IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

SPORTSCASTR INC. (d/b/a PANDA INTERACTIVE), Plaintiff, v. SPORTRADAR GROUP, AG, and SPORTRADAR AG, Defendants.	§ § § § § § § § § § §	Civil Action No. 2:23-cv-00472-JRG JURY TRIAL DEMANDED

SPORTSCASTR INC. (d/b/a PANDA INTERACTIVE), Plaintiff, v. GENIUS SPORTS LTD., GENIUS SPORTS MEDIA LTD., GENIUS SPORTS TECHNOLOGIES LTD., GENIUS SPORTS UK LTD., GENIUS SPORTS HOLDINGS LTD., GENIUS SPORTS GROUP LTD., MAVEN TOPCO LTD., MAVEN MIDCO LTD., MAVEN DEBTCO LTD., and MAVEN BIDCO LTD., Defendants.	§ §	Civil Action No. 2:23-cv-00471-JRG JURY TRIAL DEMANDED

GENIUS SPORTS' SECOND SUPPLEMENTAL INVALIDITY AND
SUBJECT-MATTER ELIGIBILITY CONTENTIONS (12/9/2024)

Pursuant to the Rules of Practice for Patent Cases before the Eastern District of Texas (the "Patent Rules" and each a "Patent Rule") and the First Amended Docket Control Order in effect in this case (Dkt. 93), Defendants Genius Sports Ltd., Genius Sports Media Ltd., Genius Sports

Technologies Ltd., Genius Sports UK Ltd., Genius Sports Holdings Ltd., Genius Sports Group Ltd., Maven Topco Ltd., Maven Midco Ltd., Maven Debtco Ltd., and Maven Bidco Ltd. (collectively, "Genius Sports"), by their undersigned counsel, provide the following Supplemental Invalidity Contentions to Plaintiff SportsCastr Inc. (d/b/a PANDA Interactive) ("Plaintiff" or "PANDA") for U.S. Patent Nos. 11,039,218 ("the '218 Patent"); 10,805,687 ("the '687 Patent"); 10,425,697 ("the '697 Patent"); and 11,871,088 ("the '088 Patent") (collectively, the "Asserted Patents").

These contentions and disclosures are preliminary and reflect information possessed by Genius Sports and its attorneys at the present time, without the benefit of a claim construction order from the Court. As such, these contentions are based, at least in part, upon PANDA's apparent constructions of the Asserted Claims of the Asserted Patents in light of PANDA's Second Supplemental Infringement Contentions, served on November 26, 2024 ("Second Supp. Infr. Cont."). Nothing herein, however, should be construed as an admission or acquiescence by Genius Sports that PANDA's apparent construction of the claims is correct. Genius Sports denies infringement and expressly reserves the right to propose alternative constructions to those that PANDA advocates or suggests, expressly or by inference.

Additional discovery may further support these invalidity contentions with respect to the Asserted Patents. Genius Sports has not, for example, received all relevant and responsive documents from PANDA or document productions and deposition testimony from third parties that are likely to have additional relevant and responsive information and materials. Accordingly, these supplemental invalidity contentions are made without prejudice to Genius Sports' right to further supplement and amend as more information becomes available.

Additional prior art may become relevant depending on the claim-construction positions that PANDA hereafter asserts and the constructions that the Court adopts. Genius Sports' ongoing investigations may also uncover additional prior art, and Genius Sports further reserves the right to rely upon additional combinations of references under 35 U.S.C. § 103 based upon arguments that PANDA may hereafter raise. For example, Genius Sports is currently unaware of the extent to which PANDA may contend that elements of the claims of the Asserted Patents are not disclosed in the art that Genius Sports presents herein. Genius Sports therefore reserves the right to further supplement or modify these contentions based on further discovery and in a manner consistent with the Federal Rules of Civil Procedure and the Court's local and individual rules.

Genius Sports reserves the right to amend or supplement these contentions and disclosures based on fact and expert discovery, after claim terms are construed, and as permitted by the Court's rules and orders. Genius Sports reserves the right to rely on arguments Defendants Sportradar Group AG and Sportradar AG ("Sportradar") make in their invalidity contentions. These contentions and disclosures are subject to correction for inadvertent errors or omissions, if any.

PANDA contends that Genius Sports infringes the following claims (the "Asserted Claims") of the Asserted Patents:

Asserted Patent	Asserted Claims
'687 Patent	1*–18, 19*–22, 23*–26, 27*–30
'697 Patent	1*–18, 19*–22, 23*–26, 27*–30
'218 Patent	1*–11, 12*–15, 16*–20, 21*–30
'088 Patent	1*–7, 8*–12, 13*–23, 24*–34

** Indicates independent claims*

Genius Sports contends that the Asserted Claims are invalid and not infringed. To the extent that PANDA is later permitted to assert any additional claims, Genius Sports reserves the right to further supplement its contentions and assert additional prior art.

The charts attached as Appendices A–C and E are not designed to represent the entire scope of the invalidity of the Asserted Patents, but merely illustrate examples of manners in which the Asserted Patents are invalid. In particular, Genius Sports' invalidity contentions (i) list specific examples of where the prior art discloses, either expressly or inherently, each limitation of the Asserted Claims and (ii) identify examples of combinations of prior art that render the Asserted Claims obvious. These citations are substantial, but they are not intended to be exhaustive. Genius Sports may rely on uncited portions of the cited prior art and offer expert testimony to explain and provide context for the prior art. Genius Sports further reserves the right to rely on portions of any documents incorporated by reference into the cited prior art. The citation of certain exemplary obviousness combinations does not exclude other combinations. The obviousness combinations are not intended to be exhaustive.

