control server:



Ex.1017, Fig. 4. The **LDS** is a generic server comprising one or more **processors**, **memory devices**, and **communication interfaces**. *Id.*; Ex.1012, 65:15-25. Moreover, the LDS performs the same functions as the '088's control server. The LDS contains an LDS communication component that allows LDS "to receive live data and transmit the data payloads to MQS device 410." Ex.1017 ¶55. The live data received by the LDS includes "sports scores and breaking news" and, when related to baseball, can include "a score, a play, an error, an injury, a player-at-bat, and so forth." *See id.* ¶¶27, 48, 66 ("A data payload may include ... information about the live event in progress, such as a score, a name of the player that scored or made a

play, an injury, a penalty, an error, a new record set, and so forth.”). The LDSD retrieves the live data over the internet from the live data source because the live data sources are “associated with [the] live event,” and servers in Spivey communicate over the internet. *Id.* ¶¶35, 37, 178. Thus, it is my opinion that a POSA would have understood that Ellis alone, or, in the alternative, Ellis as modified by Spivey, discloses these limitations.

4. **Dependent Claim 6**

- a. **Limitations 6.0-6.2: “The system of claim 1, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

181. Ellis discloses a **SCS** providing first live event information germane to the first live sporting event through a “plurality of real-time data feeds,” one of which can include “sports score and game status information,” while the other carries “sports commentary.” Ex.1016 ¶41; *see also id.* ¶¶93, 103.

5. **Dependent Claim 7**

- a. **Limitations 7.0-7.2: “The system of claim 1, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

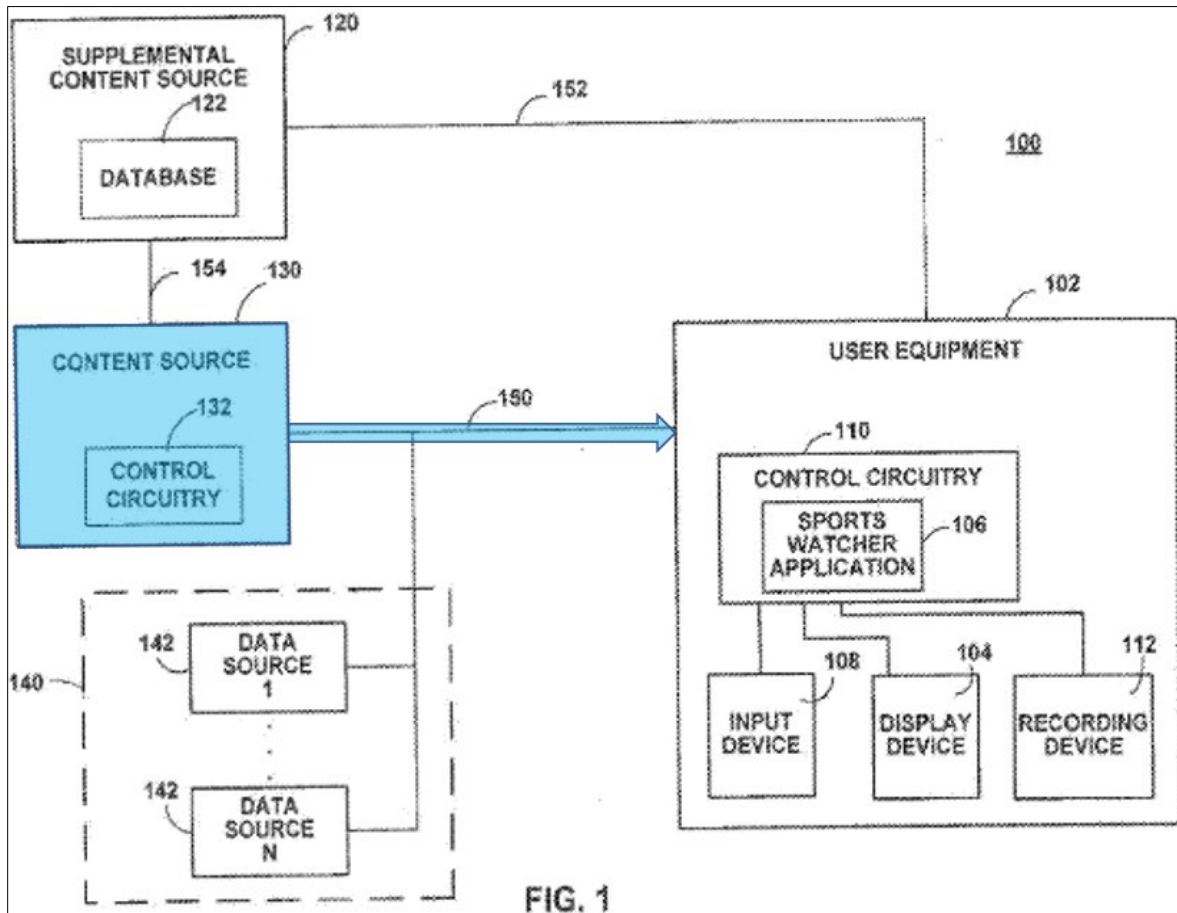
182. *See* §X.A.4.

6. **Independent Claim 8**

- a. **Limitations 8.0-8.2: “A method, comprising: A) receiving, by at least one media source, an audio/video feed of a live event; B) providing a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source;”**

183. Ellis's disclosure relates to broadcasting systems and methods for "enhanced sports-related media content access and display." Ex.1016, Abstract.

Figure 1 depicts an exemplary media system:



Id. ¶15, Fig. 1 (annotated). As shown, Ellis's system includes content sources 130 (*i.e.*, "media sources"), which are "any suitable source of media content" such as an "Internet or network media/web server, or any other suitable facility or system for originating or distributing passive or interactive content to user equipment." *Id.* ¶40. Ellis's content sources serve to receive a broadcast of a live event and distribute video content to users 102 via communications paths 150. *See id.* ¶¶39-41, 45, 47.

Ellis also discloses multiple content sources, *i.e.*, a plurality. *Id.* ¶39. The content sources provide multiple streams of digital content, including “broadcast programming” and live sporting events. *Id.* ¶¶40, 45, 74. Ellis also states that a user may “actively watch one or more sporting events,” and the user “may change or swap primary and/or secondary sporting events at any time.” *Id.* ¶¶61-62. Thus, in my opinion, Ellis discloses content sources that receive multiple live streams of digital content. Furthermore, in my opinion, anyone who had streamed live events before 2017 would have understood that Ellis’s broadcasts of live events would obviously, if not inherently, include audio and video.

184. Although Ellis does not specifically use the word “endpoint,” in my opinion, the audio/video feed of the live sporting event that is distributed from content sources 130 to users 102 via communication paths 150 necessarily leaves the content sources from an endpoint. *See, e.g.*, Ex.1016, Fig. 1 (junction between 130 and 150), ¶74. To the extent Ellis does not specifically describe media source endpoints, in my opinion, a POSA would have understood that such endpoints were present in Ellis’s system which delivers audio/video feeds from the media sources to the viewer client devices. This would have been easily understood by a POSA because Ellis uses the Internet Protocol, meaning it necessarily uses Internet addresses/endpoints to designate the location from which viewer client devices can receive requested content.

- b. Limitation 8.3: “C) transmitting first instructions to a first client device that includes at least one first display to enable the at least one first display of the first client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted in C) cause the first client device to:”**

185. As I explained above, in my opinion, the combination of Ellis and Spivey provide video communication channels between the media source and the viewer client device, and event information communication channels between an event socket of the socket server and the viewer client device. *See* §§IV.C, IX.A.1, IX.B.1, X.A.6.a. In my opinion, a POSA would have known that these communication channels would have been established using a known webserver, which transmits instructions to the viewer client device to establish the connections and allow for the flow of data in the claimed manner. §IV.C. As I explained above, *see* §IV.C, IX.B.1, it was widely-known before 2017 that webserver could advantageously be arranged in media streaming systems to facilitate communication between clients, media servers, and socket servers, and doing so includes the step of transmitting instructions.

186. In my opinion, Ellis’s viewer client device includes a display that can render video relating to the live event as well as first event information relating to the live event that the viewer client device receives from the video communication channels 150 and the event information communication channels 152. *See, e.g.,*

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Ex.1016, Abstract (disclosing broadcasting systems for “enhanced sports-related media content access and display”); Figs. 4-5 (displaying video and online gaming information); ¶132 (“game commentary from a variety of sources may also be displayed to the user”).

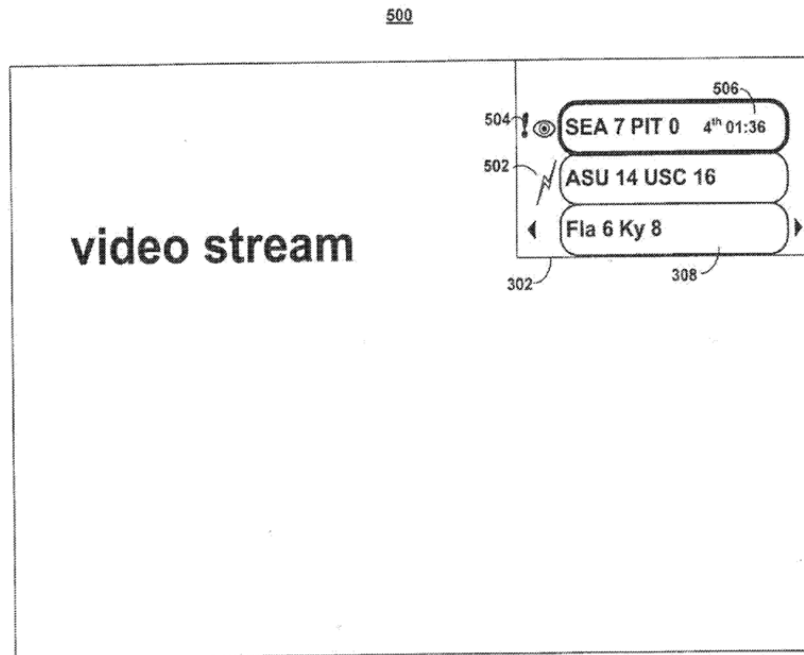


FIG. 5

- c. **Limitation 8.4: “connect to the first media server endpoint of the at least one media source to receive, on a first communication channel between the first media server endpoint and the first client device, the first copy of the audio/video feed of the live event;”**

187. As I explained above, I am of the opinion that Ellis and Spivey’s combined system transmits instructions (using a known webserver) to the viewer client device to establish a video communication channel between the media source and the viewer client device. *See* §§X.A.6.a, IV.C, X.A.6.b. The video

communication channel connects a specified media server endpoint of the media source to the viewer client device. *See* §X.A.6.a.

d. Limitation 8.5: “connect to a first socket of a socket server to receive, on a second communication channel between the first socket and the first client device, first digital content corresponding to the first event information;”

188. In my opinion, Ellis in view of Spivey discloses this limitation. Figure 1 of Ellis illustrates that the SCS transmits “sports-related information” to user equipment 102 over communication path 152. Ellis teaches that the SCS may be any suitable content source configured to provide real-time sports information, but does not specify that the SCS is a socket server which transmits the sports-related information to the viewer client device.

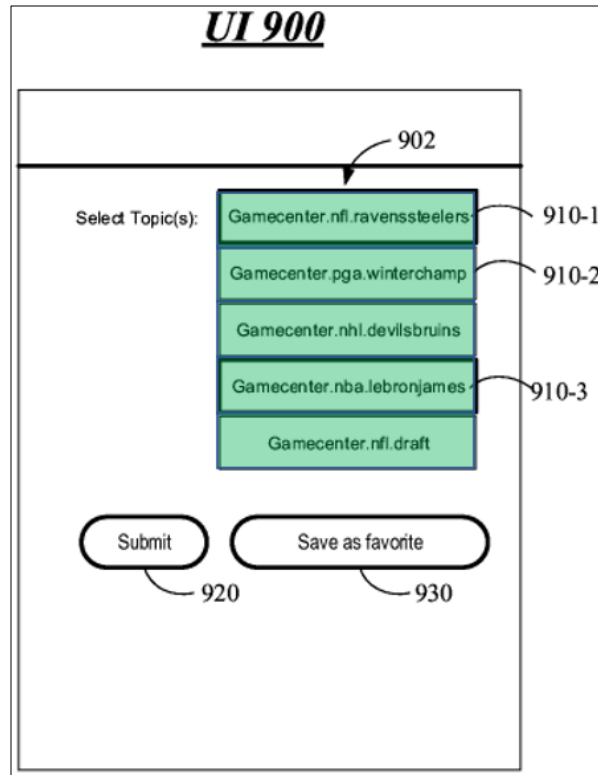
189. Spivey provides “live event data in real time.” Ex.1017, Abstract. Spivey teaches that viewer client devices “may request and participate in a websocket connection,” which “typically comprises a two-way connection between two entities.” *Id.* ¶¶43, 61. In my opinion, a POSA would have known that a websocket connection is between a socket server and at least one client.

190. The '088 explains that a socket server contains “one or more first event sockets [] dedicated to the first event information.” Ex.1012, 21:30-33. The first event socket has a corresponding EventID that the viewer client device “uses ... to connect to [the] socket,” *e.g.*, by using a “URL including the ... EventID in a path

of the URL.” *Id.*, 21:34-46. Thus, it is my opinion that a POSA would have understood a “socket” to be a uniquely addressable communication endpoint on a server where first event information is provided to a viewer client device. *Id.*, 20:26-42, 21:34-54. A first event socket corresponding to the first event information is simply a socket where information about one sporting event is provided to viewer client devices. *Id.*

191. Spivey’s **topic queues** are “where data payloads are placed” that, for example, “relate to a specific game.” Ex.1017 ¶¶51-52. The data payloads include, “for example, a score, a play, ..., and so forth.” *Id.* ¶48. Topic queues have a corresponding “topic label” (*e.g.*, text string such as gamecenter.nfl.ravenssteelers) which is used “to identify a topic queue.” *Id.* ¶¶49, 66.

192. Viewer client devices use these topic label text strings to connect and subscribe to MQSD’s topic queues. First, viewer client devices “request a live data connection” with the MQSD by “select[ing] or enter[ing] the address or connection information to a particular” MQSD. *See id.* ¶¶81-82. This “address may resemble a uniform resource locator (URL).” *Id.* ¶82. Second, as shown in Figure 9, viewer client devices can use the topic labels to select “the topics available from [the MQSD] in a topic selection list” and “subscribe to” those topic queues:



Id. ¶¶83-84, Fig. 9. Third, “the data payload” may be pushed to the subscribed connected devices that requested that topic. *Id.* ¶96. Thus, it is my opinion that a POSA would have understood that Spivey’s topic queues disclose first event sockets corresponding to the first event information.

193. Furthermore, as I explained above, Ellis/Spivey transmits instructions (using a known webserver) to the viewer client device to establish an event information communication channel (*i.e.*, communication channel 152 in Ellis Figure 1, which is separate and distinct from communication channel 150 that transmits copies of the audio/video feed) between an event socket of the socket server and the viewer client device. *See* §§IX.A.1, IV.C, X.A.6.b.

- e. **Limitation 8.6: “render, on the at least one first display of the first client device, at least some of the first event information as at least one first user-interactive feature overlaid on or adjacent to the first video relating to the live event; and”**

194. Ellis discloses rendering first event information on a display of a viewer client device as a user-interactive feature overlaid on or adjacent to the first video relating to the live event. Ex.1016 ¶¶69, 72, 93, Figs. 3, 6.

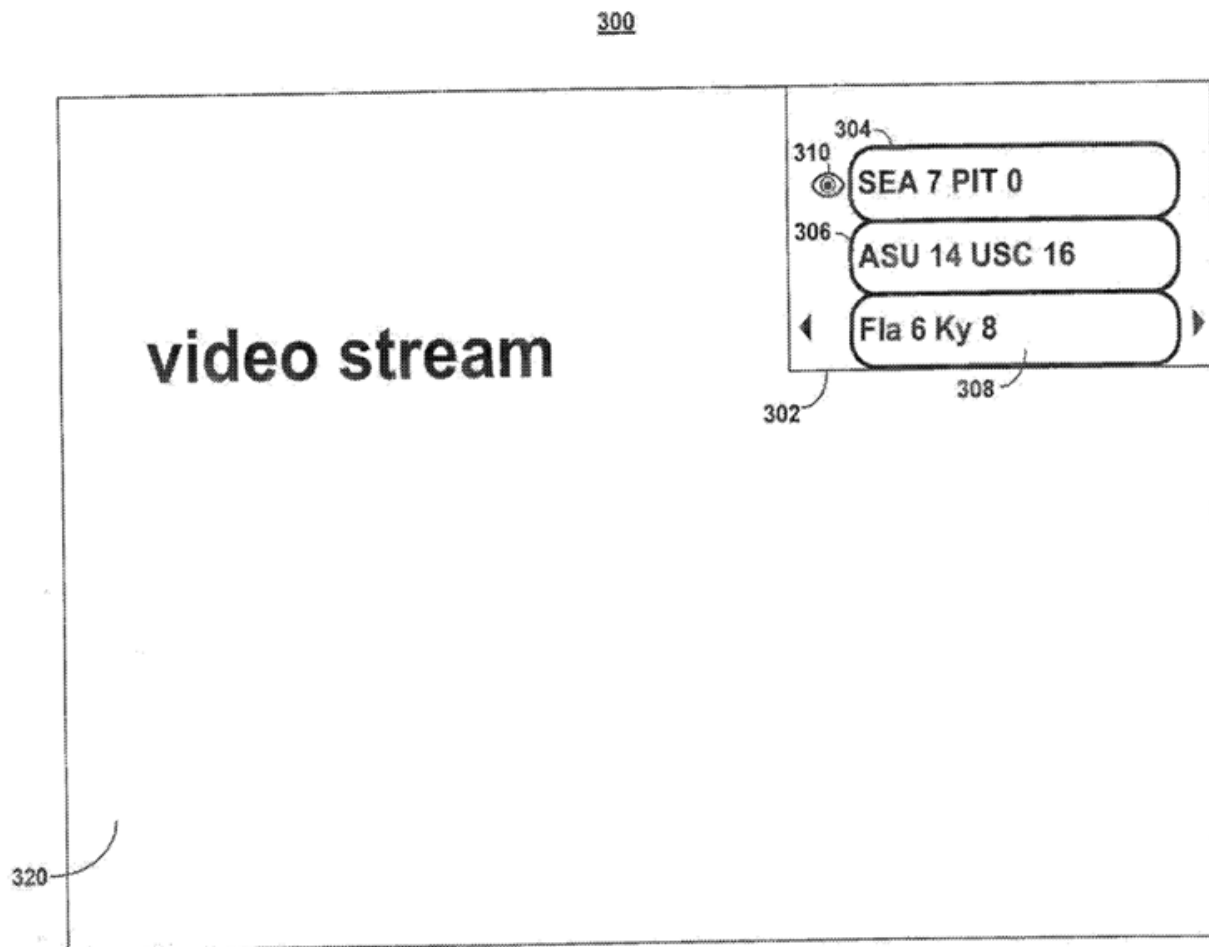


FIG. 3

195. For example, Ellis discloses a “game information screen” with a “flip banner” that the user can not only toggle but customize with digital sports content.

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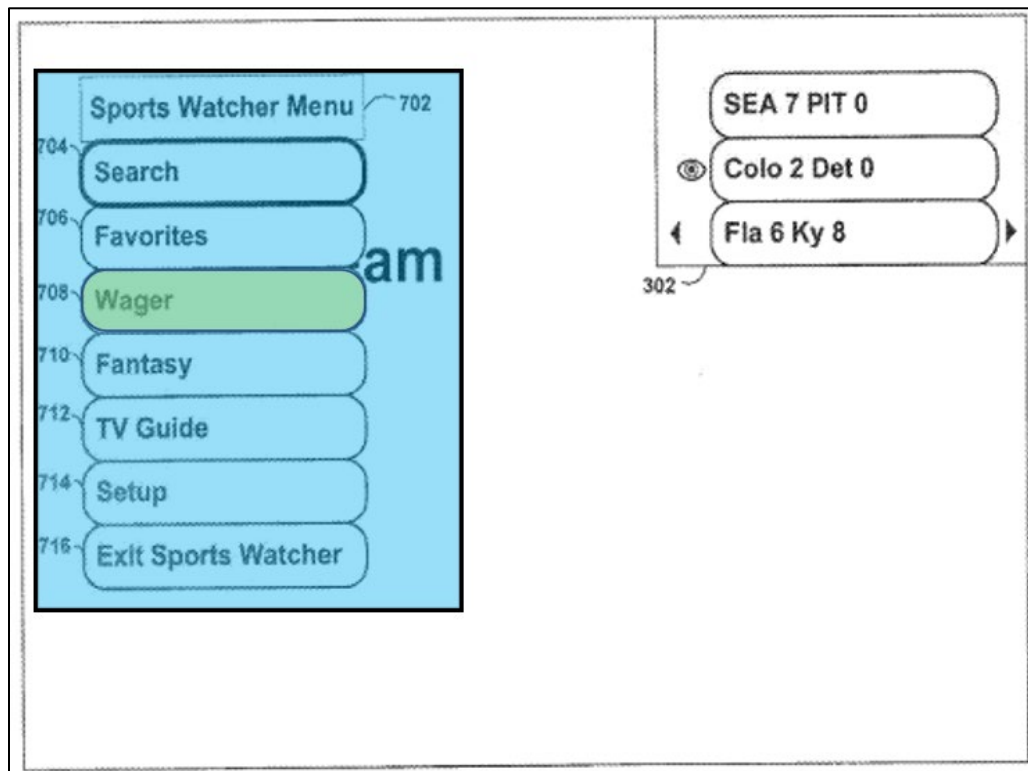
Ex.1016 ¶72. Ellis also discloses a “wager” option in the flip banner that a user can select to display a “custom wagering interface” that allows the user to “wager on the game, to modify a previous wager on the game, or to view a wager previously made on the game, including any results.” *Id.* ¶98.