For any claim limitation that PANDA may contend is not disclosed in the cited prior art, Genius Sports reserves the right to assert that the limitation is inherent, the limitation would have been obvious to a person of ordinary skill in the art (hereinafter, "POSITA"), or that the limitation is disclosed in other prior art that may be combined with the cited prior art.

Further, PANDA has not yet provided discovery on products embodying the Asserted Patents that may have been previously used, publicly disclosed, published, offered for sale or sold prior to the claimed priority dates or effective filing dates of the Asserted Patents. Genius Sports reserves the right to supplement or amend these contentions based on future discovery related to PANDA products embodying the Asserted Patents.

In addition to the below claim charts, Defendants further incorporate by reference the petitions identified below, including the identified grounds and all supporting exhibits:

- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01305 (U.S. Patent No. 10,805,687), Patent Trial and Appeal Board

- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01307 (U.S. Patent No. 10,805,687), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01308 (U.S. Patent No. 10,425,697), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01309 (U.S. Patent No. 10,425,697), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01310 (U.S. Patent No. 11,039,218), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2024-01311 (U.S. Patent No. 11,039,218), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2025-00251 (U.S. Patent No. 11,871,088), Patent Trial and Appeal Board
- *Genius Sports Ltd. v. SportsCastr Inc.*, IPR2025-00252 (U.S. Patent No. 11,871,088), Patent Trial and Appeal Board

The following disclosures are made subject to and without waiving any of the foregoing.

I. ASSERTED CLAIMS NOT ENTITLED TO PRIORITY

A "patent may only claim priority to an earlier application if the earlier application fulfills the requirements of § 112, first paragraph, which requires, in part, that the application 'shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.'" *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1253 (Fed. Cir. 2004).

PANDA asserts that the '687, '697, and '218 Patents are "entitled at least to the earliest priority date listed on the face of the Patent, specifically, August 5, 2016, corresponding to Provisional Application No. 62/371,558." Second Supp. Infr. Cont. at 9–10. PANDA further asserts that the '088 Patent "is entitled at least to the earliest priority date listed on the face of the Patent, specifically May 16, 2017, corresponding to Provisional Application No. 62/507,158."[1]

[1] PANDA further purports to reserve the right to "assert and rely on an earlier invention date … corresponding to a date of conception followed by diligence and reduction to practice of the claimed invention" should Genius Sports identify prior art predating the Asserted Patents' priority dates. Second Supp. Infr. Cont. at 10. But the Asserted Patents are governed by the

Id. The ’687, ’697, and ’218 Patents claim a priority benefit to U.S. Provisional Patent Application Serial Nos. 62/371,558, filed Aug. 5, 2016 (“the ’558 Application”); 62/435,361, filed Dec. 16, 2016 (“the ’361 Application”); 62/485,878, filed Apr. 14, 2017 (“the ’878 Application”); and 62/518,506, filed Jun. 12, 2017 (“the ’506 Application”). The earliest non-provisional application to which the ’687, ’697, and ’218 Patents claim priority is International Patent Application No. PCT/US2017/045801, filed Aug. 7, 2017 (“the ’801 Application”). The ’088 Patent claims a priority benefit to U.S. Provisional Patent Application Serial Nos. 62/627,859, filed Feb. 8, 2018 (“the ’859 Application”); 62/542,729, filed Aug. 8, 2017 (“the ’729 Application”); and 62/507,158, filed May 16, 2017 (“the ’158 Application”). The earliest non-provisional application to which the ’088 Patent claims priority is International Patent Application No. PCT/US2018/033016, filed May 16, 2018 (“the ‘016 Application”).

As an initial matter, PANDA has not met its burden of demonstrating, for each limitation of the Asserted Claims, that the disclosures of any of the provisional applications satisfy the written description and enablement requirements of 35 U.S.C. § 112 with respect to the claimed subject matter. Accordingly, Genius Sports contends that no Asserted Claim of the ’687, ’697, and ’218 Patents is entitled to a priority date any earlier than August 7, 2017, and that no Asserted Claim of the ’088 Patent is entitled to a priority date earlier than May 16, 2018.

Further, Genius Sports contends that the Asserted Claims are not entitled to claim priority to any of the provisional applications. For example, none of the provisional applications contain an enabling description of the claimed “socket server” or a written description sufficient to show that the inventors were in possession of a “socket server” having the functionality recited in at least

---

AIA’s first-to-file regime and thus any purported earlier invention date is irrelevant to the priority date to which the Asserted Patents are entitled.

Claims 1, 19, and 23 of the ’687 Patent, Claims 1, 19, and 23 of the ’697 Patent, Claims 1, 12, and 16 of the ’218 Patent, and Claims 1, 8, 13, and 24 of the ’088 Patent, or claims dependent upon any of the foregoing. Similarly, none of the provisional applications provide support for a socket server having a “first event socket” or “at least one first event socket” or “at least one second event socket” or “first socket” or “socket” as recited by Claims 1, 19, and 23 of the ’687 Patent, Claims 1, 19, and 23 of the ’697 Patent, Claims 1, 12, and 16 of the ’218 Patent, and Claims 1, 8, 13, and 24 of the ’088 Patent, or claims dependent upon any of the foregoing. The provisional applications also fail to support the transmission of certain information via channels “between” such event sockets or sockets and various configurations of viewer client devices as required by at least Claims 1, 19, and 23 of the ’687 Patent, Claims 1, 19, and 23 of the ’697 Patent, Claims 1, 12, and 16 of the ’218 Patent, and Claims 1, 8, 13, and 24 of the ’088 Patent, or claims dependent upon any of the foregoing. Similarly, none of the provisional applications disclose sufficient structure corresponding to “means for transmitting the first event information to at least the first viewer client device via a first event information communication channel that is different from the first video communication channel” as recited in Claim 27 of the ’687 Patent or “means for transmitting the first score information to at least the first viewer client device via a first event information communication channel that is different from the first video communication channel” as recited in Claim 27 of the ’697 Patent. Further, the provisional applications also fail to support the steps of receiving first digital content corresponding to a first video relating to a first sporting event “on a first communication channel” and receiving second digital content corresponding to online gaming information “on a second communication channel different from the first communication channel” as required by Claim 21 of the ’218 Patents, and its dependent claims. The provisional applications also fail to support the steps of receiving a first copy of a composite outgoing stream on a first

communication channel, and receiving first digital content corresponding to first event information on a second communication channel that is different from the first communication channel, as required by Claims 13 and 24 of the ’088 Patent and its dependent claims. In sum, none of the earlier applications disclose any particular structure or describe any functionality regarding the operations of a socket server, event socket, or their equivalent. Therefore, the applications fail to “reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010).

Moreover, as discussed in Section V, *infra*, the disclosures of the ’801 Application (the earliest non-provisional application to which the ’687, ’697, and ’218 Patents claim priority) and the ’016 Application (the earliest non-provisional application to which the ’088 Patent claims priority) do not satisfy 35 U.S.C. § 112 with respect to one or more of the Asserted Claims, including with respect to the same subject matter described within this Section.

II. IDENTIFICATION OF PRIOR ART

Pursuant to Patent Rule 3-3(a) and based on public information and documents available to it at this time, Genius Sports identifies the following prior art that Genius Sports alleges anticipates or renders obvious each Asserted Claim.

A. Prior Art Patents and Patent Application Publications

Reference Designation	Country	Pat./Pub. No.	Title	Date of Prior Art
Mandyam	U.S.	8,595,186	System and method for building and delivering mobile widgets	6/6/2008
Bota	U.S.	9,456,230	Real time overlays on live streams	7/28/2014

Reference Designation	Country	Pat./Pub. No.	Title	Date of Prior Art
Dengler	U.S.	9,905,082	Systems, methods, and computer-readable media for determining and synchronizing live event information	3/9/2016
Ma	U.S.	2012/0011267	Live streaming media delivery for mobile audiences	9/15/2011
Mukherjee	U.S.	2014/0129680	Socket communication apparatus and method	11/8/2012
Ellis	U.S.	2014/0229992	Systems and methods for providing enhanced sports watching media guidance	4/22/2014
Herzog	U.S.	2015/0163379	Time synchronization of video and data inside a mobile device	12/11/2013
Mitic	U.S.	2016/0006817	System and method for pushing live media content in an adaptive streaming environment	9/12/2014
Spivey	U.S.	2016/0036910	Techniques to broadcast live event data in real-time	8/4/2014
Cromarty ’420	U.S.	8,677,420	Personal Monitoring and Information Apparatus	1/31/2005
Cromarty ’751	U.S.	2008/0052751	Personal Monitoring and Information Apparatus	1/31/2005
Perlman	U.S.	10,150,030	Hosting and Broadcasting Virtual Events Using Streaming Interactive Video	8/10/2015

Reference Designation	Country	Pat./Pub. No.	Title	Date of Prior Art
Levinson	U.S.	2016/0294906	System and Method for Simultaneous Real Time Video Streaming from Multiple Mobile Devices Or Other Sources Through a Server to Recipient Mobile Devices Or Other Video Displays, Enabled by Sender Or Recipient Requests, to Create a Wall Or Matrix of Real Time Live Videos, and to Enable Responses from Those Recipients	3/30/2015
Grubbs	U.S.	2018/0176621	Systems and Methods for Production and Delivery of Live Video	3/28/2017
Abulikemu	U.S.	2018/0367820	A Crowd-Sourced Broadcasting System and Method	12/8/2015
Basso	U.S.	2011/0252156	System and Method for Providing Information to Users of a Communication Network	4/8/2010
Lemmons	U.S.	2014/0281007	Automatically Publishing Streams to Multiple Destinations	3/15/2013
Good ’534	U.S.	2014/0108534	Systems and Methods of Communication Using a Message Header that Includes Header Flags	4/17/2014
Good ’113	U.S.	8,752,113	Insertion of Graphic Overlays Into a Stream	3/15/2013
Good ’780	U.S.	9,350,780	Insertion of Graphic Overlays Into a Stream	5/2/2014

Reference Designation	Country	Pat./Pub. No.	Title	Date of Prior Art
Houle	U.S.	2018/0139260	Systems and Methods for Utilizing Client-Side Synchronization of Video and Overlay	11/15/2016
Kedenburg	U.S.	2018/0167427	Systems and Methods for Interactive Broadcasting	12/12/2016
Yang	U.S.	9,973,785	Automatic Failover for Live Video and Streaming	12/28/2015