196. Furthermore, as I explained above, Ellis/Spivey transmits instructions (using a webserver) to establish a communication channel that provides the event information between the socket server and viewer client device. *See* §§X.A.6.a, IV.C, X.A.6.b, X.A.6.d.

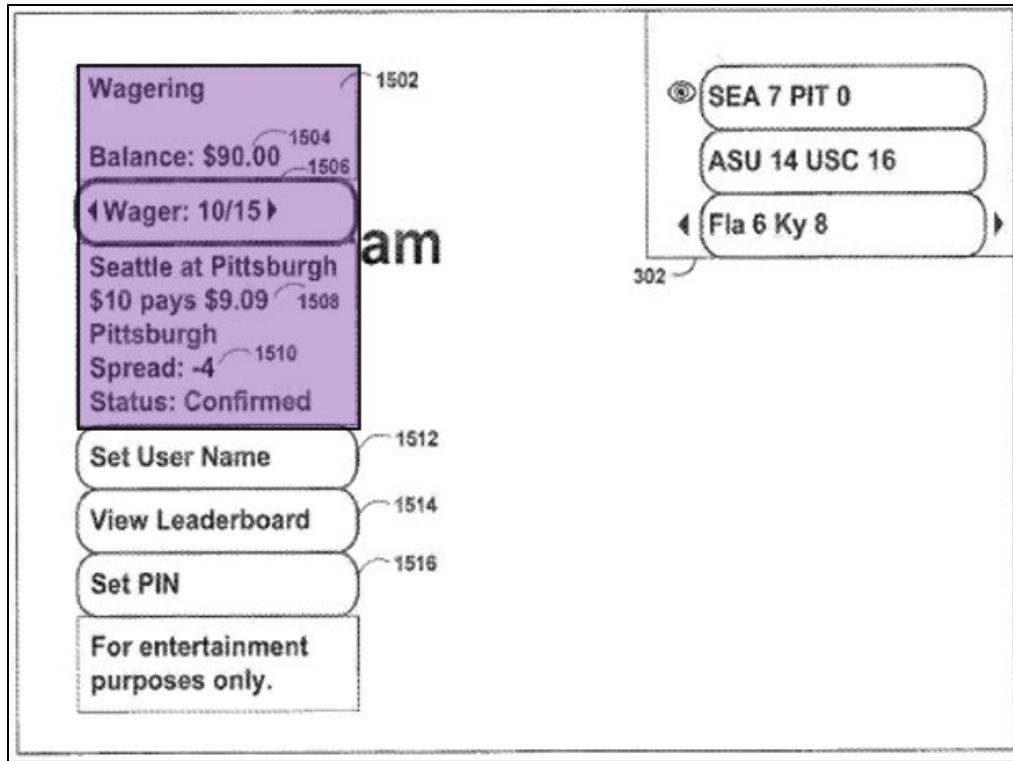
f. Limitation 8.7: “obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature; and”

197. In my opinion, Ellis discloses this limitation. Ellis discloses obtaining access to first additional information relating to the live event and redirecting to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature. For example, Ellis discloses a “wager” option in the flip banner that a user can select to display a “custom wagering interface” that allows the user to “wager on the game, to modify a previous wager on the game, or to view a wager previously made on the game, including any results.” *Id.* ¶98.

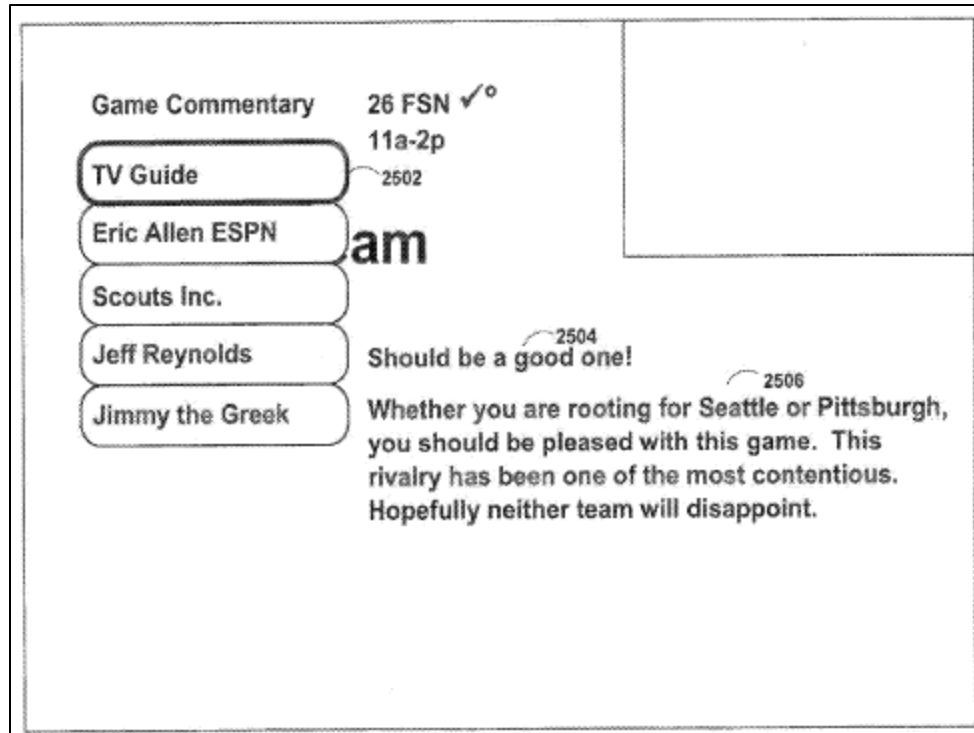
198. As a further example, when a user of Ellis selects the “TV Guide” option, an “[interactive media guidance application main menu](#)” appears on the display, presenting the user with several options to further engage with sporting event information. *Id.* ¶103. Figure 7, below, illustrates the options available to the user:



Id., Fig.7 (annotated). For example, “display screen 1500 (FIG.15) may be displayed after a user selects [wagering option 708](#).” *Id.* ¶103. Figure 15, displaying [wagering information](#) related to a first sporting event, is shown below:



Id., Fig. 15. Additionally, Ellis discloses displaying a screen that allows a user to “select any commentary option to be presented” relevant to a sporting event. *Id.* ¶132. Game commentary “may include text, graphics, video, and interactive elements (e.g., interactive playbooks, polls, and discussion forums).” *Id.* Figure 25, below, illustrates the game commentary menu:



Id., Fig. 25. By selecting any option presented above, a user can obtain access to the associated sports-related commentary and be redirected. *Id.* ¶132; *see also id.* ¶72 (disclosing user’s ability to obtain access to additional information relating to the live event by way of a “game information screen” with a “flip banner” that the user can not only toggle but customize with digital sports content).

- g. Limitation 8.8: “D) transmitting second instructions to a second client device that includes at least one second display to enable the at least one second display of the second client device to render the first event information relating to the live event, wherein the second instructions transmitted in D) cause the second client device to:”**

199. In my opinion, this limitation is substantially the same as Limitation 8.3, except that it requires transmitting *second* instructions to a *second* client device

that includes a *second* display, and that the second instructions also render the first event information relating to the live event. For the same reasons I explained above with respect to Limitation 8.3 and the first instructions, first client device, and first display, and because Ellis discloses transmitting multiple streams of digital content to multiple different users, I conclude that Ellis discloses this limitation. *See* §X.A.6.b; Ex.1016 ¶¶39, 94.

- h. Limitation 8.9: “connect to the first socket of the socket server to receive, on a third communication channel between the first socket and the second client device, the first digital content corresponding to the first event information so that the first digital content received at the first client device and the second client device is synchronized and client-by-client latency between the first client device and second client device to render the first event information is thereby mitigated or significantly reduced;”**

200. As I explained above with respect to Limitation 8.5, Ellis/Spivey’s system transmits instructions (using a webserver) to a viewer client device to cause the viewer client device to connect to a first event socket of a socket server to receive, on an event information communication channel between the first event socket and the viewer client device, digital content corresponding to the first event information. *See* §X.A.6.d. In my opinion, Limitation 8.9 is substantially the same as Limitation 8.5 but requires another connection between the same first event socket of the socket and a *second* viewer client device, such that the digital content corresponding to the first event information received by the first viewer client device and the second

viewer client device is synchronized and client-by-client latency between the two viewer client devices to render the first event information is mitigated or significantly reduced.

201. For the same reasons I provided above as to Limitation 8.5, and because the combination of Ellis and Spivey enables multiple viewer client devices to connect to any number of event sockets, I conclude that this limitation is met. *See* §§X.A.6.d; X.A.6.b; Ex.1016 ¶¶39, 94; Ex.1017 ¶¶78, 81-82.

202. To the extent the synchronization and client-by-client latency mitigation limitation is not met simply by virtue of the Ellis and Spivey combination satisfying all the structural limitations of the claims, in my opinion, a POSA would have understood that the Ellis and Spivey combination nonetheless share the first event information in a synchronized manner between viewer client devices that mitigates client-by-client latency. Spivey, for example, discloses this because it teaches that “the embodiments discussed herein may reduce [] delay to an order of milliseconds (ms) (e.g., 100ms) or less, providing a significant advantage over the conventional practices.” Ex.1017 ¶28. Spivey also teaches that digital content “may be pushed to the subscribed connected client devices substantially simultaneously with . . . a time delay of 100 milliseconds or less.” *Id.* ¶96. Further, according to Spivey, “‘substantially simultaneously’ means that the set of actions execute within

the same defined period of time. The defined period of time may be of any length as suitable for a given implementation.” *Id.*; *see also* Ex.1043, 48.

i. Limitation 8.10: “render, on the at least one second display of the second client device, at least some of the first event information as at least one second user-interactive feature; and”

203. This limitation is substantially the same as Limitation 8.6, except that it requires the first event information to be rendered as a user-interactive feature on the display of the *second* viewer client device. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 8.6. *See* §X.A.6.e, *supra*. Ellis discloses a plurality of different communication channels facilitating digital content transmission for the reasons I stated above. *See* Ex.1016 ¶¶39, 94; §§IX.A.1, X.A.6.a, *supra*.

j. Limitation 8.11: “obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least one second user-interactive feature.”

204. This limitation is substantially the same as Limitation 8.7, except that it requires obtaining the claimed access when a user of the *second* viewer client device selects a portion of the rendered *second* user-interactive feature. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 8.7. *See* §X.A.6.f, *supra*. Ellis discloses a plurality of different

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communication channels facilitating digital content transmission for the reasons I stated above. *See* Ex.1016 ¶¶39, 94; §§IX.A.1, X.A.6.a, *supra*.

7. Dependent Claim 11

- a. Limitations 11.0-11.2: “The method of claim 8, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

205. In my opinion, Ellis discloses these limitations. Ellis discloses a **SCS** providing first live event information germane to the first live sporting event through a “plurality of real-time data feeds,” one of which can include “sports score and game status information,” while the other carries “sports commentary.” Ex.1016 ¶41; *see also id.* ¶¶93, 103.

8. Dependent Claim 12

- a. Limitations 12.0-12.2: “The method of claim 8, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

206. In my opinion, Ellis discloses these limitations. *See* §X.A.7.a.

B. Ground 1B: Claims 2, 3, 9, 10 and 13-34 Are Obvious Over Ellis in View of Spivey and Abulikemu

207. For the reasons I stated in Section IX.C.1, above, it is my opinion that a POSA would have been motivated to combine the teachings of Ellis, Spivey, and Abulikemu to arrive at the claimed invention with a reasonable expectation of success.

1. Dependent Claim 2

a. Limitations 2.0-2.1: “The system of claim 1, wherein: the at least one media source is configured to:”

208. In my opinion, Ellis and Abulikemu disclose media sources configured to operate in the claimed manner. *See* §§X.A.1.a, IX.C.1.

b. Limitation 2.2: “receive the audio/video feed of the live event;”

209. In my opinion, Ellis and Abulikemu disclose media sources configured to receive the audio/video feed of the live event. *See* §§X.A.1.a, IX.C.1.

c. Limitation 2.3: “provide the first copy of the audio/video feed of the live event from the first media server endpoint;”

210. In my opinion, Ellis and Abulikemu disclose media sources configured to provide the first copy of the audio/video feed of the live event from the first media server endpoint. *See* §§X.A.1.a, IX.C.1. For the same reasons I explained above with respect to Ellis, in my opinion, a POSA would have understood that Abulikemu also uses Internet address/endpoints to designate the location from which client devices can receive requested digital content. *See* §X.A.1.a. For example, in my opinion, a POSA would have understood that Abulikemu’s system uses Internet address/endpoints to designate the location from which client devices can receive requested digital content because Abulikemu describes using “communication channel[s],” Ex.1050 ¶29, over the Internet, which necessarily would include endpoints. *Id.* ¶27; *see also id.* Fig. 1 (junctions between viewers and central server). Likewise, in my opinion, a POSA would have also understood that Abulikemu uses

other, distinct Internet address/endpoints to designate the location from which the viewer client devices can receive the requested composite outgoing stream.

d. Limitation 2.4: “receive from the first client device a composite outgoing stream of the audio/video feed and additional video content; and”

211. Abulikemu discloses media sources, *e.g.*, central server 100, configured to receive from the first client device, *e.g.*, viewer 108, a composite outgoing stream of the audio/video feed and additional video content. *See* §IX.C.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2.

e. Limitation 2.5: “provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source; and”

212. Abulikemu discloses media sources, *e.g.*, central server 100, configured to provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source. *See* §IX.C.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2. As I explained, in my opinion, a POSA would have understood that Abulikemu uses Internet address/endpoints to designate the location from which client devices can receive the requested audio/video feed of the live event. *See* §X.B.1.c. Likewise, in my opinion, a POSA would have also understood that Abulikemu uses other, distinct Internet address/endpoints to designate the location from which the client devices can receive the requested composite outgoing stream.

- f. Limitations 2.6-2.7: “the webserver is configured to transmit the second instructions to the second client device to cause the second client device to: connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the second client device, the first copy of the composite outgoing stream.”**

213. As I explained above, in my opinion, a POSA would have found it obvious to integrate a known webserver into Ellis/Spivey’s data delivery system and configure it to facilitate connections between viewer client devices and the media sources and between viewer client devices and the socket server. *See* §IX.B.1. Moreover, in my opinion, a POSA would have likewise configured the known webserver to facilitate a connection between the second viewer client device and the second media server endpoint to provide the first copy of the composite outgoing stream to the second viewer client device. As I explained above, in my opinion, a POSA would have understood that video communication channels between the media source and the viewer client device, and event information communication channels between an event socket of the socket server and the viewer client device, are established when the known webserver transmits instructions to the viewer client device. *See* §§X.A.1.c, X.A.1.h.

2. Dependent Claim 3

- a. Limitations 3.0-3.1: “The system of claim 2, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”**

214. As I explained above, a POSA would have understood that RTMP is a low-latency data transmission protocol in use as of at least 2012 that is designed to support live online streaming in social media platforms, streaming platforms, and media servers. *See* §IV.D.5; Ex.1035, 3; Ex.1036, 1. A POSA would have understood that once a connection is established between the client and server, RTMP operates as a bi-directional multiplexing service over TCP to stream live and on-demand video or audio data from the server to the client device. *See* §IV.D.5; Ex.1035, 3. The '088 references use of this traditional protocol. *See* Ex.1012, Figs. 2, 29. A POSA would have also understood that HLS is another known traditional data transmission protocol referenced by the '088. *See* §IV.D.7. HLS was developed by Apple and released in 2009 to provide video feeds over the Internet. Ex.1028, 1. As HLS was originally promulgated by Apple, it was well known to web software and hardware developers.

215. Ellis teaches streaming video from content source 130, *e.g.*, an “Internet or network media/web server” to a client device, over the Internet. Ex.1016 ¶¶40, 74. Thus, in my opinion, a POSA would have understood that Ellis, filed in 2014, would support the use of all forms of standard Internet streaming protocols, including RTMP and HLS.

216. To the extent Ellis does not specifically disclose that its media sources include RTMP and HLS servers, in my opinion, it would have been well-within a

POSA's knowledge to utilize these known protocols to execute the desired streaming functionality disclosed in Ellis. Specifically, these protocols were well-known to POSAs at the time as desirable techniques for transmitting data to multiple users. Thus, I conclude that selecting these traditional protocols among other known protocols would have been a simple and obvious matter of design choice.

b. Limitation 3.2: "the first media server endpoint is coupled to the at least one HLS server;"

217. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis's media sources to employ an HLS server. *See* §X.B.2.a. In employing the HLS protocol in Ellis's system, a POSA would have coupled the HLS server to the first media server endpoint.

c. Limitation 3.3: "the at least one RTMP media server is configured to receive the audio/video feed of the live event and transmit a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and"

218. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis's media sources to include RTMP and HLS servers. *See* §X.B.2.a. Moreover, in my opinion, a POSA would have understood that implementing that design included configuring the RTMP server to receive live event data and sending the data to an HLS server. Thus, I conclude that in employing the RTMP and HLS protocols in Ellis's system, a POSA would have configured the

system to transmit a first HLS copy of the audio/video feed of the live event from the RTMP server to the HLS server. Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

- d. **Limitation 3.4: “the at least one HLS server is configured to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint.”**

219. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis’s media sources to include an HLS server. *See* §X.B.2.a. In employing the HLS protocols in Ellis’s system, a POSA would have configured the HLS server to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint. Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

3. **Dependent Claim 9**

- a. **Limitations 9.0-9.1: “The method of claim 8, further comprising: E) receiving, by the at least one media source from the first client device, a composite outgoing stream of the audio/video feed and additional video content; and”**

220. Abulikemu discloses media sources, *e.g.*, central server 100, configured to receive from the first viewer client device, *e.g.*, viewer 108, a composite outgoing stream of the audio/video feed and additional video content. *See* §IX.C.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2.

- b. **Limitation 9.2: “(F) providing a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source,”**

221. In my opinion, Abulikemu discloses media sources, *e.g.*, central server 100, configured to provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source. *See* §IX.C.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2. For the same reasons I explained above with respect to Ellis, in my opinion, a POSA would have understood that Abulikemu also uses Internet address/endpoints to designate the media source location from which viewer client devices can receive requested content. *See* §X.A.6.a. For example, in my opinion, a POSA would have understood that Abulikemu's system uses Internet address/endpoints to designate the location from which client devices can receive requested digital content because Abulikemu describes using "communication channel[s]," Ex.1050 ¶29, over the Internet, which necessarily would include endpoints. *Id.* ¶27; *see also id.* Fig. 1 (junctions between viewers and central server). Likewise, in my opinion, a POSA would have also understood that Abulikemu uses other, distinct Internet address/endpoints to designate the location from which the viewer client devices can receive the requested composite outgoing stream.

- c. **Limitations 9.3-9.4: "wherein D) further comprises transmitting the second instructions to the second client device to cause the second client device to: connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the second client device, the first copy of the composite outgoing stream."**

222. As I explained above, in my opinion, a POSA would have known that the video and event information communication channels disclosed by Ellis/Spivey would have been established using a known webserver, which transmits instructions to the viewer client device to establish the connections and allow for the flow of data in the claimed manner. *See* §§IV.C, X.A.6.b. In my opinion, a POSA would have likewise configured the known webserver to facilitate a connection between the second viewer client device and the second media server endpoint to provide the first copy of the composite outgoing stream to the second viewer client device. As I explained above, in my opinion, a POSA would have understood that video communication channels between the media source and the viewer client device, and event information communication channels between an event socket of the socket server and the viewer client device, are established when the known webserver transmits instructions to the viewer client device. *See* §§X.A.6.b, X.A.1.h.

4. Dependent Claim 10

- a. Limitations 10.0-10.1: “The method of claim 9, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”**

223. As I explained above, in my opinion, a POSA would have understood that RTMP is a low-latency data transmission protocol in use as of at least 2012 that is designed to support live online streaming in social media platforms, streaming platforms, and media servers. *See* §IV.D.5; Ex.1035, 3; Ex.1036, 1. A POSA would

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have understood that once a connection is established between the client and server, RTMP operates as a bi-directional multiplexing service over TCP to stream live and on-demand video or audio data from the server to the viewer client device. Ex.1035, 3. The '088 references use of this traditional protocol. *See* Ex.1012, Figs. 2, 29. A POSA would have also understood that HLS is another known traditional data transmission protocol referenced by the '088. *See* §IV.D.7. HLS was developed by Apple and released in 2009 to provide video feeds over the Internet. Ex.1028, 1. As HLS was originally promulgated by Apple, it was well known to web software and hardware developers.