B. Prior Art Publications

Reference Designation	Author or Publisher	Title	Date of Prior Art
Apple HLS	Apple	"HTTP Live Streaming Overview" "Timed Metadata for HTTP Live Streaming"	3/1/2016
Hesselman	Christian Hesselman, Wouter van der Beek, Keir Shepherd, Ishan Vaishnavi, Dietwig Lowet, and John O'Connell	"Sharing Enriched Multimedia Experiences across Heterogeneous Network Infrastructures"	5/27/2010
Mate	Francesco Cricri, Sujeet Mate, Igor D. D. Curcio, and Moncef Gabbouj	"Mobile and Interactive Social Television – A Virtual TV Room"	No later than October 2009

C. Prior Art Sales or Public Disclosures

Reference Designation	Selling or Disclosing Entity	Item or Information Sold or Disclosed	Date of Sale or Disclosure
Betstream	Boolabus / Betgenius	Betstream Live Betting and Sportsbook UI Framework	As early as 2008; no later than 8/4/2016

Reference Designation	Selling or Disclosing Entity	Item or Information Sold or Disclosed	Date of Sale or Disclosure
MLB At Bat	Major League Baseball	MLB At Bat	As early as 2008; no later than 8/4/2016
OneTwoSee	OneTwoSee	OneTwoSee	As early as 6/30/2015; no later than 8/4/2016
Facebook Live	Meta	Facebook Live	As early as 2015; no later than 8/4/2016
Kaazing	Kaazing	Kaazing Real-Time Second Screen	As early as 6/2010; no later than 5/15/2017
Wowza	Wowza Media Systems	Wowza Streaming Engine f/k/a Wowza Media Server	As early as 2/11/2014; no later than 5/15/2017
YouTube Live	Google LLC	YouTube Live	As early as 5/27/2015; no later than 8/4/2016
Pusher	Pusher Ltd.	Pusher	No later than 8/4/2016
PubNub	PubNub Inc.	PubNub	No later than 8/4/2016
RabbitMQ	VMWare LLC	RabbitMQ	No later than 8/4/2016
Redis	Redis Inc.	Redis	No later than 8/4/2016
ZeroMQ	Imatix Corp.	ZeroMQ	No later than 8/4/2016
CloudAMQP	84codes AB	CloudAMQP	No later than 8/4/2016
Socket.io	Socket.io	Socket.io	No later than 8/4/2016
Red5 Pro	Infrared5 Inc.	Red5 Pro	No later than 8/4/2016
Twitch	Twitch Interactive Inc.	Twitch	As early as 6/2011; no later than 8/4/2016

Genius Sports further identifies the following prior art products or services that, based on publicly available information, may practice one or more claims of the Asserted Patents:

- 10Bet
- 360 Betting Mobile
- BAMTech

- Create:Share
- Deltatre
- Justin.tv
- Live Channel Online
- Meerkat
- Musical.ly
- NHL GameCentre Live
- Periscope
- uStream
- Vimeo Livestream
- WatchESPN Live Toolbar

Genius Sports' investigation into the functioning and operation of the foregoing prior art products and services, which is information uniquely in the possession of third parties, is ongoing. As of the date of service of these contentions, Genius Sports has served subpoenas on Alphabet Inc., Twitch Interactive Inc., Vimeo Inc., Wowza Media Systems LLC, X Corp., Comcast Corporation, The Walt Disney Company, Major League Baseball, Meta Platforms, Inc., Bamtech, LLC, Disney Streaming Services LLC, and NFL Enterprise, LLC to obtain sufficient information to develop its contentions with respect to one or more of these third-party prior art products or services. Accordingly, Genius Sports reserves the right to supplement these contentions based on information produced by such third parties in response to subpoenas.

D. Scope and Content of the Prior Art and Well-Known Elements in the Art

Genius Sports contends that certain elements of the Asserted Claims reflect common knowledge, including elements that would have been well-known to a POSITA prior to the alleged invention of the subject matter of the Asserted Patents. For example, it was well known to a POSITA how to stream live or on-demand video to multiple users over the Internet and to push relevant data to multiple subscribers at substantially the same time with low latency, including through the use of well-known networking, streaming, and messaging standards and protocols such as HTTP, TCP/IP, UDP, RTP, WebRTC, RTMP, SCTP, WebSockets, DASH, HLS, IP multicast,

AMQP, and/or similar and related video streaming or publish-subscribe technologies. Furthermore, the use of content delivery networks (CDN) to distribute information to multiple users over the Internet was well known to a POSITA. Moreover, the use of standard technologies and components to transmit live, real-time, or near-real-time video of sporting events was well known, as was the use of such technologies to provide live, real-time, or near-real-time updates relevant to such events, including but not limited to score information and betting information. Genius Sports may rely on at least the following to demonstrate the knowledge of a POSITA and to provide context for well-known elements within the scope of the prior art:

- U.S. Pat. No. 7,458,093 ("Dukes")
- U.S. Pat. No. 8,850,053 ("Basso")
- U.S. Pat. No. 9,065,984 ("Arseneau")
- U.S. Pat. No. 9,357,246 ("Wright")
- U.S. Pat. No. 9,393,485 ("Sullivan")
- U.S. Pat. No. 9,100,461 ("Lemmons")
- U.S. Pat. No. 10,535,177 ("Cornell")
- U.S. Pat. No. 10,462,524 ("Barnett")
- U.S. Pat. No. 11,405,658 ("Masterson")
- U.S. Pat. App. Pub. No. 2004/0039788 ("Lim")
- U.S. Pat. App. Pub. No. 2006/0224761 ("Howarth")
- U.S. Pat. App. Pub. No. 2007/0033531 ("Marsh")
- U.S. Pat. App. Pub. No. 2007/0204321 ("Shen")
- U.S. Pat. App. Pub. No. 2009/0183215 ("McCartie")
- U.S. Pat. App. Pub. No. 2011/0247044 ("Jacoby")
- U.S. Pat. App. Pub. No. 2013/0086278 ("Schmidt")
- U.S. Pat. App. Pub. No. 2013/0194431 ("O'Connor '431")
- U.S. Pat. App. Pub. No. 2013/0198044 ("O'Connor '044")
- U.S. Pat. App. Pub. No. 2013/0198769 ("Bountour")
- U.S. Pat. App. Pub. No. 2013/0218942 ("Willis")
- U.S. Pat. App. Pub. No. 2013/0222597 ("Brink")
- U.S. Pat. App. Pub. No. 2013/0311595 ("Milatinovici")
- U.S. Pat. App. Pub. No. 2016/0037215 ("Cardona")
- U.S. Pat. App. Pub. No. 2016/0261927 ("Smolic")
- U.S. Pat. App. Pub. No. 2016/0316262 ("Chen")
- U.S. Pat. App. Pub. No. 2016/0366464 ("Rouady")
- U.S. Pat. App. Pub. No. 2016/0381408 ("Triano")
- U.S. Pat. App. Pub. No. 2017/0041686 ("Park")
- U.S. Pat. App. Pub. No. 2018/0213266 ("Kwak")

- *5 Reasons Why Periscope Is Winning The Live-Streaming Battle,* SETUP (Apr. 14, 2015), setup.us/blog/2015/4/14/5-reasons-why-periscope-is-winning-the-live-streaming-battle
- *A Brief History of the Internet*, ONLINE LIB. LEARNING CENTER., https://www.usg.edu/galileo/skills/unit07/internet07_02.phtml
- Adrien Danjou, *How is the Sporting World Using Periscope Nowadays?,* SNACK MEDIA (Apr. 2016), https://www.snack-media.com/2016/04/how-is-the-sporting-world-using-periscope-nowadays/
- Andrew S. Tanenbaum, *Computer Networks* (Sept. 27, 2010)
- Andy Harris, *HTML5 and CSS3 All-In-One For Dummies* (Jan. 2014)
- Andy Salo, *MPEG DASH: A Technical Deep Dive and Look at What's Next*, RGB Networks, (2012)
- APPLE INC. HTTP LIVE STREAMING OVERVIEW (2016)
- APPLE INC. TIMED METADATA FOR HTTP LIVE STREAMING (2011)
- Arini, ST, MT, *Ch 6 Multimedia Distribution,* https://www.slideserve.com/tassos/ch-6-multimedia-distribution (October 11, 2014)
- Arjen Veenhuizen & Ray van Brandenburg, *Frame accurate media synchronization of heterogeneous media sources in an HBB context*, MEDIA SYNCHRONIZATION WORKSHOP (2012)
- *Betgenius Acquire Boolabus*, BOOLABUS BLOG (Sept. 9, 2011), https://web.archive.org/web/20150504045439/http://www.boolabus.com:80/blog/
- *Betstream Product Review in August Edition of "Egaming Review,"* BOOLABUS BLOG (Oct. 23, 2015), https://web.archive.org/web/20151023082029/http://www.boolabus.com:80/portfolio/
- *BOOM. More Transcode Servers.*, TWITCH BLOG (July 8, 2015), https://blog.twitch.tv/en/2015/07/08/boom-more-transcode-servers-427bcbfb519/
- Brian Snelson, *CloudFlare Now Supports WebSockets* (Aug. 5, 2014)
- Brian Petrocelli, *Attention Broadcasters: Channel Feed Beta is Now Available*, TWITCH BLOG (Mar. 28, 2016), https://blog.twitch.tv/en/2016/03/28/attention-broadcasters-channel-feed-beta-is-now-available-28f7c3dff995/
- Brian Petrocelli, *Channel Feed: Now with Comments!*, TWITCH BLOG (July 11, 2016), https://blog.twitch.tv/en/2016/07/11/channel-feed-now-with-comments-b7a0bc18e806/
- Brijesh Kumar, *Making Sense of Video Streaming Protocols*, LinkedIn. (Aug. 11, 2016), https://www.linkedin.com/pulse/making-sense-video-streaming-protocols-dr-brijesh-kumar/
- *Building a Better Twitch – Updating to HTTPS*, TWITCH BLOG (Mar. 9, 2016), https://blog.twitch.tv/en/2016/03/09/building-a-better-twitch-updating-to-https-cf06c7a02c3a/
- Carlos R. Morales et al., *Development of a Multi-Platform High Performance Computing Streaming Video Distribution Cluster*, AM. SOC'Y FOR ENG'G EDUC. (2013)
- Charles Marion & Julien Jomier, *Real-time Collaborative Scientific WebGL Visualization with Websocket*, Ass'n Computing Machinery, August 4-5, 2012
- Christopher Mueller, *MEPG-DASH vs. Apple HLS vs. Microsoft Smooth Streaming vs. Adobe HDS*, BITMOVIN. (Mar. 29, 2015), https://bitmovin.com/mpeg-dash-vs-apple-hls-vs-microsoft-smooth-streaming-vs-adobe-hds/