224. Ellis teaches streaming video from content source 130, *e.g.*, an “Internet or network media/web server” to a viewer client device, over the Internet. Ex.1016 ¶¶40, 74. Thus, in my opinion, a POSA would have understood that Ellis, filed in 2014, would support the use of all forms of standard Internet streaming protocols, including RTMP and HLS.

225. To the extent Ellis does not specifically disclose that its media sources include RTMP and HLS servers, in my opinion, it would have been well-within a POSA’s knowledge to utilize these known protocols to execute the desired streaming functionality disclosed in Ellis. Specifically, these protocols were well-known at the time as desirable techniques for transmitting data to multiple users. Thus, I conclude

that selecting these traditional protocols among other known protocols would have been a simple and obvious matter of design choice.

b. Limitation 10.2: “the first media server endpoint is coupled to the at least one HLS server;”

226. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis’s media sources to employ an HLS server. *See* §X.B.4.a. In employing the HLS protocol in Ellis’s system, a POSA would have coupled the HLS server to the first media server endpoint.

c. Limitation 10.3: “A) comprises receiving, by the at least one RTMP media server, the audio/video feed of the live event and transmitting a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and”

227. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis’s media sources to include RTMP and HLS servers. *See* §X.B.4.a. Moreover, in my opinion, a POSA would have understood that implementing that design included configuring the RTMP server to receive live event data and sending the data to an HLS server. Thus, in employing the RTMP and HLS protocols in Ellis’s system, I conclude that a POSA would have configured the system to transmit a first HLS copy of the audio/video feed of the live event from the RTMP server to the HLS server. *See* Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

- d. Limitation 10.4: “B) comprises providing the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint of the at least one HLS server to the first client device.”**

228. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice for Ellis’s media sources to include an HLS server. *See* §X.B.4.a. In employing the HLS protocols in Ellis’s system, in my opinion, a POSA would have configured the HLS server to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint. *See* Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

5. Independent Claim 13

- a. Limitations 13.0-13.2: “A method, comprising: A) receiving, by at least one media source, an audio/video feed of a live event; B) providing a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source to a first client device;”**

229. In my opinion, Ellis discloses these limitations for the same reasons I stated above. *See* §X.A.6.a.

- b. Limitation 13.3: “C) receiving, by the at least one media source from the first client device, a composite outgoing stream of the audio/video feed and additional video content;”**

230. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.3.a.

- c. **Limitation 13.4: “D) providing a first copy of the composite outgoing stream of the audio/video feed and additional video content from a second media server endpoint of the at least one media source; and”**

231. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.3.b.

- d. **Limitation 13.5: “E) transmitting first instructions to a second client device that includes at least one first display to cause the at least one first display of the second client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted in E) cause the second client device to:”**

232. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §§X.A.6.b, X.A.6.g, X.B.3.c.

- e. **Limitation 13.6: “connect to the second media server endpoint of the at least one media source to receive, on a first communication channel, the first copy of the composite outgoing stream;”**

233. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.3.c.

- f. **Limitation 13.7: “render, on the at least one first display of the first client device, the first video relating to the live event based on the first copy of the composite outgoing stream;”**

234. In my opinion, Limitation 13.7 appears to include an antecedent basis issue. Specifically, Limitation 13.7 recites “*the* at least one first display of *the* first client device,” but the only previously-discussed display in Claim 13 is located on

the *second* client device. *See* Limitation 13.5 (“a second client device that includes at least one first display”). Setting aside the drafting error in the claim, I understand the display referred to in Limitation 13.7 to be located on the *second* client device, not the first.

235. Nevertheless, to the extent this limitation can be understood, it is my opinion that this limitation is disclosed by Ellis/Spivey/Abulikemu for the same reasons I stated above. *See* §§X.A.6, X.B.3.

236. To the extent this limitation is understood to require the instructions transmitted to the *second* client device to cause the *second* client device to render the composite video stream on a display of the *first* client device, in my opinion, it would have been a simple and obvious matter of design choice to select which client device to use for displaying the composite video stream.

- g. Limitation 13.8: “connect to a socket of a socket server to receive, on a second communication channel different from the first communication channel, first digital content corresponding to the first event information; and”**

237. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §X.A.6.d.

- h. Limitation 13.9: “render, on the at least one first display of the first client device, at least some of the first event information based on the first digital content received on the second communication channel.”**

238. In my opinion, this limitation has the same antecedent basis issue described above with respect to Limitation 13.7, appearing to mistakenly require the displayed content be rendered on the *first* client device, not the *second* client device. *See* §X.B.5.f. For the same reasons I described above, I understand the display referred to in Limitation 24.10 to be located on the *second* client device, not the first. *Id.*

239. This limitation differs from Limitation 13.7 only in the type of content rendered on the display (*i.e.*, event information as opposed to composite video stream). To the extent this limitation can be understood, in my opinion, it is disclosed by Ellis/Spivey for the same reasons I stated above. *See* §§X.A.6.d, X.A.6.e.

240. To the extent this limitation is understood to require the instructions transmitted to the *second* client device to cause the *second* client device to render the event information on a display of the *first* client device, in my opinion, it would have been a simple and obvious matter of design choice to select which client device to use for displaying the event information.

6. Dependent Claim 14

- a. Limitations 14.0-14.1: “The method of claim 13, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”**

241. In my opinion, these limitations are obvious over Ellis for the same reasons I stated above. *See* §X.B.4.a.

- b. Limitation 14.2: “A) comprises receiving, by the at least one RTMP media server, the audio/video feed of the live event and transmitting a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and”**

242. In my opinion, this limitation is obvious over Ellis for the same reasons

I stated above. *See* §X.B.4.c.

- c. Limitation 14.3: “B) comprises providing the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint of the at least one HLS server to the first client device.”**

243. In my opinion, this limitation is obvious over Ellis for the same reasons

I stated above. *See* §X.B.4.d.

7. Dependent Claim 15

- a. Limitations 15.0-15.1: “The method of claim 13, wherein the first instructions transmitted in E) cause the second client device to: obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information.”**

244. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.6.g, X.A.6.i, X.A.6.j.

8. Dependent Claim 16

- a. Limitations 16.0-16.2: “The method of claim 15, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

245. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.7.a.

9. **Dependent Claim 17**

- a. **Limitations 17.0-17.2: “The method of claim 15, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

246. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.8.a.

10. **Dependent Claim 18**

- a. **Limitations 18.0-18.2: “The method of claim 13, further comprising: F) transmitting second instructions to a third client device that includes at least one second display to enable the at least one second display of the second client device to render the first event information relating to the live event, wherein the second instructions transmitted in F) cause the third client device to: connect to the socket of the socket server to receive, on a third communication channel between the socket and the third client device, the first digital content corresponding to the first event information.”**

247. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.6.g, X.A.6.h.

11. **Dependent Claim 19**

- a. **Limitation 19.0: “The method of claim 18, wherein F) further comprises transmitting the second instructions to the third client device to enable the at least one second display of the third client device to render the first video relating to the live event and render the first event information relating to the live**

event, wherein the second instructions transmitted in F) cause the third client device to:"

248. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §X.A.6.b.

- b. Limitation 19.1: "connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the third client device, the first copy of the composite outgoing stream."**

249. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §§X.A.6, X.B.3, X.B.5.

12. Dependent Claim 20

- a. Limitations 20.0-20.2: "The method of claim 19, wherein: the second instructions transmitted in F) further cause the third client device to: render, on the at least one second display of the third client device, the first video relating to the live event based on the first copy of the composite outgoing stream received on the fourth communication channel; and"**

250. In my opinion, Ellis/Spivey/Abulikemu discloses these limitations for the same reasons I stated above. *See* §§X.B.5, X.B.10, X.B.11.

- b. Limitation 20.3: "render, on the at least one second display of the third client device, at least some of the first event information based on the first digital content received on the third communication channel."**

251. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §§X.B.5, X.B.10, X.B.11.

13. **Dependent Claim 21**

- a. **Limitations 21.0-21.1: “The method of claim 20, wherein: the first instructions transmitted in E) cause the second client device to obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information; and”**

252. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.6.f, X.A.6.j.

- b. **Limitation 21.2: “the second instructions transmitted in F) cause the third client device to obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least some of the first event information.”**

253. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §§X.B.13.a, X.A.6.f, X.A.6.j.

14. **Dependent Claim 22**

- a. **Limitations 22.0-22.2: “The method of claim 21, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

254. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.7.a, X.B.8.a.

15. **Dependent Claim 23**

- a. **Limitations 23.0-23.2: “The method of claim 21, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

255. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.8.a, X.B.9.a.

16. **Independent Claim 24**

- a. **Limitations 24.0-24.3: “A system, comprising: at least one media source to: receive an audio/video feed of a live event; provide a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source to a first client device;”**

256. In my opinion, Ellis discloses these limitations for the same reasons I stated above. *See* §X.A.1.a.

- b. **Limitation 24.4: “receive from the first client device a composite outgoing stream of the audio/video feed and additional video content; and”**

257. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.1.d.

- c. **Limitation 24.5: “provide a first copy of the composite outgoing stream of the audio/video feed and additional video content from a second media server endpoint of the at least one media source; and”**

258. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.1.e.

- d. **Limitation 24.6: “a webserver to transmit first instructions to a second client device that includes at least one first display to cause the at least one first display of the second client device to render a first**

video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted by the webserver cause the second client device to:”

259. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §§X.A.1.b, X.A.1.c, X.A.1.h, X.B.1.f.

- e. Limitation 24.7: “connect to the second media server endpoint of the at least one media source to receive, on a first communication channel, the first copy of the composite outgoing stream;”**

260. In my opinion, Ellis/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.B.1.f.

- f. Limitation 24.8: “render, on the at least one first display of the first client device, the first video relating to the live event based on the first copy of the composite outgoing stream;”**

261. In my opinion, Limitation 24.8 appears to include an antecedent basis issue. Specifically, Limitation 24.8 recites “*the* at least one first display of *the* first client device,” but the only previously-discussed display in Claim 24 is located on the *second* client device. *See* Limitation 24.6 (“a second client device that includes at least one first display”). Setting aside this drafting error, I understand the display referred to in Limitation 24.8 to be located on the *second* client device, not the first.

262. Nevertheless, to the extent this limitation can be understood, in my opinion, it is disclosed by Ellis/Spivey/Abulikemu for the same reasons I stated above. *See* §§X.A.1, X.B.1.

263. To the extent this limitation is understood to require the instructions transmitted to the *second* client device to cause the *second* client device to render the composite video stream on a display of the *first* client device, in my opinion, it would have been a simple and obvious matter of design choice to select which client device to use for displaying the composite video stream.

- g. Limitation 24.9: “connect to a socket of a socket server to receive, on a second communication channel different from the first communication channel, first digital content corresponding to the first event information; and”**

264. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §X.A.1.e.

- h. Limitation 24.10: “render, on the at least one first display of the first client device, at least some of the first event information based on the first digital content received on the second communication channel.”**

265. This limitation has the same antecedent basis issue I described above with respect to Limitation 24.8, appearing to mistakenly require the displayed content be rendered on the *first* client device, not the *second* client device. *See* §X.B.16.f. For the same reasons I described above, I understand the display referred to in Limitation 24.10 to be located on the *second* client device, not the first. *Id.*

266. This limitation differs from Limitation 24.8 only in the type of content rendered on the display (*i.e.*, event information as opposed to composite video

stream). To the extent this limitation can be understood, in my opinion, it is disclosed by Ellis/Spivey for the same reasons I stated above. *See* §§X.A.1.e, X.A.1.f.

267. To the extent this limitation is understood to require the instructions transmitted to the *second* client device to cause the *second* client device to render the event information on a display of the *first* client device, in my opinion, it would have been a simple and obvious matter of design choice to select which client device to use for displaying the event information.

17. Dependent Claim 25

- a. Limitations 25.0-25.1: “The system of claim 24, wherein the first instructions transmitted by the webserver cause the second client device to: obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information.”**

268. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.1.h, X.A.1.j, X.A.1.k.

18. Dependent Claim 26

- a. Limitations 26.0-26.2: “The system of claim 24, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

269. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.4.a.

19. Dependent Claim 27

- a. **Limitations 27.0-27.2: “The system of claim 24, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

270. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.5.a.

20. **Dependent Claim 28**

- a. **Limitation 28.0: “The system of claim 24, further comprising the socket server.”**

271. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §X.A.2.a.

21. **Dependent Claim 29**

- a. **Limitations 29.0-29.1: “The system of claim 28, further comprising: a control server, coupled to the socket server, to provide the first digital content corresponding to the first event information to the socket server.”**

272. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.3.a.

22. **Dependent Claim 30**

- a. **Limitations 30.0-30.1: “The system of claim 24, wherein the webserver is configured to transmit second instructions to a third client device that includes at least one second display to enable the at least one second display of the third client device to render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the third client device to: connect to the socket of the socket server to receive, on a third communication channel between the socket and the**

**third client device, the first digital content
corresponding to the first event information.”**

273. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.1.h, X.A.1.i.

23. Dependent Claim 31

- a. Limitation 31.0: “The system of claim 30, wherein the webserver is configured to transmit the second instructions to the third client device to further enable the at least one second display of the third client device to render the first video relating to the live event and render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the third client device to:”**

274. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §X.A.1.c.

- b. Limitation 31.1: “connect to the second media server endpoint to receive, on a fourth communication channel between the first media server endpoint and the third client device, the first copy of the composite outgoing stream.”**

275. In my opinion, Limitation 31.1 appears to include an antecedent basis issue. Specifically, Limitation 31.1 requires that the third client device connects to the *second* media server endpoint to receive, on a communication channel between the *first* media server endpoint and the third client device, the first copy of the composite outgoing stream. Setting aside this drafting error, in my opinion, a POSA would have understood that the third client device connects to the *second* media

server endpoint, not the *first*, to establish the communication channel that receives the first copy of the composite video stream. *See* Limitations 24.5, 24.7 (reciting that the *second* media server endpoint provides the first copy of the composite video stream).

276. Nevertheless, to the extent this limitation can be understood, in my opinion, it is disclosed by Ellis/Spivey/Abulikemu for the same reasons I stated above. *See* §§X.A.1, X.B.1, X.B.16.

277. To the extent this limitation is understood to require the communication channel providing the first copy of the composite video stream to be between the *first* media server endpoint and the third client device, which, in my opinion, would not make sense, I believe that a POSA would have found it obvious to choose whichever media server endpoint was appropriate (*i.e.* whichever endpoint outputs the composite stream).

24. **Dependent Claim 32**

- a. **Limitations 32.0-32.1: “The system of claim 31, wherein: the first instructions transmitted by the webserver cause the second client device to obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information; and”**

278. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.A.1.g, X.A.1.k.

- b. Limitation 32.2: “the second instructions transmitted by the webserver cause the third client device to obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least some of the first event information.”**

279. In my opinion, Ellis/Spivey discloses this limitation for the same reasons I stated above. *See* §§X.B.24.a, X.A.1.g, X.A.1.k.

25. Dependent Claim 33

- a. Limitations 33.0-33.2: “The system of claim 30, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

280. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.4.a.

26. Dependent Claim 34

- a. Limitations 34.0-34.2: “The system of claim 30, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

281. In my opinion, Ellis/Spivey discloses these limitations for the same reasons I stated above. *See* §X.A.5.a.

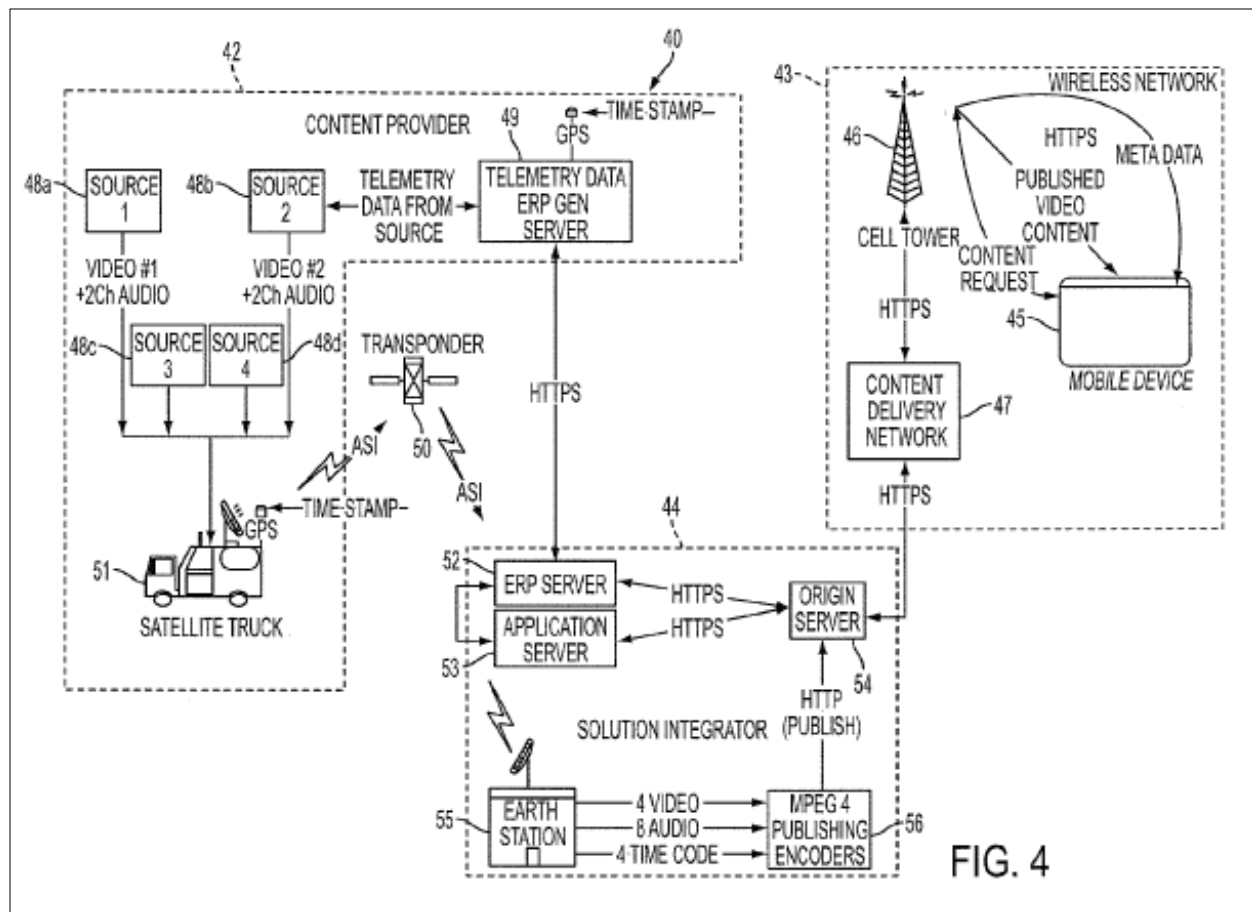
C. Ground 2A: Claims 1, 4-8, 11 and 12 Are Obvious Over Herzog in View of Spivey

282. For the reasons I stated in Section IX.D.1, above, it is my opinion that a POSA would have been motivated to combine the teachings of Herzog and Spivey to arrive at the claimed invention with a reasonable expectation of success.

1. **Independent Claim 1**

- a. **Limitations 1.0-1.1: “A system, comprising: at least one media source to receive an audio/video feed of a live event and provide a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source; and”**

283. Herzog provides “live video and audio data” to viewer client devices over a “communication network.” *See* Ex.1015, Abstract. Herzog’s primary embodiment includes providing “multiple video/audio streams of race cars and drivers [*i.e.*, sources 48a-d], as they are imaged at different locations on the race track:”



Ex.1015 ¶45; Fig 4. This system makes these video feeds available to “mobile stations” and other “similar users.” *Id.* ¶19. Each user can then request video from “one or more channels of video/audio for viewing a live event.” *Id.* ¶70. The user then “receives both the video/audio stream” via HLS. *Id.* ¶51. Thus, Herzog provides a system where multiple different users can select the same, or different, live stream relating to a sporting event.

284. Herzog also provides event information germane to the sporting event. Specifically, Herzog transmits “meta-data” such as “the status of each car and driver in the race” and may include “lap number, car speed and acceleration,” among other

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event information. Ex.1015 ¶45. In my opinion, a POSA would have understood such meta-data to include online gaming information and/or score information.

285. Herzog discloses multiple MPEG 4 Publishing Encoders (“Encoders”) as a plurality of media sources. Ex.1015 ¶48. Just like in the ’088, these encoders receive all the video/audio data from the live event, such as the Indy Car Race. Ex.1015 ¶¶46 (any form of communication technologies may be used to send video/audio data to Encoders), 49. The Encoders can “encode[]” the video/audio data and then the “encoded video is then published to the content delivery network 47 (for example) via IP utilizing [] HLS.” *Id.* ¶¶49, 55.

286. Herzog’s Encoders receive the video/audio data from the event. Ex.1015 ¶49. Herzog discloses that the audio/video data can be provided to the Encoders using “communication technologies for communicating multiple video and audio streams.” *Id.* ¶46. Thus, I conclude that Herzog discloses media sources that receive an audio/video feed of a live event.