- Cong Zhang & Jiangchuan Liu, *On Crowdsourced Interactive Live Streaming: A Twitch.TV-Based Measurement Study*, 25TH ACM WORKSHOP ON NETWORK AND OPERATING SYS. SUPPORT FOR DIGITAL AUDIO & VIDEO 55 (2015)
- David Carr, *Amazon Bets on Content in Deal for Twitch*, N.Y. TIMES (Aug. 31, 2014), ttps://www.nytimes.com/2014/09/01/business/media/amazons-bet-on-content-in-a-hub-for-gamers.html
- David Pierce, *Twitter's Periscope App Lets You Livestream Your World*, WIRED (Mar. 26, 2015), https://www.wired.com/2015/03/periscope/
- Douglas Soo, *Twitch Engineering: An Introduction and Overview*, TWITCH ENG'G (Jan. 19, 2016)
- *Embed Scoreboard User Guide*, LIVE SCORE APP, https://web.archive.org/web/20150926085347/http://www.live-scopre-app.com:80/userguide/embed-scoreboard
- Fidji Simo, *Introducing New Ways to Create, Share and Discover Live Video on Facebook*, FACEBOOK WATCH (Dec. 8, 2016)
- *From NHL GameCenter to NHL.TV: A Look at MLBAM's Relaunch of NHL Digital Properties*, SPORTS BUS. J. (Feb. 26, 2016), https://www.sportsbusinessjournal.com/Daily/Issues/2016/02/26/Technology/from-nhl-gamecenter-to-nhl-tv-a-look-at-mlbams-relaunch-of-nhl-digital-pr%E2%80%A6
- Hardeep Singh Parmar & Michael C. Thornburgh, *Adobe's Real Time Messaging Protocol*, Veriskope. (Dec. 21, 2002)
- Hisayuki Ohmata et al., *Hybridcast: A New Media Experience by Integration of broadcasting and Broadband*, ITU KALEIDOSCOPE (2013)
- *How Does Twitch Keep a Persistent Video Window over Several Pages*, STACK OVERFLOW, https://stackoverflow.com/questions/41286748/how-does-twitch-keep-a-persistent-video-window-over-several-pages
- *How Facebook Live Streams to 800,000 Simultaneous Viewers*, HIGH SCALABILITY (June 27, 2016), https://highscalability.com/how-facebook-live-streams-to-800000-simultaneous-viewers/
- *How to Create a WebSocket Server*, WOWZA BLOG (June 23, 2016), https://web.archive.org/web/20170926004104/https://www.wowza.com/docs/how-to-create-a-websocket-server
- *How to Stream to Facebook Live*, TELESTREAM, https://www.telestream.net/telestream-support/wire-cast/how-to-stream-to-facebook-live.htm
- H. Schulzrinne, *RTP: A Transport Protocol for Real-Time Applications* (Jul. 2003)
- *HTML5 Chat is Live!*, TWITCH BLOG (June 30, 2015), https://blog.twitch.tv/en/2015/06/30/html5-chat-is-live-345782edded0/
- Ian Fette & Alexey Melnikov, *The WebSocket Protocol*, RFC Editor. (Dec. 2016), https://www.rfc-editor.org/rfc/rfc6455.html
- Ian Sherr, *Videogames Become a Spectator Sport*, WALL ST. J. (Nov. 24, 2013), http://online.wsj.com/article/SB10001424052702304607104579210140721840928.html
- Ida-Maria Tunturipuro, Building a Low-Cost Streaming System, May 14, 2015, Bachelor's Thesis, Helsinki Metropolia University of Applied Science
- Ilya Grigorik, *WebRTC*, in High Performance Browser Networking, (2013)