287. Herzog provides the selected audio/video stream to each user individually over individual communication channels via HLS, *i.e.*, an Internet connection. Ex.1015 ¶51. Thus, in my opinion, a POSA would have understood that each viewer client device receives its own copy of the audio/video stream from the Encoders over a communication channel that is unique to each viewer client device. *Id.* ¶¶2, 51. This would create a plurality of copies being distributed, where the first

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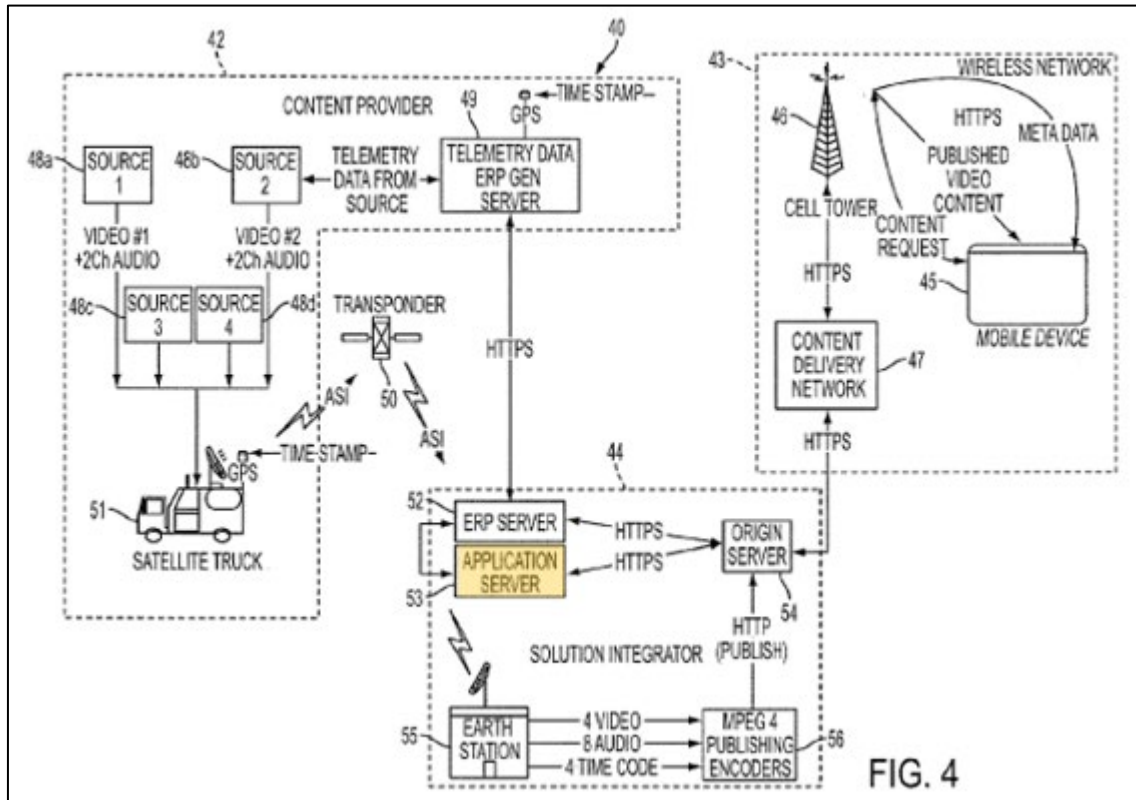
copy is sent to the first user, and so on. Thus, each user would receive an individual copy of the audio/video feed of the event from the media sources.

288. Herzog discloses that the copies of the audio/video feed of the live event are provided to the users over the individual communication channels that are established between the user and a media server endpoint/Internet address of the media sources. Specifically, Herzog discloses a media server endpoint/Internet address, albeit indirectly, when describing the type of content a viewer client device may store. Ex.1015 ¶35 (“The memories 114, 116 also store various data, such as telephone numbers and server addresses”). To the extent Herzog does not explicitly reference a media server endpoint/Internet address, in my opinion, a POSA would have understood that the system in Herzog necessarily requires such an endpoint/address to stream the audio/video feed of the live event from the media sources to the viewer client device. Specifically, in my opinion, a POSA would have understood that Herzog’s HTTPS communication format uses the Transmission Control Protocol (TCP), which in turn uses the Internet Protocol (IP). *Id.* These protocols require an IP address to designate the location from which viewer client devices can receive requested content. *Id.*

b. Limitation 1.2: “a webserver configured to:”

289. Herzog discloses an “application server 53” (*i.e.*, webserver), which is “configured to receive the request from the client application software and begin

sending the meta-data with the corresponding .JSON time stamp via the ERP server 52 in the solution integrator 44.” Ex.1015 ¶58. Herzog’s application server is depicted below in Figure 4:



Ex.1015, Fig. 4. The application server facilitates streaming between the origin server and viewer client device by receiving a “request with the time code call out” from the viewer client device, then prompting the origin server to transmit a meta-data stream to the viewer client devices. *Id.* ¶51. While doing so, the application server “satisfies time synchronization requirements between a client application residing in mobile device 45 and the solution integrator 44.” *Id.*

- c. **Limitation 1.3: “transmit first instructions to a first client device that includes at least one first display,**

the first instructions transmitted by the webserver enabling the at least one first display of the first client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted by the webserver cause the first client device to:”

290. Herzog’s application server (*i.e.*, “webserver”) transmits instructions to viewer client devices to cause the viewer client devices to request a copy of audio/video feeds of the live event. *See* Ex.1015 ¶¶28, 51, 84, 86, 88, cl. 11; §§X.C.1.a, X.C.1.b. Furthermore, in my opinion, a POSA would have understood that Herzog’s application server transmits instructions to viewer client devices to establish a connection between its user equipment and media sources.

291. In my opinion, Herzog also discloses causing a display on the viewer client device to render **video** and **event information** relating to the event, as shown below in Figures 4 and 7:

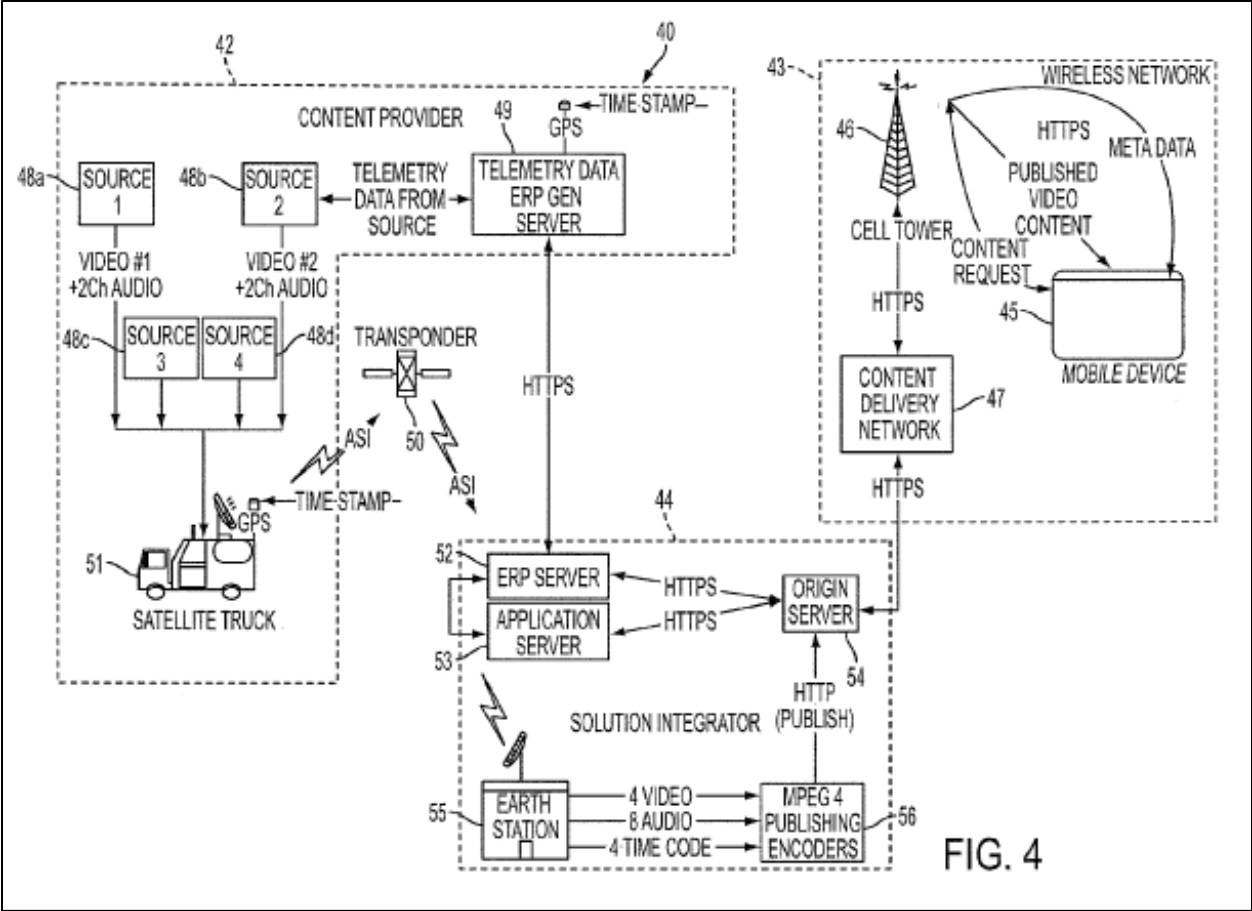


FIG. 4

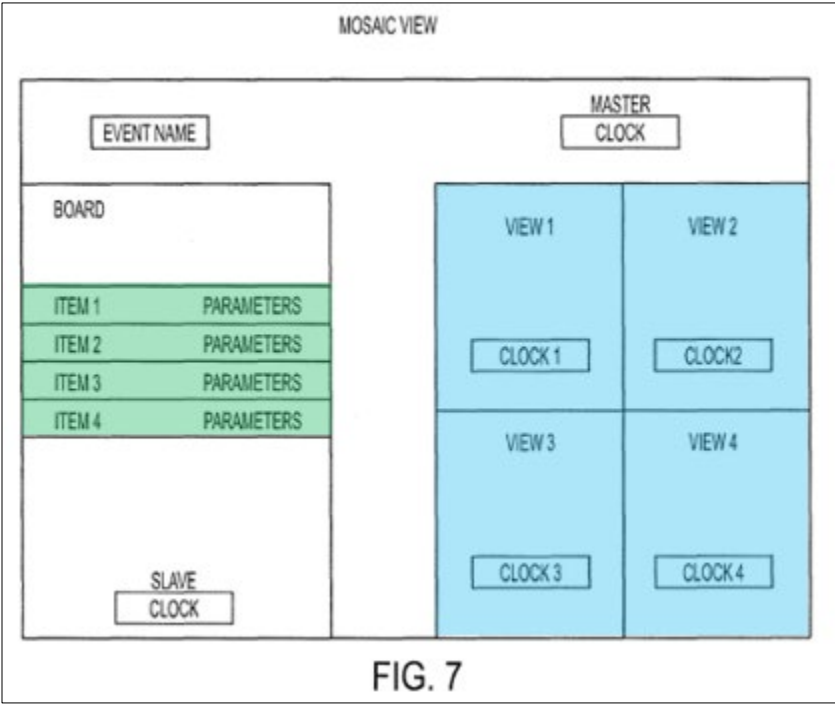
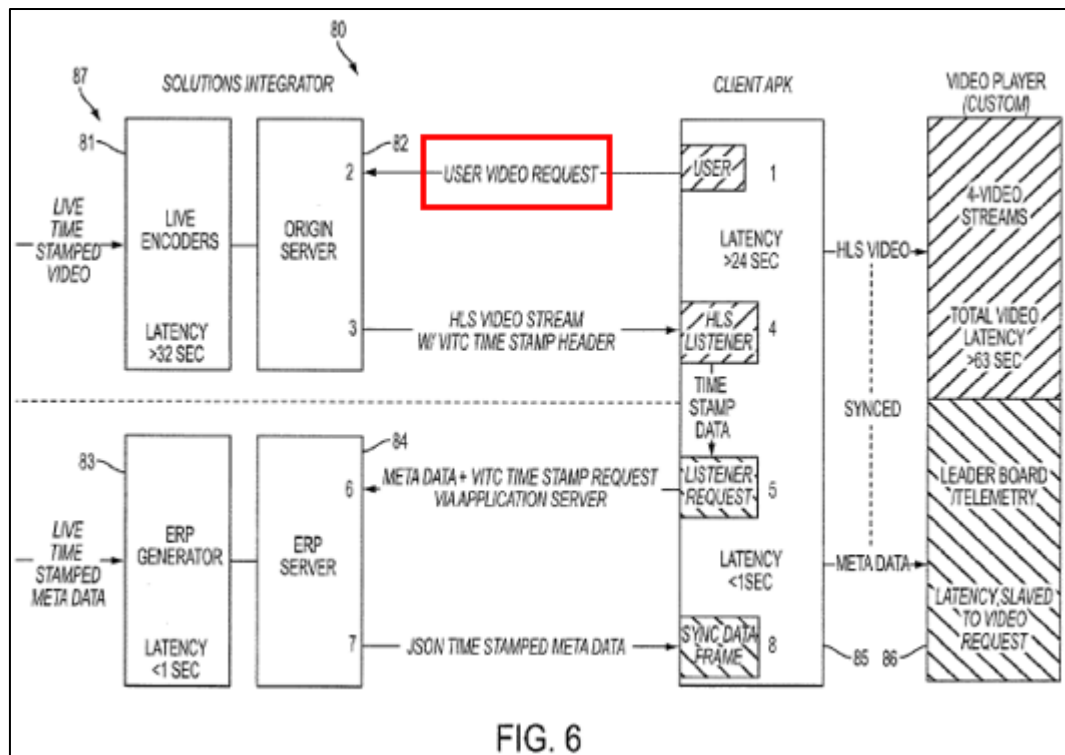


FIG. 7

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Ex.1015 ¶12; Figs. 4, 7. Herzog accomplishes this by streaming “multiple paths of... content” (*i.e.*, sources 48a-d), then “display[s] the different streaming content in a synchronous manner.” *Id.* ¶16. These sources relate to a sporting event, as they originate from a “sports venue.” *Id.*

292. Furthermore, as shown below in Figure 6, Herzog discloses a viewer client device receiving an audio/video feed of a sporting event on a communication channel after making a “user video request”:



Ex.1015, Fig. 6. Herzog makes clear that a viewer client device receives this audio/video feed via a communication channel, as it discloses that “it may be desirable for a user to view video that is streamed live from the Internet to a client player using” HLS. *Id.* ¶3.

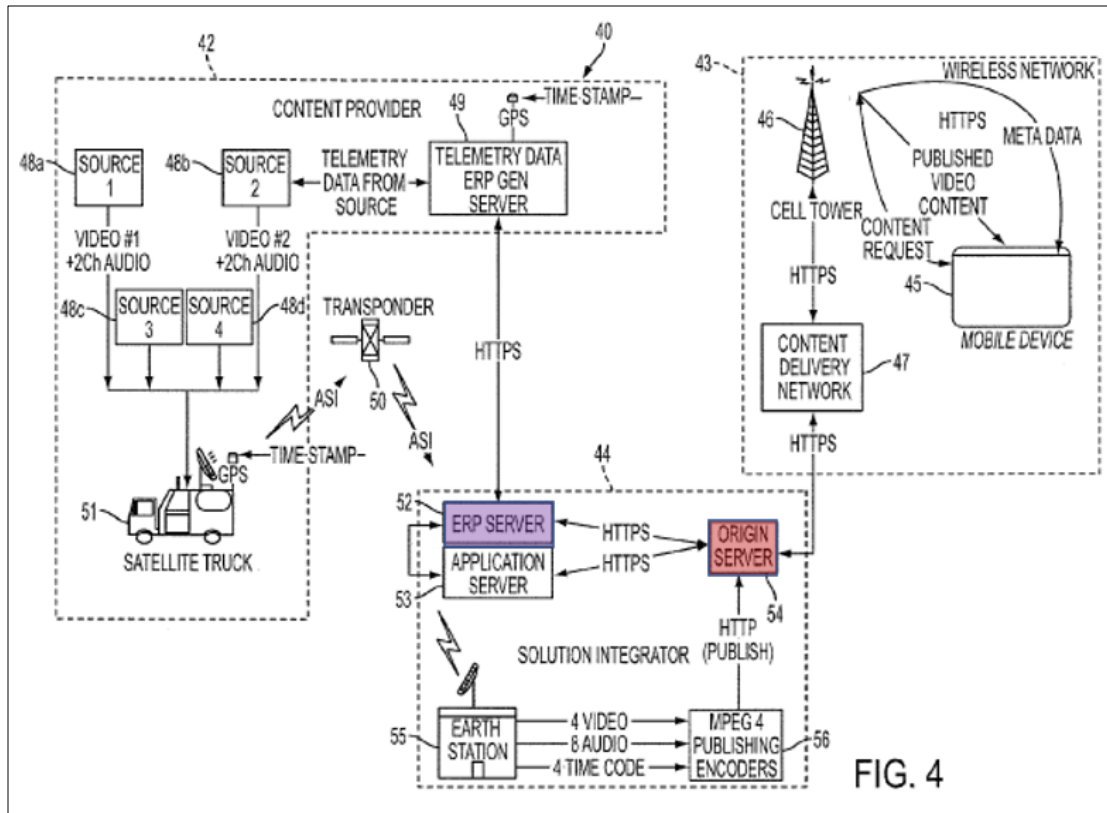
- d. **Limitation 1.4: “connect to the first media server endpoint of the at least one media source to receive, on a first communication channel between the first media server endpoint and the first client device, the first copy of the audio/video feed of the live event;”**

293. As I explained above, Herzog’s application server transmits instructions to the viewer client device to establish a communication channel between the media source and the viewer client device that provides copies of the audio/video feed of the live event to the viewer client device. *See* §§X.C.1.a, X.C.1.b, X.C.1.c. In my opinion, the communication channel connects a specified media server endpoint of the media source to the viewer client device. *See* §X.C.1.a.

- e. **Limitation 1.5: “connect to a first socket of a socket server to receive, on a second communication channel between the first socket and the first client device, first digital content corresponding to the first event information;”**

294. In my opinion, Herzog in view of Spivey discloses a **socket server** having a plurality of event sockets that correspond to particular event information. *See* §IX.D.1.

295. Herzog discloses providing event information, including online gaming information/score information, over a separate connection to viewer client devices. Ex.1015 ¶¶48-52, 67; Figs. 4, 6. That process includes the **ERP Server** (*i.e.*, a control server) transmitting data to the **Origin Server**:

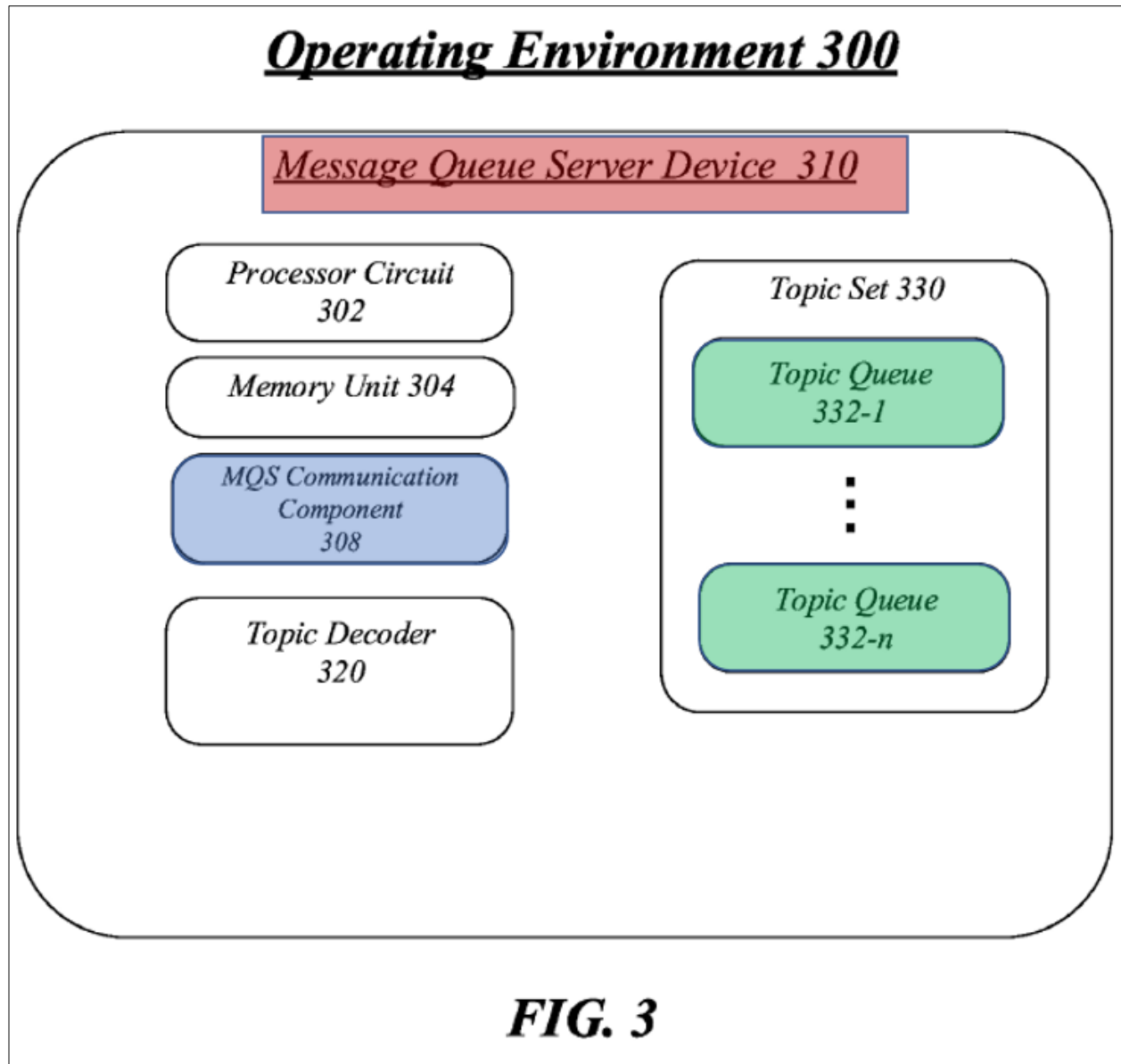


Ex.1015 ¶¶50-51, 83; Fig. 4. As I explained above, in my opinion, a POSA would have incorporated Spivey's MQSD into Herzog's Origin Server, to reduce latency.

See §IX.D.1.

296. Like the '088's socket server, Spivey's MQSD is a generic server that contains processors, memory, and communication components. Ex.1017 ¶¶35, 53; Figs. 3, 4. Moreover, Spivey's MQSD carries out the same purpose as the '088's socket server. The MQSD "receive[s]" and "process[es] live data to provide live data" to "the subscribed connected client devices substantially simultaneously." *Id.* ¶36; *see id.* ¶¶45 ("[MQS] device 310 may be a representative example of message queue server 120"); 54 (MQSD is "substantially similar" to "MQS device 310"); 96.

To accomplish this, the MQSD receives event data from the LDS, which just “receive[d] live data:”



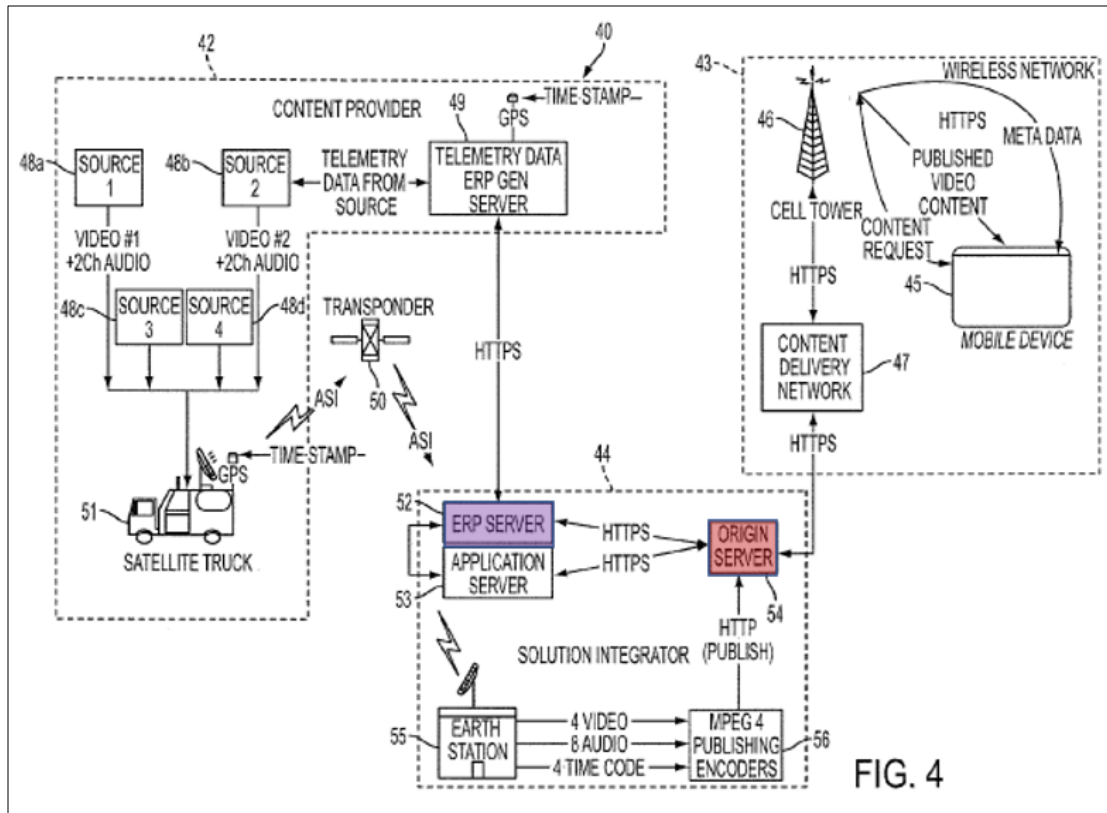
Id. ¶55; Fig. 3. MQSD contains the MQS communication component which would allow the MQSD to communicate with the ERP Server, as contemplated in Spivey. See *id.* ¶¶46 (communication component 308 transmits and receives data), 54 (communication component 408 is analogous to 308); 55 (“LDS communication

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component 418 ... allows [LDSD] 450 to ... transmit the data payloads to [MQSD].”); Ex.1015, Fig. 4.

297. After receiving the data, the MQSD organizes the received live data “into one or more of a plurality of **topic queues**” dedicated to storing information about “a specific game.” Ex.1017 ¶¶47, 52. After sorting the data into the proper topic queues, the MQSD shares the information “substantially simultaneously” to “the subscribed connected client devices.” *Id.* ¶96. Thus, I conclude that a POSA would have understood that Herzog’s **ERP server** transmitting HTTPS information to **Spivey’s MQSD** as disclosing the ’088’s **socket server** being communicatively coupled to a **control server**.

298. Further, Herzog’s ERP Server “receives the meta-data from ERP generator server 49 in HTTPS communication format” and “acts as an intermediary between the ERP generator server and the origin server.” Ex.1015 ¶50. Figure 4 shows that the meta-data is provided to the origin server from the ERP server in HTTPS format:



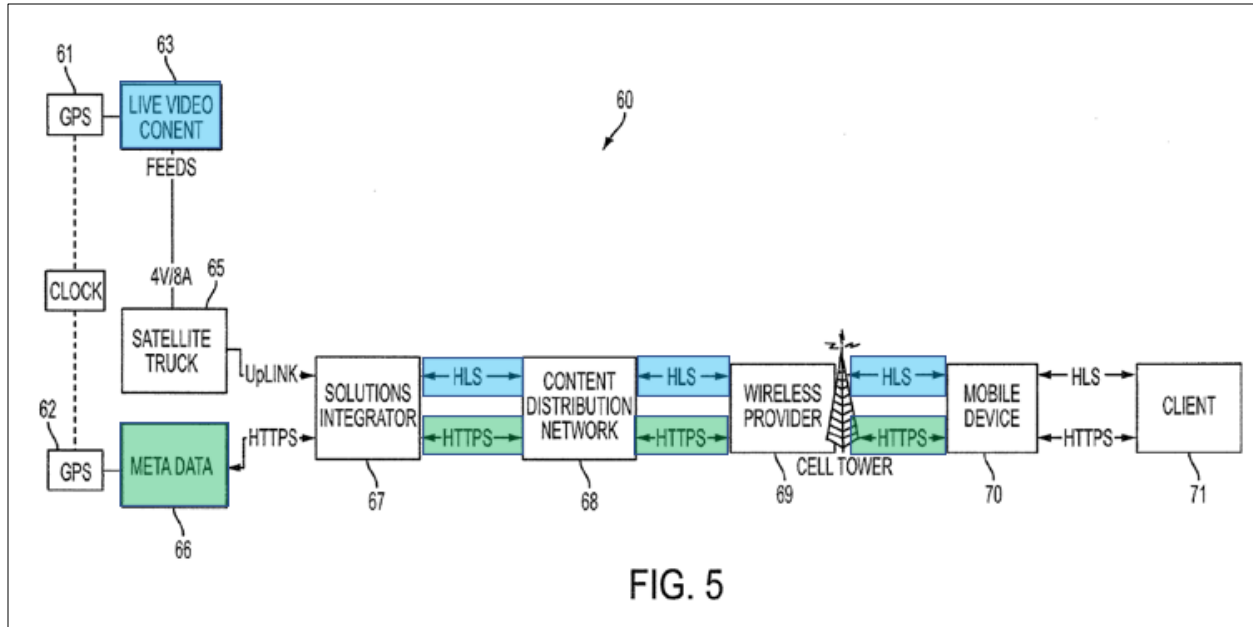
Ex.1015 ¶¶50-51, Fig. 4. Incorporating Spivey's MQSD into Herzog's origin server would thus allow the MQSD (socket server) to receive from the ERP Server (control server) the meta-data provided (first event information). Thus, I conclude that a POSA would have understood that Herzog in view of Spivey discloses a socket server receiving from the control server at least the first event information.

299. In my opinion, a POSA would have understood that Spivey's topic queues disclose the '088's event sockets corresponding to the event information germane to the live event. *See* §X.A.1.e.

300. In my opinion, both Herzog and Spivey disclose transmitting the first event information to the first viewer client device of the plurality of viewer client

devices. For example, in Spivey, the MQSD “may push data from topic queues ... to the subscribers of the topics corresponding to those topic queues.” Ex.1017 ¶46. In Herzog, the Origin Server may be configured to transmit “the meta-data to the content delivery network 47,” which the user receives “in an HTTPS communications protocol.” Ex.1015 ¶51. In my opinion, a POSA would have known that the websocket client-server communication protocol employed by Spivey was an alternative to the HTTP polling used by Herzog. *See* §§IX.D.1, IV.D; Ex.1046 at 46-47.

301. In my opinion, Herzog in view of Spivey discloses providing first event information over a separate Internet communication channel. Spivey’s entire system is based on providing “live event data in real time.” Ex.1017, Abstract. The MQSD can be an “internet server.” *See id.* ¶35. Spivey communicates with client devices over “any ... combination of wired and/or wireless networks including ... the Internet.” *Id.* ¶179. For example, client devices “may request and participate in a websocket connection,” which “typically comprises a two-way connection between two entities.” *Id.* ¶¶43, 61. Moreover, consistent with Spivey, Herzog discloses providing **event information** over a separate communication path than the **video signal** where there is “a unique video and meta-data source that do not follow the same path of transmission:”



Ex.1015 ¶¶47-51, 83; Figs. 1, 4, 6. Thus, in my opinion, a POSA would have understood Spivey to disclose transmitting first event information via a separate Internet connection.

302. Further, this information is provided via a connection between a topic queue and the first viewer client device. Users can access the MQSD using a URL. See Ex.1017 ¶¶81-82. Then, the user can access the specific topic queue they wish to receive information from by using a text string, *e.g.*, a topic label or Event ID, associated with a topic queue. *Id.* ¶179; Fig. 9 (“Gamecenter.nfl.ravenssteelers.”). Thus, in my opinion, a POSA would have understood that Herzog in view of Spivey discloses distributing event information from a socket to a user device over an internet connection. Further, I believe a POSA would have understood that the internet connection is established using a URL and text string identifying a uniquely

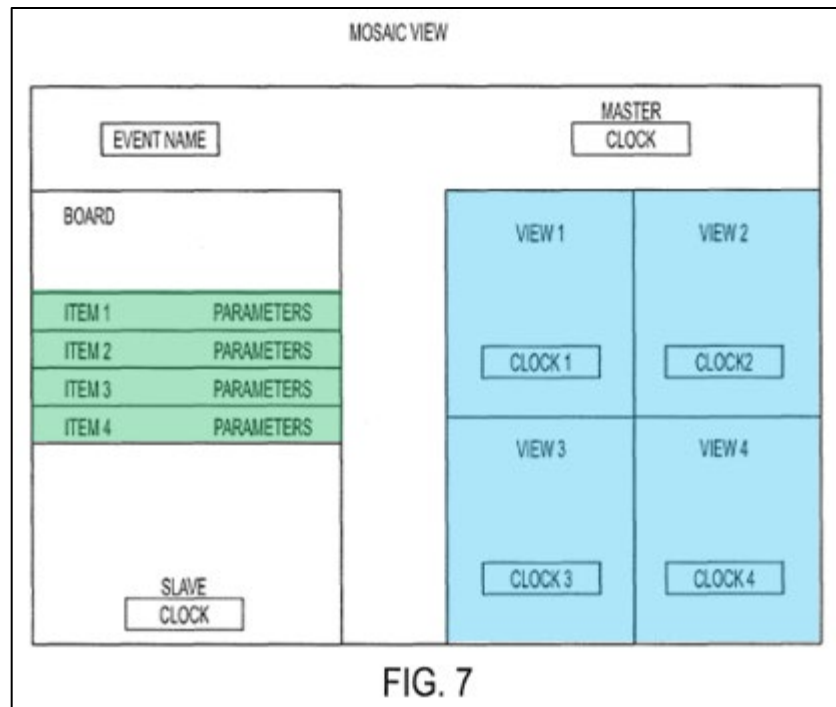
addressable communication endpoint on the MQSD, where first event information is transmitted to a viewer client device.

303. Furthermore, as I explained above, in my opinion, Herzog's application server (webserver) transmits instructions to the viewer client device to establish an event information communication channel between the viewer client device and the event socket of the socket server, which is separate and distinct from the communication channel that transmits copies of the audio/video feed. *See* §§IX.D.1, X.C.1.b, X.C.1.c.

f. Limitation 1.6: “render, on the at least one first display of the first client device, at least some of the first event information as at least one first user-interactive feature overlaid on or adjacent to the first video relating to the live event; and”

304. As I explained above, in my opinion, Herzog's application server transmits instructions to the viewer client device to establish a communication channel between the socket server and the viewer client device that provides the event information to be rendered on a viewer client device's display. *See* §§X.C.1.a, X.C.1.b, X.C.1.c, X.C.1.e.

305. As I explained above, Herzog renders multiple videos related to the same sporting event in addition to information about the event (meta-data). *See* §X.C.1.c. For example, Herzog's Figure 7 shows “four different **videos** of a live event and **meta-data** of multiple parameters” from which a user can select:



Ex.1015 ¶¶12, 80-81, Fig.7. As shown in Figure 7, the display of the viewer client device provides the **event information** adjacent to the **video** relating to the live event.

306. To the extent Herzog does not specifically disclose that the **event information** it presents to users is interactive, *see, e.g.*, Ex.1015 ¶39 (“[u]se of a touchscreen display as part of the user interface enables a user to interact directly with the information presented on the display”), in my opinion, a POSA would have understood that presenting such information as interactive would have been a simple and obvious matter of design choice. Indeed, information provided to users over the Internet has been presented in an interactive manner since the beginning of the Internet. Users have been able to click on information provided to them and obtain access to additional, related information, either by being redirected to a different website or application. For example, since well before 2017, users could access a

website such as ESPN.com, click on the box score of a game, click on certain players or teams on the box score, and be redirected to a different web page with information about that player or team. This type of interactive functionality provides users with a more dynamic and engaging experience. Thus, to the extent Herzog does not specifically disclose that the **event information** it presents to users is interactive, I conclude that a POSA would have been motivated to enable such functionality, using known methods, to enhance the user experience.

307. In my opinion, a POSA would have had a reasonable expectation of success in making Herzog's event information interactive because Herzog already enables the flow of event information to users. In my opinion, a POSA would have understood that providing Herzog's event information in a manner that allows users to interact with the meta-data would have required only minor programming adjustments that were well within the skill of a POSA. The programming would be similar to that of embedding URLs or other "clickable" elements into the rendered page. This is a basic element of web page design.

- g. Limitation 1.7: "obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature; and"**

308. In my opinion, Herzog renders this limitation obvious for the reasons I explained above. *See* §X.C.1.f.

- h. Limitation 1.8: “transmit second instructions to a second client device that includes at least one second display, the second instructions transmitted by the webserver enabling the at least one second display of the second client device to also render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the second client device to:”**

309. This limitation is substantially the same as Limitation 1.3, except that it provides that the webserver transmit *second* instructions to a *second* client device that includes a *second* display, and that the second instructions also render the first event information relating to the live event. For the same reasons I explained above with respect to Limitation 1.3 and the first instructions, first client device, and first display, and because Herzog discloses transmitting multiple streams of digital content to multiple different users, I conclude that Herzog discloses this limitation. See §§X.C.1.a, X.C.1.c.

- i. Limitation 1.9: “connect to the first socket of the socket server to receive, on a third communication channel between the first socket and the second client device, the first digital content corresponding to the first event information so that the first digital content received at the first client device and the second client device is synchronized and client-by-client latency between the first client device and second client device to render the first event information is thereby mitigated or significantly reduced;”**

310. As I explained above with respect to Limitation 1.5, the combination of Herzog and Spivey discloses a webserver configured to transmit instructions to a

viewer client device to cause the viewer client device to connect to a first event socket of a socket server to receive, on an event information communication channel between the first event socket and the viewer client device, digital content corresponding to the first event information. *See* §X.C.1.e. Limitation 1.9 is substantially the same as Limitation 1.5 but requires another connection between the same first event socket of the socket and a *second* viewer client device, such that the digital content corresponding to the first event information received by the first viewer client device and the second viewer client device is synchronized and client-by-client latency between the two viewer client devices to render the first event information is mitigated or significantly reduced.

311. For the same reasons I provided above as to Limitation 1.5, and because the combination of Herzog and Spivey enables multiple viewer client devices to connect to any number of event sockets, I conclude that this limitation is met. *See* §§X.C.1.a, X.C.1.c, X.C.1.e; Ex.1017 ¶¶78, 81-82.

312. To the extent the synchronization and client-by-client latency mitigation limitation is not met simply by virtue of the Herzog and Spivey combination satisfying all the structural limitations of the claims, I believe the combination nonetheless shares the first event information in a synchronized manner between viewer client devices that mitigates client-by-client latency. Herzog discloses sharing online gaming information in a “synchronous manner” using a

“VITC time stamp” as the “master time for synchronization.” Ex.1015 ¶¶16, 58. Because the meta-data is synchronized to the videos, and the videos are delivered to the client devices at the same time, I conclude that the meta-data is necessarily shared in a synchronized manner by the two client devices.

313. In my opinion, Spivey also discloses this, as it teaches that “the embodiments discussed herein may reduce [] delay to an order of milliseconds (ms) (e.g., 100ms) or less, providing a significant advantage over the conventional practices.” Ex.1017 ¶28. Spivey further teaches that digital content “may be pushed to the subscribed connected client devices substantially simultaneously with . . . a time delay of 100 milliseconds or less.” *Id.* ¶96. According to Spivey, “‘substantially simultaneously’ means that the set of actions execute within the same defined period of time. The defined period of time may be of any length as suitable for a given implementation.” *Id.*; *see also* Ex.1043, 48.

j. Limitation 1.10: “render, on the at least one second display of the second client device, at least some of the first event information as at least one second user-interactive feature; and”

314. This limitation is substantially the same as Limitation 1.6, except that it requires the first event information to be rendered as a user-interactive feature on the display of the *second* viewer client device. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 1.6. *See* §X.C.1.f, *supra*.

Herzog discloses a plurality of different communication channels facilitating digital content transmission for the reasons I stated above. *See* §§IX.D.1, X.C.1.a, *supra*.

- k. **Limitation 1.11: “obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app when a second user selects at least a portion of the rendered at least one second user-interactive feature.”**

315. This limitation is substantially the same as Limitation 1.7, except that it requires obtaining the claimed access when a user of the *second* viewer client device selects a portion of the rendered *second* user-interactive feature. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 1.7. *See* §X.C.1.g, *supra*. Herzog also discloses a plurality of different communication channels facilitating digital content transmission for the reasons I stated above. *See* §§IX.D.1, X.C.1.a, *supra*.

2. **Dependent Claim 4**

- a. **Limitation 4.0: “The system of claim 1, further comprising the socket server.”**

316. In my opinion, Spivey discloses the socket server for the reasons I stated above. *See* §§IX.D.1, X.C.1.e.

3. **Dependent Claim 5**

- a. **Limitations 5.0-5.1: “The system of claim 4, further comprising: a control server, coupled to the socket server, to provide the first digital content corresponding to the first event information to the socket server.”**

317. Herzog in combination with Spivey discloses a control server, coupled to the socket server, to provide the first digital content corresponding to the first event information to the socket server. *See* §X.C.1.e.

4. **Dependent Claim 6**

- a. **Limitations 6.0-6.2: “The system of claim 1, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

318. Herzog discloses the live event is a sporting event, and that the event information is online gaming information/score information. Specifically, Herzog transmits “meta-data” such as “the status of each car and driver in the race” and may include “lap number, car speed and acceleration” but there may be as many as “50 different parameters that are available.” Ex.1015 ¶45; *see also id.* ¶16 (streams originate from a “sports venue.”). In my opinion, a POSA would have understood such parameters to include online gaming information and/or score information.