- Jake Smith, *Facebook Rolls Out Live Video Streaming to All iPhone Users Across US*, ZDNET (Jan. 28, 2016), https://web.archive.org/web/20160129091001/http://www.zdnet.com/article/facebook-rolls-out-live-streaming-to-all-iphone-users-across-us/
- James Cook, *Twitch Founder: We Turned A 'Terrible Idea' into a Billion-Dollar Company*, BUS. INSIDER (Oct. 20, 2014)
- James F. Kurose & Keith W. Ross, *Application Layer*, in Computer Networking A Top-Down Approach (Michael Hirsch et al. eds., 4th ed. 2012)
- James F. Kurose & Keith W. Ross, *Computer Networking: A Top-Down Approach* (Michael Hirsch et al. eds., 6th ed. 2013)
- James Trew, *MLB At Bat 2012 App Update Brings New Stats Overlay, Ford SYNC integration and more*, ENGADGET (Sept. 3, 2012), https://www.engadget.com/2012-09-03-mlb-at-bat-2012-app-update-brings-new-stats-overlay.html
- Jan Newmarch, *Introduction to Stream Control Transmission Protocol*, LINUX J. (Sep. 1, 2007), https://www.linuxjournal.com/article/9748
- Jan Ozer, *Usstream, Justin.tv, Livestream, and Bambuster: Streaming Unplugged*, STREAMING MEDIA (June 2012), web.archive.org/web/20131010063326/https:/www.streamingmedia.com/Articles/ReadArticle.aspx
- Jan Ozer, *Ustream Review: Strong Customization, but a Weak Embedded Player*, STREAMING MEDIA (Feb. 24, 2012), https://www.streamingmedia.com/Articles/ReadArticle.aspx?ArticleID=80899
- Jason Cipriani, *How to Start a Facebook Live Video*, CNET (July 8, 2016), https://www.cnet.com/tech/services-and-software/how-to-use-facebooks-live-video-feature/
- Jason Maestas, *Top Games for July 2015 – Rocket League Edition*, TWITCH BLOG (Aug. 10, 2015), https://blog.twitch.tv/en/2015/08/10/top-games-for-july-2015-rocket-league-edition-f278d248475a/
- Jeff Baumgartner, *Comcast's X1 Blends Sports with Interactivity*, MULTICHANNEL NEWS (June 19, 2015), https://www.nexttv.com/news/comcast-s-x1-blends-sports-interactivity-391773
- Jie Deng et al., *Behind the Game: Exploring the Twitch Streaming Platform*, IEEE 14TH INT'L WORKSHOP ON NETWORK AND SYS. SUPPORT FOR GAMES (2015)
- Jillian D'Onfro, *Facebook just proved how serious it is about live video with a huge product update*, BUSINESS INSIDER (Apr. 6, 2016), https://www.businessinsider.com/facebook-live-video-update-2016-4
- John C. Tang et al., *Meerkat and Periscope: I Stream, You Stream, Apps Stream for Live Streams*, 4770 CHI (2016)
- John Constine, *Facebook Launches "Live" Streaming Video Feature, But Only for Celebrities*, TECHCRUNCH (Aug. 5, 2015), https://techcrunch.com/2015/08/05/facescope/
- John Dilley et al., *Globally Distributed Content Delivery*, IEEE Internet Computing (Sept.–Oct. 2002)
- Jordan Golson, *MLB At Bat Goes Live for 2012 with Improved Pricing Scheme*, MACRUMORS (Feb. 29, 2012), https://web.archive.org/web/20120302182806/http://www.macrumors.com: 80/2012/02/29 /mlb-at-bat-goes-live-for-2012-with-improved-pricing-scheme

- Jordan Golson, *MLB At Bat Updated for the 2013 Season, Local Game Video Still Blacked Out*, MACRUMORS (Feb. 21, 2013), https://web.archive.org/web/20130225104539/http://www.macrumors.com:80/2013/02/21/mlb-at-bat-updated-dor-the-2013-season-local-game-video-still-blacked-out/
- Joshua Carroll, *How to Live Stream a Sporting Event*, INSTRUCTABLES (Nov. 22, 2015), http://www.instructables.com/id/How-to-live-stream-a-sporting-event-using-equipmen/
- Julia Greenberg, *Zuckerberg Really Wants You to Stream Live Video on Facebook*, WIRED (Apr. 6, 2016), https://www.wired.com/2016/04/facebook-really-really-wants-broadcast-watch-live-video/
- Julianna Reyes, *How OneTwoSee's Baseball App is Getting in front of Millions of Comcast Subscribers*, TECHNICAL.LY (June 30, 2015), https://technical.ly/startups/comast-mlb-baseball-onetwosee/
- *Justin.tv's Live Video Broadcasting Architecture*, HIGH SCALABILITY (Mar. 16, 2010), https://highscalability.com/justintvs-live-video-broadcasting-architecture/
- Kaazing WebSocket Gateway: Detailed Technical Overview (June 2010)
- Karine Pires & Gwendal Simon, *YouTube Live and Twitch: A Tour of User-Generated Live Streaming Systems*, 225 MMSYS (2015)
- Kate Abrosimova, *What Technology Powers Periscope's Live Video Stream?*, MEDIUM (June 5, 2016), https://web.archive.org/web/20170116004851/hhttps://medium.com/yalantis-mobile/what-technology-powers-periscopes-live-video-stream-1de663a13ebd
- Katie Collins, *Periscope CEO: 'our app is just not very good at piracy*,' WIRED (July 3, 2015), https://web.archive.org/web/20160807230614/http://www.wired.co.uk:80/article/periscope-ceo-kayvon-beykpour-wimbledon-game-of-thrones
- Kinji Matsumura et al., *Personalization of Broadcast Programs using Synchronized Internet Content*, ICCE (2010)
- Kyung-Hoe Kim et al, *A transmission control SCTP for real-time multimedia streaming*, 54 Computer Networks 1418, (2010)
- Lexsan, *Twitch and Youtube Settings Guide*, XENFORO (Mar. 5, 2015)
- *Live Betting in 2009? Just a Warm up for 2010*, BOOLABUS BLOG (Jan. 2, 2010), https://web.archive.org/web/20140122054545/http://www.boolabus.com:80/2010/01/live-
- *Livestream Platform Tech Specs*, https://web.archive.org/web/20160530045226/http://livestream.com:80/platform/tech
- LIVESTREAM, LIVESTREAM BROADCASTER PRO USER MANUAL (2015)
- LIVESTREAM, NEW LIVESTREAM
- LIVESTREAM, STUDIO LIVE PRODUCTION SWITCHER USER MANUAL FOR LIVESTREAM STUDIO VERSION 1.1
- LIVESTREAM, STUDIO SURFACE USER MANUAL (2015)
- Lucian Popa et al., *HTTP as the narrow waist of the future internet*, 2010 ACM SIGCOMM Workshop, October 2013
- Lourdes Beloqui Yuste & Hugh Melvin, *Client-side Multisource Media Streams Multiplexing for HbbTV*, 2ND INT'L CONF. ON CONSUMER ELECS. (1012)
- Lourdes Beloqui Yuste & Hugh Melvin, *Enhanced IPTV Services Through Time Synchronisation*, 14TH INT'L SYMP. ON CONSUMER ELECS. (2010)