5. **Dependent Claim 7**

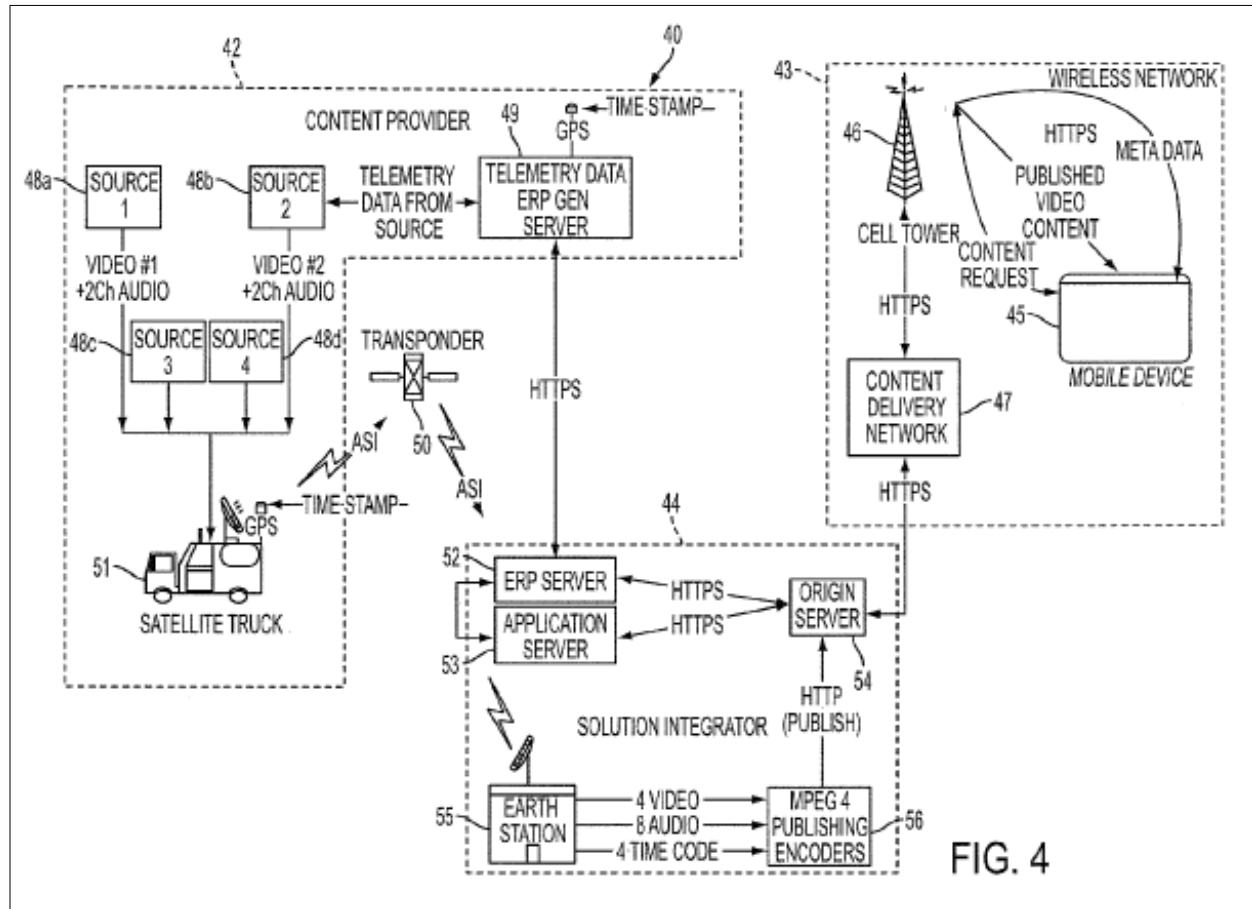
- a. **Limitations 7.0-7.2: “The system of claim 1, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

319. In my opinion, Herzog discloses these limitations. *See* §X.C.4.a.

6. **Independent Claim 8**

- a. **Limitations 8.0-8.2: “A method, comprising: A) receiving, by at least one media source, an audio/video feed of a live event; B) providing a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source;”**

320. Herzog provides “live video and audio data” to user devices over a “communication network.” *See* Ex.1015, Abstract. Herzog’s primary embodiment includes providing “multiple video/audio streams of race cars and drivers [*i.e.*, sources 48a-d], as they are imaged at different locations on the race track:”



Ex.1015 ¶45; Fig 4. This system makes these video feeds available to “mobile stations” and other “similar users.” *Id.* ¶19. Each user can then request video from “one or more channels of video/audio for viewing a live event.” *Id.* ¶70. The user then “receives both the video/audio stream” via HLS. *Id.* ¶51. Thus, in my opinion.

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Herzog provides a system where multiple different users can select the same, or different, live stream of digital content relating to a sporting event.

321. In my opinion, Herzog also provides event information germane to the sporting event. Specifically, Herzog transmits “meta-data” such as “the status of each car and driver in the race” and may include “lap number, car speed and acceleration,” among other event information. Ex.1015 ¶45. In my opinion, a POSA would have understood such meta-data to include online gaming information and/or score information.

322. Herzog discloses multiple MPEG 4 Publishing Encoders (“Encoders”) as a plurality of media sources. Ex.1015 ¶48. Just like in the ’088, these encoders receive all the video and audio data from the live event, such as the Indy Car Race. Ex.1015 ¶¶46 (any form of communication technologies may be used to send video/audio data to Encoders), 49. The Encoders can “encode[]” the video and audio data and then the “encoded video is then published to the content delivery network 47 (for example) via IP utilizing [] HLS.” *Id.* ¶¶49, 55.

323. Herzog’s Encoders receive the video and audio data from the live event. Ex.1015 ¶49. Herzog discloses that the audio and video data can be provided to the Encoders using “communication technologies for communicating multiple video and audio streams.” *Id.* ¶46. Thus, I conclude that Herzog discloses media sources that receive an audio/video feed of a live event.

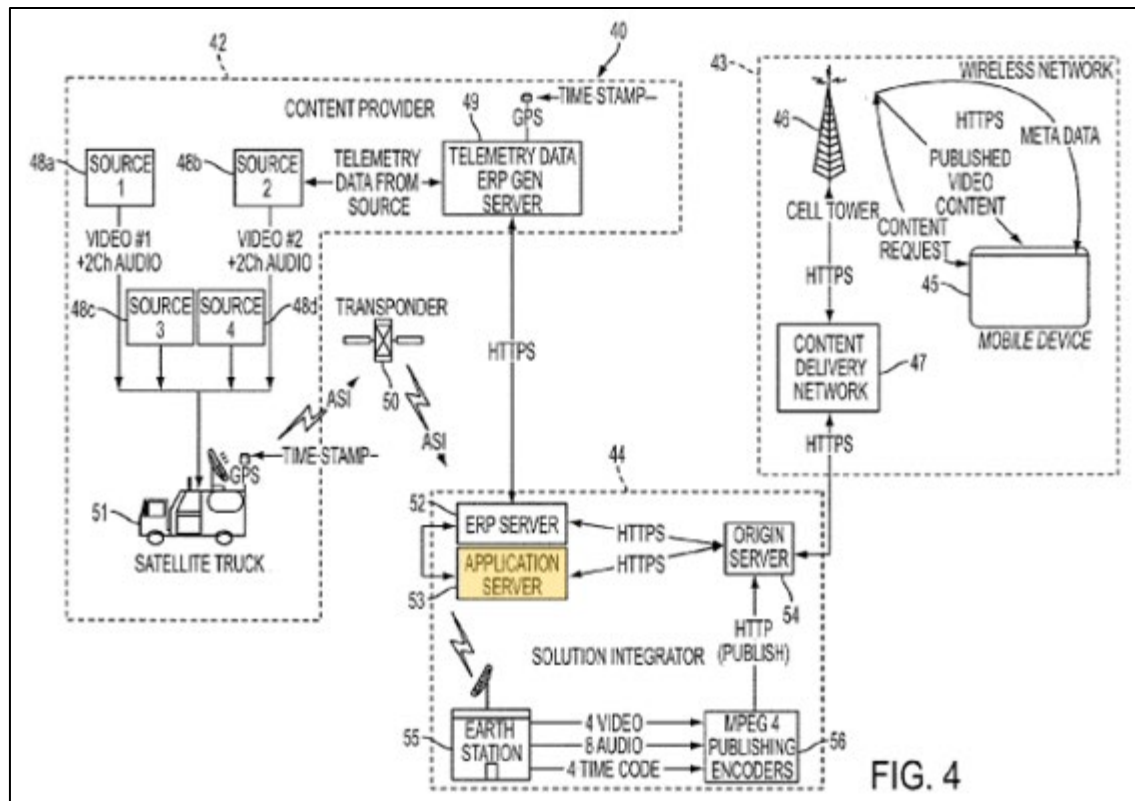
324. Herzog provides the selected audio/video stream to each user individually over individual communication channels via HLS, *i.e.*, an internet connection. Ex.1015 ¶51. Thus, in my opinion, a POSA would have understood that each user device receives its own copy of the audio/video stream from the Encoders over a communication channel that is unique to each user device. *Id.* ¶¶2 (user devices “are used mainly for viewing published content from the Internet, such as video.”), 51. This would create a plurality of copies being distributed, where the first copy is sent to the first user, and so on. Thus, in my opinion, each user would receive an individual copy of the audio/video feed of the live event from the media sources.

325. In my opinion, Herzog discloses that the copies of the audio/video feed of the live event are provided to the users over the individual communication channels that are established between the user and a media server endpoint/Internet address of the media sources. Specifically, in my opinion, Herzog discloses a media server endpoint/Internet address, albeit indirectly, when describing the type of content a viewer client device may store. Ex.1015 ¶35 (“The memories 114, 116 also store various data, such as telephone numbers and server addresses”). To the extent Herzog does not explicitly reference a media server endpoint/Internet address, in my opinion, a POSA would have understood that the system in Herzog necessarily requires such an endpoint/address to stream the audio/video feed of the live event from the media sources to the viewer client device. Specifically, I believe that a

POSA would have understood that Herzog's HTTPS communication format uses the Transmission Control Protocol (TCP), which in turn uses the Internet Protocol (IP). These protocols require an IP address to designate the location from which viewer client devices can receive requested digital content.

- b. Limitation 8.3: “C) transmitting first instructions to a first client device that includes at least one first display to enable the at least one first display of the first client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted in C) cause the first client device to:”**

326. Herzog discloses an “**application server 53**” (*i.e.*, webserver), which is “configured to receive the request from the client application software and begin sending the meta-data with the corresponding .JSON time stamp via the ERP server 52 in the solution integrator 44.” Ex.1015 ¶58. Herzog's **application server** is depicted below in Figure 4:

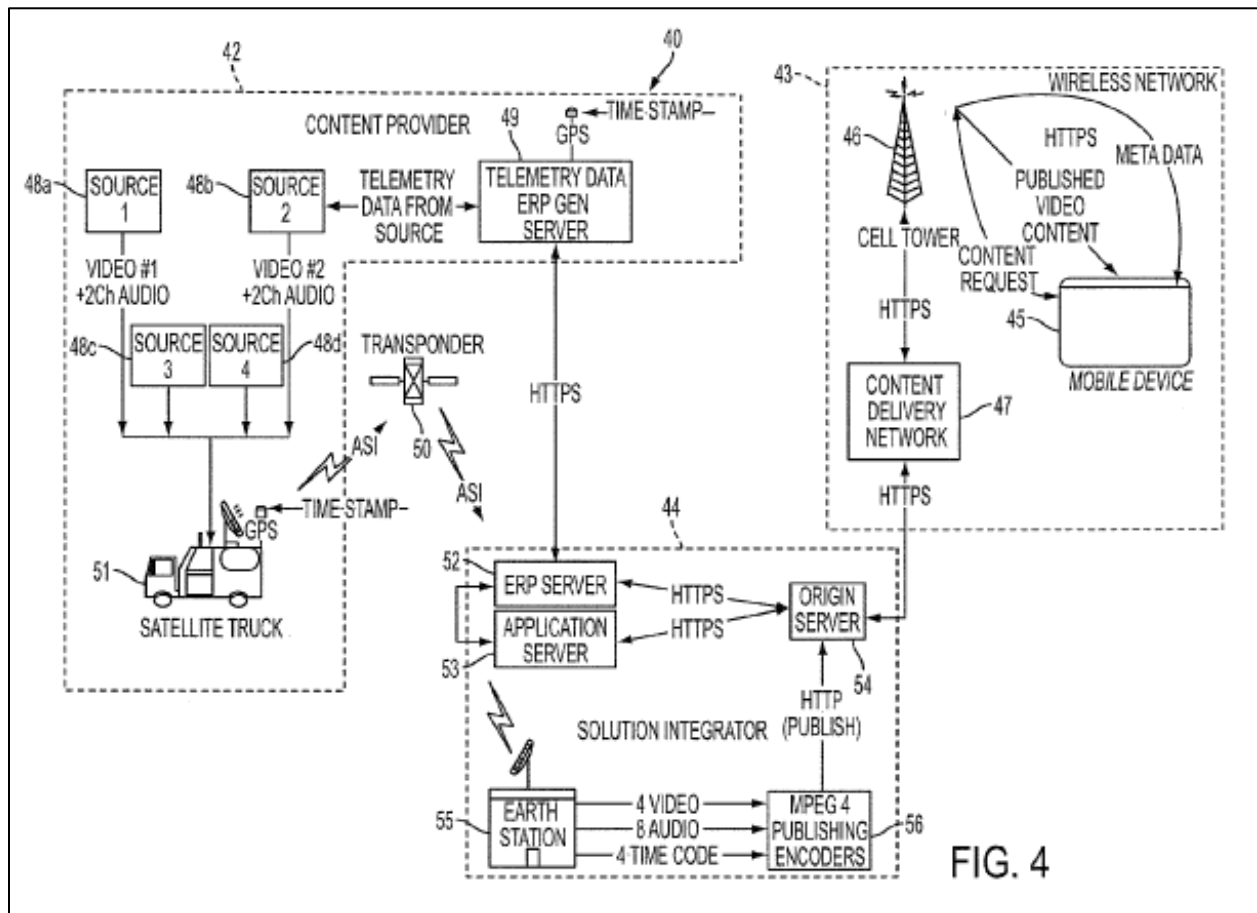


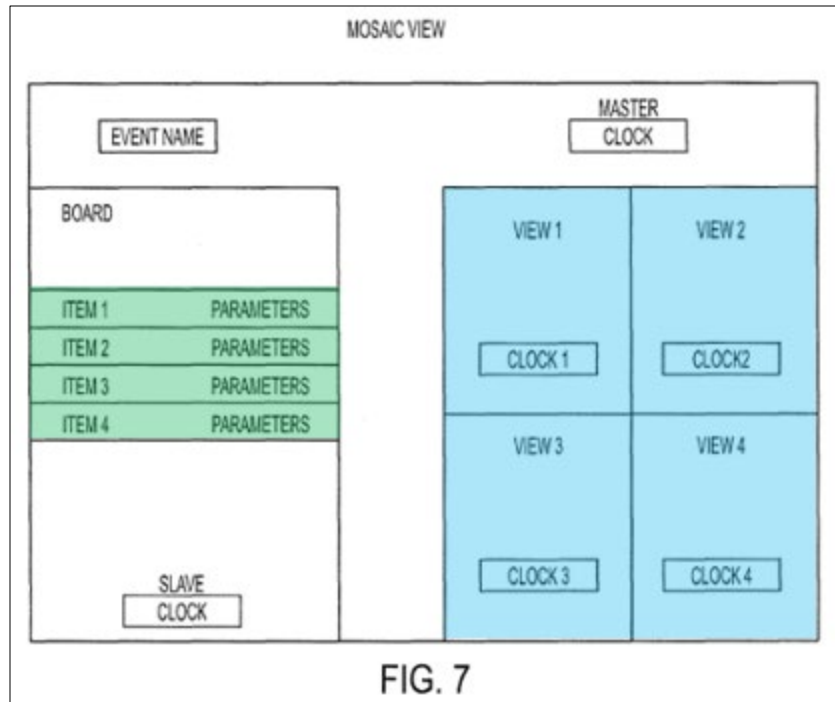
Ex.1015, Fig. 4. The application server facilitates streaming between the origin server and viewer client device by receiving a “request with the time code call out” from the viewer client device, then prompting the origin server to transmit a meta-data stream to the viewer client devices. *Id.* ¶51. While doing so, the application server “satisfies time synchronization requirements between a client application residing in mobile device 45 and the solution integrator 44.” *Id.*

327. In my opinion, Herzog’s application server (*i.e.*, “webserver”) transmits instructions to viewer client devices to cause the viewer client devices to request a copy of audio/video feeds of the event. *See* Ex.1015 ¶¶28, 51, 84, 86, 88, cl. 11; §X.C.6.a. Furthermore, in my opinion, a POSA would have understood that

Herzog's application server transmits instructions to viewer client devices to establish a connection between its viewer client devices and media sources.

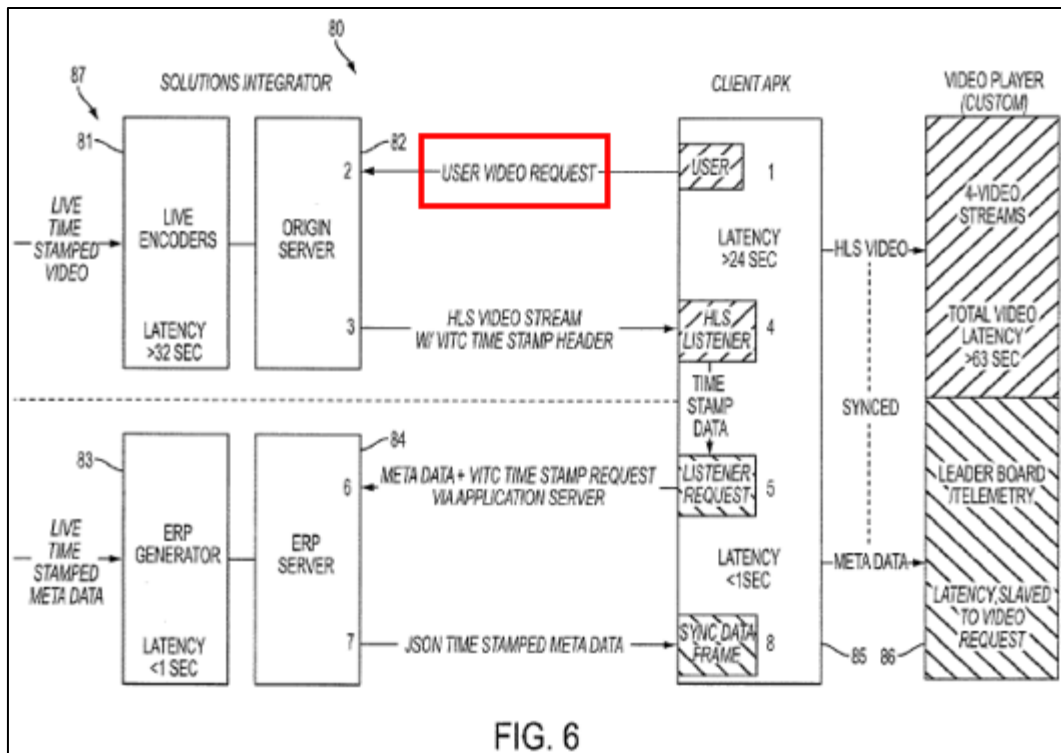
328. Herzog also discloses causing a display on the viewer client device to render **video** and **event information** relating to the event, as shown below in Figures 4 and 7:





Ex.1015 ¶12; Figs. 4, 7. Herzog accomplishes this by streaming “multiple paths of... content” (*i.e.*, sources 48a-d), then “display[s] the different streaming content in a synchronous manner.” *Id.* ¶16. In my opinion, Herzog discloses that these sources relate to a sporting event, as they originate from a “sports venue.” *Id.*

329. Furthermore, as shown below in Figure 6, Herzog discloses a viewer client device receiving an audio/video feed of a sporting event on a communication channel after making a “user video request”:



Ex.1015, Fig. 6. In my opinion, Herzog makes clear that a viewer client device receives this audio/video feed via a communication channel, as it discloses that “it may be desirable for a user to view video that is streamed live from the Internet to a client player using” HLS. *Id.* ¶3.

- c. **Limitation 8.4: “connect to the first media server endpoint of the at least one media source to receive, on a first communication channel between the first media server endpoint and the first client device, the first copy of the audio/video feed of the live event;”**

330. As I explained above, in my opinion, Herzog’s application server transmits instructions to the viewer client device to establish a communication channel between the media source and the viewer client device that provides copies of the audio/video feed of the live event to the viewer client device. *See* §§X.C.6.a,

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X.C.6.b. In my opinion, the communication channel connects a specified media server endpoint of the media source to the viewer client device. *See* §X.C.6.a.

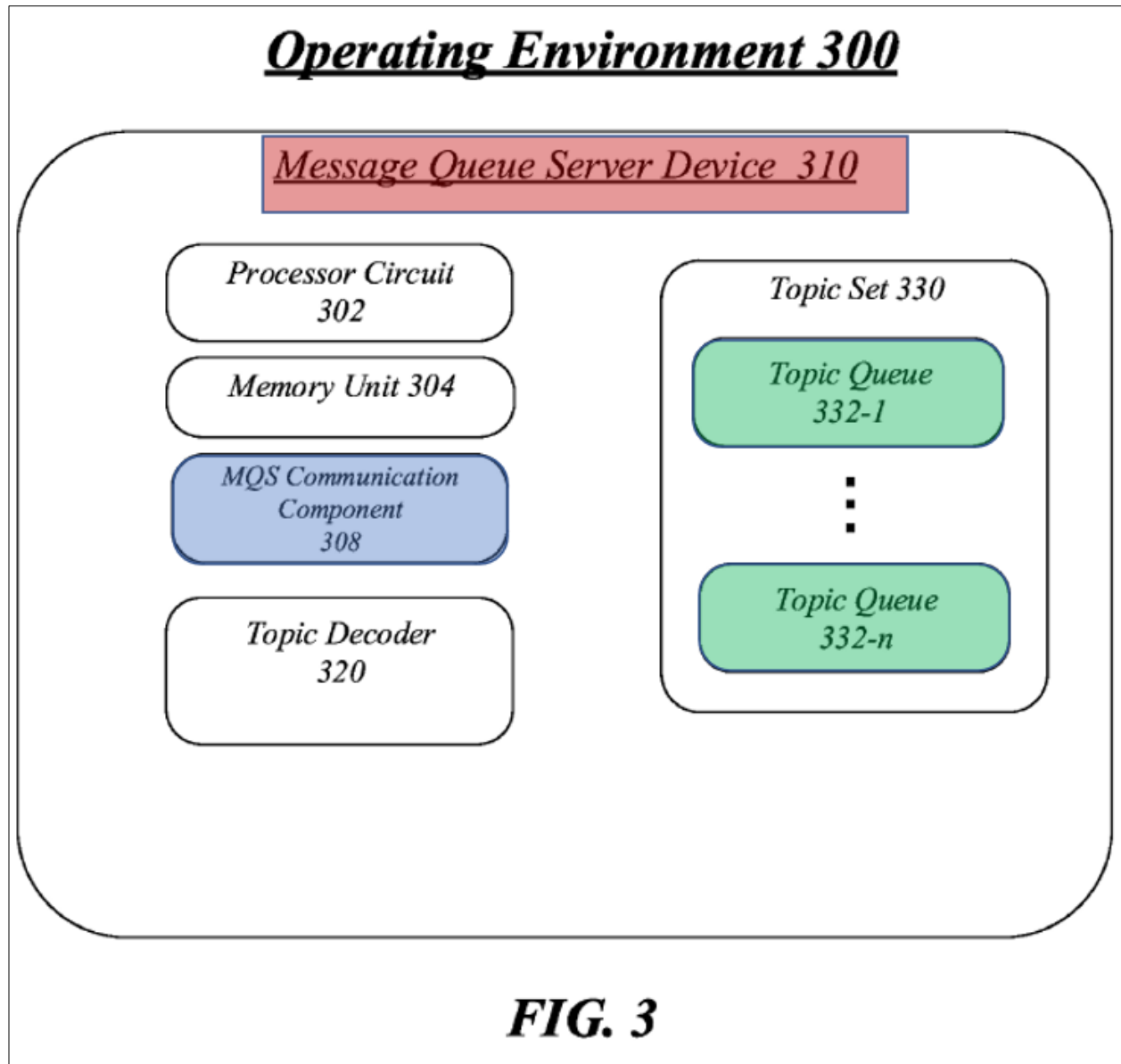
- d. **Limitation 8.5: “connect to a first socket of a socket server to receive, on a second communication channel between the first socket and the first client device, first digital content corresponding to the first event information;”**

331. In my opinion, Herzog in view of Spivey discloses a **socket server** having a plurality of event sockets that correspond to particular event information. *See* §IX.D.1.

332. Herzog discloses providing event information, including online gaming information/score information, over a separate connection to viewer client devices. Ex.1015 ¶¶48-52, 67; Figs. 4, 6. That process includes the **ERP Server** (*i.e.*, a control server) transmitting data to the **Origin Server**:

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To accomplish this, the MQSD receives live event data from the LDSD, which just “receive[d] live data:”



Id. ¶55; Fig. 3. MQSD contains the MQS communication component which would allow the MQSD to communicate with the ERP Server, as contemplated in Spivey. See *id.* ¶¶46 (communication component 308 transmits and receives data), 54 (communication component 408 is analogous to 308); 55 (“LDS communication

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component 418 ... allows [LDSD] 450 to ... transmit the data payloads to [MQSD].”); Ex.1015, Fig. 4.

334. After receiving the data, the MQSD organizes the received live data “into one or more of a plurality of **topic queues**” dedicated to storing information about “a specific game.” Ex.1017 ¶¶47, 52. After sorting the data into the proper topic queues, the MQSD shares the information “substantially simultaneously” to “the subscribed connected client devices.” *Id.* ¶96. Thus, I conclude that a POSA would have understood that Herzog’s **ERP server** transmitting HTTPS information to **Spivey’s MQSD** as disclosing the ’088’s **socket server** being communicatively coupled to a **control server**.

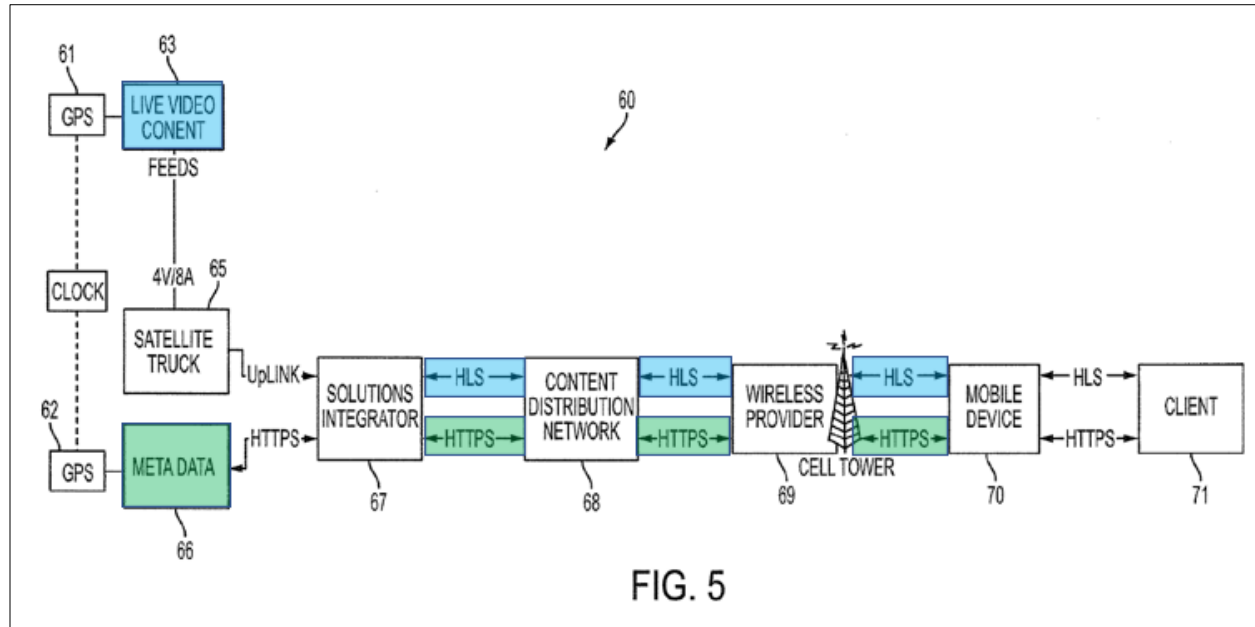
335. Further, Herzog’s ERP Server “receives the meta-data from ERP generator server 49 in HTTPS communication format” and “acts as an intermediary between the ERP generator server and the origin server.” Ex.1015 ¶50. Figure 4 shows that the meta-data is provided to the origin server from the ERP server in HTTPS format:

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337. In my opinion, both Herzog and Spivey disclose transmitting the first event information to the first viewer client device of the plurality of viewer client devices. For example, in Spivey, the MQSD “may push data from topic queues ... to the subscribers of the topics corresponding to those topic queues.” Ex.1017 ¶46. In Herzog, the Origin Server may be configured to transmit “the meta-data to the content delivery network 47,” which the user receives “in an HTTPS communications protocol.” Ex.1015 ¶51. As I explained above, I believe that a POSA would have known that the websocket client-server communication protocol employed by Spivey was an alternative to the HTTP polling used by Herzog. *See* §§IX.D.1, IV.D.

338. In my opinion, Herzog in view of Spivey discloses providing first event information over a separate internet communication channel. Spivey’s entire system is based on providing “live event data in real-time.” Ex.1017, Abstract. The MQSD can be an “internet server.” *See id.* ¶35. Spivey communicates with viewer client devices over “any ... combination of wired and/or wireless networks including ... the Internet.” *Id.* ¶179. For example, viewer client devices “may request and participate in a websocket connection,” which “typically comprises a two-way connection between two entities.” *Id.* ¶¶43, 61. Moreover, consistent with Spivey, Herzog discloses providing **event information** over a separate communication path

than the **video signal** where there is “a unique video and meta-data source that do not follow the same path of transmission:”



Ex.1015 ¶¶47-51, 83; Figs. 1, 4, 6. Thus, I conclude that a POSA would have understood Spivey to disclose transmitting first event information via a separate Internet connection.

339. Further, in my opinion, this information is provided via a connection between a topic queue and the first viewer client device. Users can access the MQSD using a URL. *See* Ex.1017 ¶¶81-82. Then, the user can access the specific topic queue they wish to receive information from by using a text string, *e.g.*, a topic label or Event ID, associated with a topic queue. *Id.* ¶179; Fig. 9 (“Gamecenter.nfl.ravenssteelers.”). Thus, in my opinion, a POSA would have understood that Herzog in view of Spivey discloses distributing event information

from a socket to a user device over an internet connection. Further, I believe that a POSA would have understood that the Internet connection is established using a URL and text string identifying a uniquely addressable communication endpoint on the MQSD, where first event information is transmitted to a viewer client device.

340. Furthermore, as I explained above, I believe that Herzog's application server (webserver) transmits instructions to the viewer client device to establish an event information communication channel between the viewer client device and the event socket of the socket server, which is separate and distinct from the communication channel that transmits copies of the audio/video feed. *See* §§IX.D.1, X.C.6.b.

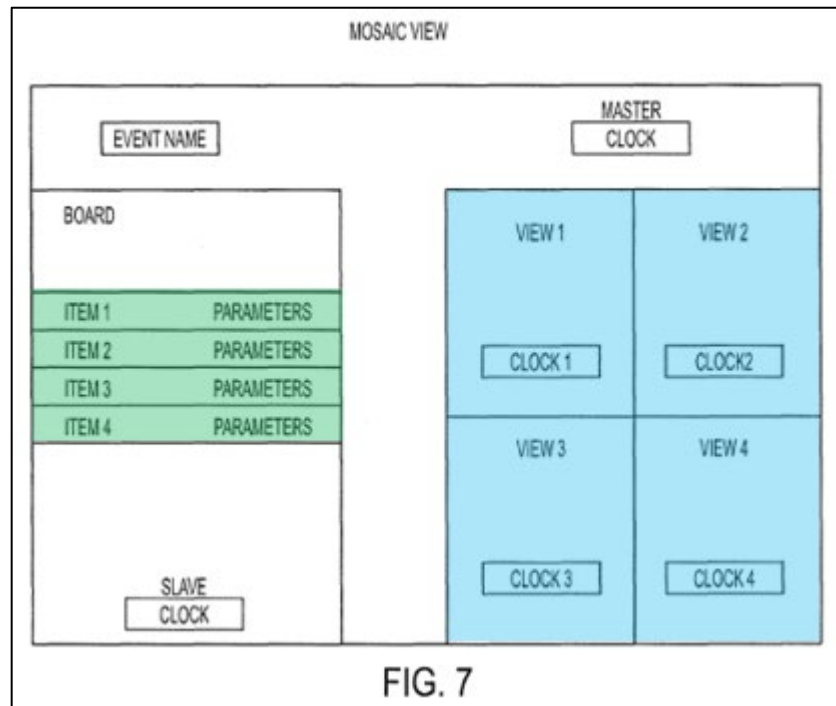
- e. **Limitation 8.6: “render, on the at least one first display of the first client device, at least some of the first event information as at least one first user-interactive feature overlaid on or adjacent to the first video relating to the live event; and”**

341. As I explained above, in my opinion, Herzog's application server transmits instructions to the viewer client device to establish a communication channel between the socket server and the viewer client device that provides the event information to be rendered on a viewer client device's display. *See* §§X.C.6.a, X.C.6.b, X.C.6.d.

342. As I explained above, Herzog renders multiple videos related to the same sporting event in addition to information about the event (meta-data). *See*

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§X.C.6.b. For example, Herzog's Figure 7 shows "four different **videos** of a live event and **meta-data** of multiple parameters" from which a user can select:



Ex.1015 ¶¶12, 80-81, Fig.7. As shown in Figure 7, the display of the viewer client device provides the **event information** adjacent to the **video** relating to the live event.

343. To the extent Herzog does not specifically disclose that the **event information** it presents to users is interactive, *see, e.g.*, Ex.1015 ¶39 ("[u]se of a touchscreen display as part of the user interface enables a user to interact directly with the information presented on the display"), in my opinion, a POSA would have understood that presenting such information as interactive would have been a simple and obvious matter of design choice. Indeed, information provided to users over the Internet has been presented in an interactive manner since the beginning of the Internet. Users have been able to click on information provided to them and obtain

access to additional, related information, either by being redirected to a different website or application. For example, since well before 2017, users could access a website such as ESPN.com, click on the box score of a game, click on certain players or teams on the box score, and be redirected to a different web page with information about that player or team. This type of interactive functionality provides users with a more dynamic and engaging experience. Thus, to the extent Herzog does not specifically disclose that the **event information** it presents to users is interactive, I conclude that a POSA would have been motivated to enable such functionality, using known methods, to enhance the user experience.

344. In my opinion, a POSA would have had a reasonable expectation of success in making Herzog's event information interactive because Herzog already enables the flow of event information to users. In my opinion, a POSA would have understood that providing Herzog's event information in a manner that allows users to interact with the meta-data would have required only minor programming adjustments that were well within the skill of a POSA. The programming would be similar to that of embedding URLs or other "clickable" elements into the rendered page. This is a basic element of web page design.

- f. Limitation 8.7: "obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least one first user-interactive feature; and"**

345. In my opinion, Herzog renders this limitation obvious for the reasons I explained above. *See* §X.C.6.e.

- g. Limitation 8.8: “D) transmitting second instructions to a second client device that includes at least one second display to enable the at least one second display of the second client device to render the first event information relating to the live event, wherein the second instructions transmitted in D) cause the second client device to:”**

346. This limitation is substantially the same as Limitation 8.3, except that it requires transmitting *second* instructions to a *second* client device that includes a *second* display, and that the second instructions also render the first event information relating to the live event. For the same reasons I explained above with respect to Limitation 8.3 and the first instructions, first client device, and first display, and because Herzog discloses transmitting multiple streams of digital content to multiple different users, I conclude that Herzog discloses this limitation. *See* §§X.C.6.a, X.C.6.b.

- h. Limitation 8.9: “connect to the first socket of the socket server to receive, on a third communication channel between the first socket and the second client device, the first digital content corresponding to the first event information so that the first digital content received at the first client device and the second client device is synchronized and client-by-client latency between the first client device and second client device to render the first event information is thereby mitigated or significantly reduced;”**

347. As I explained above with respect to Limitation 8.5, in my opinion, the combination of Herzog and Spivey discloses transmitting instructions to a viewer client device to cause the viewer client device to connect to a first event socket of a socket server to receive, on an event information communication channel between the first event socket and the viewer client device, digital content corresponding to the first event information. *See* §X.C.6.d. Limitation 8.9 is substantially the same as Limitation 8.5 but requires another connection between the same first event socket of the socket and a *second* viewer client device, such that the digital content corresponding to the first event information received by the first viewer client device and the second viewer client device is synchronized and client-by-client latency between the two viewer client devices to render the first event information is mitigated or significantly reduced.

348. For the same reasons I provided above as to Limitation 8.5, and because the combination of Herzog and Spivey enables multiple viewer client devices to connect to any number of event sockets, I conclude that this limitation is met. *See* §§X.C.6.a, X.C.6.b, X.C.6.d; Ex.1017 ¶¶78, 81-82.

349. In my opinion, the Herzog and Spivey combination shares the first event information in a synchronized manner between viewer client devices that mitigates client-by-client latency. Herzog discloses sharing online gaming information in a “synchronous manner” using a “VITC time stamp” as the “master

time for synchronization.” Ex.1015 ¶¶16, 58. Because the meta-data is synchronized to the videos, and the videos are delivered to the viewer client devices at the same time, in my opinion, the meta-data is necessarily shared in a synchronized manner by the two viewer client devices.

350. In my opinion, Spivey also discloses this, as it teaches that “the embodiments discussed herein may reduce [] delay to an order of milliseconds (ms) (e.g., 100ms) or less, providing a significant advantage over the conventional practices.” Ex.1017 ¶28. Spivey further teaches that digital content “may be pushed to the subscribed connected client devices substantially simultaneously with . . . a time delay of 100 milliseconds or less.” *Id.* ¶96. According to Spivey, “‘substantially simultaneously’ means that the set of actions execute within the same defined period of time. The defined period of time may be of any length as suitable for a given implementation.” *Id.*; *see also* Ex.1043, 48.

i. Limitation 8.10: “render, on the at least one second display of the second client device, at least some of the first event information as at least one second user-interactive feature; and”

351. This limitation is substantially the same as Limitation 8.6, except that it requires the first event information to be rendered as a user-interactive feature on the display of the *second* viewer client device. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 8.6. *See* §X.C.6.e, *supra*. Herzog also discloses a plurality of different communication channels facilitating

digital content transmission for the reasons I stated above. *See* §§IX.D.1, X.C.6.a, *supra*.

- j. **Limitation 8.11: “obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least one second user-interactive feature.”**

352. This limitation is substantially the same as Limitation 8.7, except that it requires obtaining the claimed access when a user of the *second* viewer client device selects a portion of the rendered *second* user-interactive feature. In my opinion, this limitation is met for at least the same reasons as I explained for Limitation 8.7. *See* §X.C.6.f, *supra*. Herzog also discloses a plurality of different communication channels facilitating digital content transmission for the reasons I stated above. *See* §§IX.D.1, X.C.6.a, *supra*.

7. **Dependent Claim 11**

- a. **Limitations 11.0-11.2: “The method of claim 8, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

353. In my opinion, Herzog discloses the live event is a sporting event, and that the event information is online gaming information/score information. Specifically, Herzog transmits “meta-data” such as “the status of each car and driver in the race” and may include “lap number, car speed and acceleration” but there may

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be as many as “50 different parameters that are available.” Ex.1015 ¶45; *see also id.* ¶16 (streams originate from a “sports venue.”). In my opinion, a POSA would have understood such parameters to include online gaming information and/or score information.

8. Dependent Claim 12

- a. Limitations 12.0-12.2: “The method of claim 8, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

354. In my opinion, Herzog discloses these limitations. *See* §X.C.7.a.

D. Ground 2B: Claims 2, 3, 9, 10, and 13-34 Are Obvious Over Herzog in View of Spivey and Abulikemu

355. For the reasons I stated in Section IX.E.1, above, it is my opinion that a POSA would have been motivated to combine the teachings of Herzog, Spivey, and Abulikemu to arrive at the claimed invention with a reasonable expectation of success.

1. Dependent Claim 2

- a. Limitations 2.0-2.1: “The system of claim 1, wherein: the at least one media source is configured to:”**

356. In my opinion, Herzog and Abulikemu disclose media sources configured to operate in the claimed manner. *See* §§X.C.1.a, IX.E.1.

- b. Limitation 2.2: “receive the audio/video feed of the live event;”**

357. In my opinion, Herzog and Abulikemu disclose media sources configured to receive the audio/video feed of the live event. *See* §§X.C.1.a, IX.E.1.

c. Limitation 2.3: “provide the first copy of the audio/video feed of the live event from the first media server endpoint;”

358. In my opinion, Herzog and Abulikemu disclose media sources configured to provide the first copy of the audio/video feed of the live event from the first media server endpoint. *See* §§X.C.1.a, IX.E.1. For the same reasons I explained above with respect to Herzog, in my opinion, a POSA would have understood that Abulikemu also necessarily uses Internet address/endpoints to designate the location from which client devices can receive requested digital content. *See* §X.C.1.a. For example, in my opinion, a POSA would have understood that Abulikemu’s system uses Internet address/endpoints to designate the location from which client devices can receive requested digital content because Abulikemu describes using “communication channel[s],” Ex.1050 ¶29, over the Internet, which necessarily would include endpoints. *Id.* ¶27; *see also id.* Fig. 1 (junctions between viewers and central server). Likewise, in my opinion, a POSA would have also understood that Abulikemu uses other, distinct Internet address/endpoints to designate the location from which the viewer client devices can receive the requested composite outgoing stream.

d. Limitation 2.4: “receive from the first client device a composite outgoing stream of the audio/video feed and additional video content; and”

359. Abulikemu discloses media sources, *e.g.*, central server 100, configured to receive from the first client device, *e.g.*, viewer 108, a composite outgoing stream of the audio/video feed and additional video content. *See* §IX.E.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2.

e. Limitation 2.5: “provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source; and”

360. Abulikemu discloses media sources, *e.g.*, central server 100, configured to provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source. *See* §IX.E.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2. As I explained, in my opinion, a POSA would have understood that Abulikemu necessarily uses Internet address/endpoints (*i.e.*, Internet address such as 130.24.20) to designate the location from which client devices can receive the requested audio/video feed of the live event. *See* §X.D.1.c. Likewise, in my opinion, a POSA would have also understood that Abulikemu necessarily uses other, distinct Internet address/endpoints to designate the location from which the client devices can receive the requested composite outgoing stream.

- f. **Limitation 2.6-2.7: “the webserver is configured to transmit the second instructions to the second client device to cause the second client device to: connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the second client device, the first copy of the composite outgoing stream.”**

361. As I explained above, Herzog’s application server (webserver) is configured to facilitate connections between viewer client devices and the media sources and between viewer client devices and the socket server. *See* §X.C.1.b. In my opinion, a POSA would have found it obvious to further utilize the webserver to facilitate a connection between the second viewer client device and the second media server endpoint to provide the first copy of the composite outgoing stream to the second viewer client device. In my opinion, POSA would have had a reasonable expectation of success in doing so as it would have involved simply using the same, known webserver to facilitate yet another connection. Webservers are in fact designed to support large numbers of simultaneous connections. HTTP is transaction-based and memoryless, further increasing the number of possible connections within a given server’s computational limitations.

362. As I explained above, in my opinion, a POSA would have understood that the known webserver transmits instructions to the viewer client device to establish video communication channels between the media source and the viewer client device, and to establish event information communication channels between

an event socket of the socket server and the viewer client device. *See* §§X.C.1.c, X.C.1.h.

2. Dependent Claim 3

a. Limitations 3.0-3.1: “The system of claim 2, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”

363. As I explained above, a POSA would have understood that RTMP and HLS were well-known data transmission protocols available at least by 2012. *See* §X.B.2.a. Indeed, Herzog discloses media sources including an HLS server. Ex.1015 ¶¶49-51, 55, 83. As I discussed above, in my opinion, use of an RTMP server and/or and HLS server was well known and use of those servers was a mere matter of design choice that was well within the purview and capabilities of a POSA. In my opinion, Herzog’s disclosure of use of an HLS server demonstrates that capability and it would have likewise been well-within the knowledge of a POSA to utilize the known RTMP transmission protocol to execute the desired streaming functionality. Moreover, in my opinion, leveraging the benefits of RTMP by integrating the protocol into Herzog would have been a simple and obvious matter of design choice.

b. Limitation 3.2: “the first media server endpoint is coupled to the at least one HLS server;”

364. In my opinion, Herzog discloses the first media server endpoint is coupled to the HLS server. *See* §§X.C.1.a, X.D.2.a.

c. Limitation 3.3: “the at least one RTMP media server is configured to receive the audio/video feed of the live

event and transmit a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and”

365. As I explained above, in my opinion, it would have been a simple and obvious matter of design choice to incorporate an RTMP server into Herzog’s media sources, which already include an HLS server. *See* §X.D.2.a. Moreover, in my opinion, a POSA would have understood that implementing that design included configuring the RTMP server to receive live event data and sending the data to an HLS server. Thus, in employing the RTMP and HLS protocols in Herzog’s system, I conclude that a POSA would have configured the audio/video feed of the live event and to transmit a first HLS copy of the audio/video feed of the live event from the RTMP server to the HLS server. *See* Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

d. Limitation 3.4: “the at least one HLS server is configured to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint.”

366. In my opinion, Herzog discloses the HLS server is configured to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint. *See* §§X.C.1.a, X.D.2.a.

3. Dependent Claim 9

a. Limitations 9.0-9.1: “The method of claim 8, further comprising: E) receiving, by the at least one media source from the first client device, a composite outgoing stream of the audio/video feed and additional video content; and”

367. In my opinion, Abulikemu discloses media sources, *e.g.*, central server 100, configured to receive from the first viewer client device, *e.g.*, viewer 108, a composite outgoing stream of the audio/video feed and additional video content. *See* §IX.E.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2.

b. Limitation 9.2: “(F) providing a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source,”

368. In my opinion, Abulikemu discloses media sources, *e.g.*, central server 100, configured to provide a first copy of the composite outgoing stream of the audio/video feed and the additional video content from a second media server endpoint of the at least one media source. *See* §IX.E.1; Ex.1050 ¶¶11-16, 21-24, Fig. 2. For the same reasons I explained above with respect to Herzog, in my opinion, a POSA would have understood that Abulikemu also uses Internet address/endpoints to designate the location from which viewer client devices can receive requested content. *See* §X.C.6.a. For example, in my opinion, a POSA would have understood that Abulikemu’s system uses Internet address/endpoints to designate the location from which client devices can receive requested digital content because Abulikemu describes using “communication channel[s],” Ex.1050 ¶29, over the Internet, which necessarily would include endpoints. *Id.* ¶27; *see also id.* Fig. 1 (junctions between viewers and central server). Likewise, in my opinion, a POSA would have also understood that Abulikemu uses other, distinct Internet address/endpoints to

designate the location from which the viewer client devices can receive the requested composite outgoing stream.

- c. **Limitations 9.3-9.4: “wherein D) further comprises transmitting the second instructions to the second client device to cause the second client device to: connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the second client device, the first copy of the composite outgoing stream.”**

369. As I explained above, Herzog’s application server (webserver) is configured to facilitate connections between viewer client devices and the media sources and between viewer client devices and the socket server. *See* §X.C.6.b. In my opinion, a POSA would have found it obvious to further utilize the webserver to facilitate a connection between the second viewer client device and the second media server endpoint to provide the first copy of the composite outgoing stream to the second viewer client device. In my opinion, a POSA would have had a reasonable expectation of success in doing so as it would have involved simply using the same, known webserver to facilitate yet another connection. Webservers are in fact designed to support large numbers of simultaneous connections. HTTP is transaction-based and memoryless, further increasing the number of possible connections within a given server’s computational limitations.

370. As I explained above, in my opinion, a POSA would have understood that the known webserver transmits instructions to the viewer client device to

establish video communication channels between the media source and the viewer client device, and to establish event information communication channels between an event socket of the socket server and the viewer client device. *See* §§X.C.6.b, X.C.6.g.

4. **Dependent Claim 10**

- a. **Limitations 10.0-10.1: “The method of claim 9, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”**

371. As I explained above, a POSA would have understood that RTMP and HLS were well-known data transmission protocols available at least by 2012. *See* §X.B.4.a. Indeed, Herzog discloses media sources including an HLS server. Ex.1015 ¶¶49-51, 55, 83. As I discussed above, in my opinion, use of an RTMP server and/or and HLS server was well known and use of those servers was a mere matter of design choice that was well within the purview and capabilities of a POSA. In my opinion, Herzog’s disclosure of use of an HLS server demonstrates that capability and it would have likewise been well-within the knowledge of a POSA to utilize the known RTMP transmission protocol to execute the desired streaming functionality. Moreover, in my opinion, leveraging the benefits of RTMP by integrating the protocol into Herzog would have been a simple and obvious matter of design choice.

- b. **Limitation 10.2: “the first media server endpoint is coupled to the at least one HLS server;”**

372. In my opinion, Herzog discloses the first media server endpoint is coupled to the HLS server. *See* §§X.C.6.a, X.D.4.a.

- c. **Limitation 10.3: “A) comprises receiving, by the at least one RTMP media server, the audio/video feed of the live event and transmitting a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and”**

373. As I explained above, it is my opinion that it would have been a simple and obvious matter of design choice to incorporate an RTMP server into Herzog’s media sources, which already include an HLS server. *See* §X.D.4.a. Moreover, in my opinion, a POSA would have understood that implementing that design included configuring the RTMP server to receive live event data and sending the data to an HLS server. Thus, in employing the RTMP and HLS protocols in Herzog’s system, I conclude that a POSA would have configured the audio/video feed of the live event and to transmit a first HLS copy of the audio/video feed of the live event from the RTMP server to the HLS server. *See* Ex.1051, 6:44-59, 18:6-67, 19:34-44, Fig. 5.

- d. **Limitation 10.4: “B) comprises providing the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint of the at least one HLS server to the first client device.”**

374. In my opinion, Herzog discloses the HLS server is configured to provide the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint. *See* §§X.C.6.a, X.D.4.a.

5. **Independent Claim 13**

- a. **Limitations 13.0-13.2: “A method, comprising: A) receiving, by at least one media source, an audio/video feed of a live event; B) providing a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source to a first client device;”**

375. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.6.a.

- b. **Limitation 13.3: “C) receiving, by the at least one media source from the first client device, a composite outgoing stream of the audio/video feed and additional video content;”**

376. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.4.a.

- c. **Limitation 13.4: “D) providing a first copy of the composite outgoing stream of the audio/video feed and additional video content from a second media server endpoint of the at least one media source; and”**

377. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.3.b.

- d. **Limitation 13.5: “E) transmitting first instructions to a second client device that includes at least one first display to cause the at least one first display of the second client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted in E) cause the second client device to:”**

378. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §§X.C.6.b, X.C.6.g, X.D.3.c.

- e. **Limitation 13.6: “connect to the second media server endpoint of the at least one media source to receive, on a first communication channel, the first copy of the composite outgoing stream;”**

379. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.3.c.

- f. **Limitation 13.7: “render, on the at least one first display of the first client device, the first video relating to the live event based on the first copy of the composite outgoing stream;”**

380. To the extent this limitation can be understood, *see* §X.B.5.c, in my opinion, it is disclosed by Herzog/Abulikemu for the same reasons I stated above. *See* §§X.C.6, X.D.3; *see also* X.B.5.f (obvious design choice).

- g. **Limitation 13.8: “connect to a socket of a socket server to receive, on a second communication channel different from the first communication channel, first digital content corresponding to the first event information; and”**

381. In my opinion, Herzog/Spivey discloses this limitation for the same reasons I stated above. *See* §X.C.6.d.

- h. **Limitation 13.9: “render, on the at least one first display of the first client device, at least some of the first event information based on the first digital content received on the second communication channel.”**

382. To the extent this limitation can be understood, *see* §X.B.5.h, in my opinion, it is disclosed by Herzog/Spivey for the same reasons I stated above. *See* §§X.C.6.d, X.C.6.e; *see also* X.B.5.h (obvious design choice).

6. Dependent Claim 14

- a. Limitations 14.0-14.1: “The method of claim 13, wherein: the at least one media source comprises at least one RTMP media server and at least one HLS server;”**

383. In my opinion, these limitations are obvious over Herzog for the same reasons I stated above. *See* §X.D.4.a.

- b. Limitation 14.2: “A) comprises receiving, by the at least one RTMP media server, the audio/video feed of the live event and transmitting a first HLS copy of the audio/video feed of the live event from the at least one RTMP media server to the at least one HLS server; and”**

384. In my opinion, this limitation is obvious over Herzog for the same reasons I stated above. *See* §X.D.4.c.

- c. Limitation 14.3: “B) comprises providing the first copy of the audio/video feed of the live event as another HLS copy from the first media server endpoint of the at least one HLS server to the first client device.”**

385. In my opinion, this limitation is obvious over Herzog for the same reasons I stated above. *See* §X.D.4.d.

7. Dependent Claim 15

- a. **Limitations 15.0-15.1: “The method of claim 13, wherein the first instructions transmitted in E) cause the second client device to: obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information.”**

386. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.C.6.g, X.C.6.h, X.C.6.j.

8. **Dependent Claim 16**

- a. **Limitations 16.0-16.2: “The method of claim 15, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

387. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.7.a.

9. **Dependent Claim 17**

- a. **Limitations 17.0-17.2: “The method of claim 15, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

388. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.8.a.

10. **Dependent Claim 18**

- a. **Limitation 18.0-18.2: “The method of claim 13, further comprising: F) transmitting second instructions to a third client device that includes at least one second display to enable the at least one second display of the second client device to render the first event information relating to the live event,**

wherein the second instructions transmitted in F) cause the third client device to: connect to the socket of the socket server to receive, on a third communication channel between the socket and the third client device, the first digital content corresponding to the first event information.”

389. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.C.6.g, X.C.6.h.

11. Dependent Claim 19

- a. Limitation 19.0: “The method of claim 18, wherein F) further comprises transmitting the second instructions to the third client device to enable the at least one second display of the third client device to render the first video relating to the live event and render the first event information relating to the live event, wherein the second instructions transmitted in F) cause the third client device to:”**

390. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §X.C.6.b.

- b. Limitation 19.1: “connect to the second media server endpoint to receive, on a fourth communication channel between the second media server endpoint and the third client device, the first copy of the composite outgoing stream.”**

391. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §§X.C.6, X.D.3; X.D.5.

12. Dependent Claim 20

- a. Limitations 20.0-20.2: “The method of claim 19, wherein: the second instructions transmitted in F) further cause the third client device to: render, on the**

at least one second display of the third client device, the first video relating to the live event based on the first copy of the composite outgoing stream received on the fourth communication channel; and”

392. In my opinion, Herzog/Spivey/Abulikemu discloses these limitations for the same reasons I stated above. *See* §§X.D.5, X.D.10, X.D.11.

- b. Limitation 20.3: “render, on the at least one second display of the third client device, at least some of the first event information based on the first digital content received on the third communication channel.”**

393. In my opinion, Herzog/Spivey/Abulikemu discloses this limitation for the same reasons I stated above. *See* §§X.D.5, X.D.10, X.D.11.

13. Dependent Claim 21

- a. Limitations 21.0-21.1: “The method of claim 20, wherein: the first instructions transmitted in E) cause the second client device to obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information; and”**

394. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §§X.C.6.f, X.C.6.j.

- b. Limitation 21.2: “the second instructions transmitted in F) cause the third client device to obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least some of the first event information.”**

395. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §§X.D.13.a, X.C.6.f, X.C.6.j.

14. **Dependent Claim 22**

- a. **Limitations 22.0-22.2: “The method of claim 21, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

396. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §§X.C.8.a, X.D.8.a.

15. **Dependent Claim 23**

- a. **Limitations 23.0-23.2: “The method of claim 21, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

397. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §§X.C.8.a, X.D.9.a.

16. **Independent Claim 24**

- a. **Limitations 24.0-24.3: “A system, comprising: at least one media source to: receive an audio/video feed of a live event; provide a first copy of the audio/video feed of the live event from a first media server endpoint of the at least one media source to a first client device;”**

398. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.1.a.

- b. **Limitation 24.4: “receive from the first client device a composite outgoing stream of the audio/video feed and additional video content; and”**

399. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.1.d.

- c. **Limitation 24.5: “provide a first copy of the composite outgoing stream of the audio/video feed and additional video content from a second media server endpoint of the at least one media source; and”**

400. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.1.e.

- d. **Limitation 24.6: “a webserver to transmit first instructions to a second client device that includes at least one first display to cause the at least one first display of the second client device to render a first video relating to the live event and render first event information relating to the live event, wherein the first instructions transmitted by the webserver cause the second client device to:”**

401. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §§X.C.1.b, X.C.1.c, X.C.1.h, X.D.1.f.

- e. **Limitation 24.7: “connect to the second media server endpoint of the at least one media source to receive, on a first communication channel, the first copy of the composite outgoing stream;”**

402. In my opinion, Herzog/Abulikemu discloses this limitation for the same reasons I stated above. *See* §X.D.1.f.

- f. **Limitation 24.8: “render, on the at least one first display of the first client device, the first video relating to the live event based on the first copy of the composite outgoing stream;”**

403. To the extent this limitation can be understood, *see* §X.B.16.f, in my opinion, it is disclosed by Herzog/Abulikemu for the same reasons I stated above. *See* §§X.C.1, X.D.1; *see also* X.B.16.f (obvious design choice).

- g. Limitation 24.9: “connect to a socket of a socket server to receive, on a second communication channel different from the first communication channel, first digital content corresponding to the first event information; and”**

404. In my opinion, Herzog/Spivey discloses this limitation for the same reasons I stated above. *See* §X.C.1.e.

- h. Limitation 24.10: “render, on the at least one first display of the first client device, at least some of the first event information based on the first digital content received on the second communication channel.”**

405. To the extent this limitation can be understood, *see* §X.B.16.h, in my opinion, it is disclosed by Herzog/Spivey for the same reasons I stated above. *See* §§X.C.1.e, X.C.1.f; *see also* X.B.16.h (obvious design choice).

17. Dependent Claim 25

- a. Limitations 25.0-25.1: “The system of claim 24, wherein the first instructions transmitted by the webserver cause the second client device to: obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information.”**

406. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.C.1.h, X.C.1.i, X.C.1.k.

18. **Dependent Claim 26**

- a. **Limitations 26.0-26.2: “The system of claim 24, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

407. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.4.a.

19. **Dependent Claim 27**

- a. **Limitations 27.0-27.2: “The system of claim 24, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

408. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §X.C.5.a.

20. **Dependent Claim 28**

- a. **Limitation 28.0: “The system of claim 24, further comprising the socket server.”**

409. In my opinion, Herzog/Spivey discloses this limitation for the same reasons I stated above. *See* §X.C.2.a.

21. **Dependent Claim 29**

- a. **Limitations 29.0-29.1: “The system of claim 28, further comprising: a control server, coupled to the socket server, to provide the first digital content corresponding to the first event information to the socket server.”**

410. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §X.C.3.a.

22. **Dependent Claim 30**

- a. **Limitation 30.0-30.1: “The system of claim 24, wherein the webserver is configured to transmit second instructions to a third client device that includes at least one second display to enable the at least one second display of the third client device to render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the third client device to: connect to the socket of the socket server to receive, on a third communication channel between the socket and the third client device, the first digital content corresponding to the first event information.”**

411. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §§X.C.1.h, X.C.1.i.

23. **Dependent Claim 31**

- a. **Limitation 31.0: “The system of claim 30, wherein the webserver is configured to transmit the second instructions to the third client device to further enable the at least one second display of the third client device to render the first video relating to the live event and render the first event information relating to the live event, wherein the second instructions transmitted by the webserver cause the third client device to:”**

412. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §X.C.1.c.

- b. **Limitation 31.1: “connect to the second media server endpoint to receive, on a fourth communication channel between the first media server endpoint and the third client device, the first copy of the composite outgoing stream.”**

413. To the extent this limitation can be understood, *see* §X.B.23.b, in my opinion, it is disclosed by Herzog/Abulikemu for the same reasons I stated above. *See* §§X.C.1, X.D.1; *see also* X.B.23.b (obvious to choose media server endpoint).

24. Dependent Claim 32

- a. **Limitations 32.0-32.1: “The system of claim 31, wherein: the first instructions transmitted by the webserver cause the second client device to obtain access to first additional information relating to the live event and/or redirect to a first web site or first app when a first user selects at least a portion of the rendered at least some of the first event information; and”**

414. In my opinion, Herzog discloses these limitations for the same reasons I stated above. *See* §§X.C.1.g, X.C.1.k.

- b. **Limitation 32.2: “the second instructions transmitted by the webserver cause the third client device to obtain access to the first additional information or second additional information relating to the live event and/or redirect to the first web site, the first app, a second web site or a second app related to the live event when a second user selects at least a portion of the rendered at least some of the first event information.”**

415. In my opinion, Herzog discloses this limitation for the same reasons I stated above. *See* §§X.D.24.a, X.C.1.g, X.C.1.k.

25. Dependent Claim 33

- a. **Limitations 33.0-33.2: “The system of claim 30, wherein: the live event is a sporting or gaming event; and the first event information is online gaming information.”**

416. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §X.C.4.a.

26. Dependent Claim 34

- a. Limitations 34.0-34.2: “The system of claim 30, wherein: the live event is a sporting or gaming event; and the first event information is score information.”**

417. In my opinion, Herzog/Spivey discloses these limitations for the same reasons I stated above. *See* §X.C.5.a.

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

418. I have seen no evidence of, and I am not aware of any evidence of secondary considerations that have a nexus to the claimed inventions that would overcome the combinations of prior art cited above in showing the obviousness of claims 1-34 of the '088. The sheer number of independently developed, simultaneous inventions, developed within in a relatively short time-period are persuasive indicia of obviousness. However, should Patent Owner assert any secondary considerations of non-obviousness, I reserve the right to respond.

XII. CONCLUSION

419. For all the reasons discussed above, it is my opinion that claims 1-34 of the '088 are invalid.

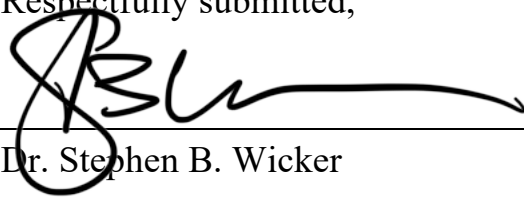
420. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief

Ex. 1001 - Declaration of Stephen B. Wicker, Ph.D.

are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. §1001.

Date: December 6, 2024

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'S. B. Wicker', written over a horizontal line.

Dr. Stephen B. Wicker