- Lourdes Beloqui Yuste et al., *Effective Synchronisation of Hybrid Broadcast and Broadband TV*, INT'L CONF. ON CONSUMER ELECS. (2012)
- Luigi Lo Iacono & Silvia Santano Guillen, *Web-native Video Live Streaming*, WEB 2014: The Second International Conference on Building and Exploring Web Based Environments, April 2014
- Lydon Ong, John Yoakum &, *An Introduction to the Stream Control Transmission Protocol (SCTP)*, Datatracker. (May. 2002), https://datatracker.ietf.org/doc/rfc3286/
- M. Michalko et al., *Building Video Streaming Platform for Educational Content Delivery*, 331 ICETA (2014)
- Marcin Warczygłowa, *Real-time Web Application with Websockets and Vert.X* (Nov. 10, 2015), https://blog.allegro.tech/2015/11/real-time-web-application-with-websockets-and-vert-x.html
- Mari Smith, *Facebook Live: What Marketers Need to Know*, SOC. MEDIA EXAM'R (Jan. 4, 2016), https://www.socialmediaexaminer.com/facebook-live-what-marketers-need-to-know/
- MARIO MARQUES DA SILVA, MULTIMEDIA COMMUNICATIONS AND NETWORKING (2012)
- Mark Newman, *MLB.com At Bat launches into Spring*, MLB (Feb. 25, 2014), https://www/mlb.com/news/mlbcom-at-bat-launches-into-spring/c-68295956
- Mark Sweney, *First ads appear on YouTube Clips*, The Guardian, Aug. 22, 2007
- MARKETLINE, BETGENIUS ACQUIRES BOOLABUS (2011)
- Maury Brown, *MLB Approves New Digital Media Company Spin-Off That Will Create Billions In New Revenues*, FORBES (Aug. 13, 2015), https://www.forbes.com/sites/maurybrown/2015/08/13/mlb-approves-new-digital-media-company-spin-off-that-will-create-billions-in-new-revenues/?sh=6d1ba6ce315d
- Matthew Prince, CloudFlare Now Supports WebSockets, CLOUDFLARE BLOG (Aug. 5, 2014), https://blog.cloudflare.com/cloudflare-nowsupports-websockets/
- Miroslav Michalko et al., *Protected Streaming of Video Content to Mobile Devices*, JSAT 1 (2014)
- *MLB At Bat for iOS brings Live Overlay of Gameday Data onto TV Broadcasts and More*, NEXT WEB (Aug. 31, 2012), https://thenextweb.com/news/mlb-at-bat-ios-updates-ford-sync-integration-social-sharing-highlight-videos
- Nick Wingfield, *In E-Sports, Video Gamers Draw Real Crowds and Big Money*, N.Y. TIMES (Aug. 30, 2014), https://www.nytimes.com/2014/08/31/technology/esports-explosionbrings-opportunity-riches-for-video-gamers.html
- Nick Wingfield, *Julia Child Marathon to Stream on Twitch as Gaming Site Widens Focus*, N.Y. TIMES (Mar. 15, 2016), https://www.nytimes.com/2016/03/16/technology/julia-child-marathon-tostream-on-twitch-in-bet-on-prerecorded-content.html
- Nick Wingfield, *What's Twitch? Gamers Know, and Amazon Is Spending $1 Billion on It*, N.Y. TIMES (Aug. 25, 2014), https://www.nytimes.com/2014/08/26/technology/amazon-nears-a-dealfor-twitch.html
- Noreen T.M., *HTML5 Video Player Beta Begins Today*, TWITCH BLOG (July 14, 2016), https://blog.twitch.tv/en/2016/07/14/html5-video-player-beta-begins-today-135d1b7baa65/.
- Omar Bladonado & Paul Saab, *Networking @Scale, May 2016 – Recap*, ENG'G META (May 24, 2016), https://engineering.fb.com/2016/05/24/networking-traffic/networking-scale-may-2016-recap/?ref=highscalability.com

- *OneTwoSee Provides Licensed, White-labeled Products that Help Some of the Biggest Names in Sports Engage and Monetize Their Audiences Through any Screen*, ONETWOSEE (July 6, 2016), https://web.archive.org/web/20160706140110/http://onetwosee.com:80/.
- *Periscope Versus Meerkat*, BUS. INSIDER (Mar. 2015), https://web.archive.org/web/20150328235030/http://www.businessinsider.com:80/periscope-versus-meerkat-2015-03
- PETER STEWART, THE PERISCOPE BIBLE (2015).
- Preston Smalley, *Comcast Bolsters Sports Technology Team with Acquisition of OneTwoSee*, COMCASTVOICES (Mar. 7, 2016), https://web.archive.org/web/20160415093127/http://corporate.comcast.com:80/comcast-voices/comcast-bolsters-sports-technology-team-with-acquisition-of-onetwosee
- Preston Smalley, *Watch a Game Like Never Before with New Baseball Extras for the X1 Platform*, COMCAST VOICES (June 29, 2015), https://web.archive.org/web/20150630175059/http://corporate.comcast.com:80/comcast-voices/watch-a-game-like-never-before-with-new-baseball-extras-for-the-x1-platform.
- Rhys Hiltner, *Go's March to Low-latency GC*, TWITCH BLOG (July 5, 2016), https://blog.twitch.tv/en/2016/07/05/gos-march-to-low-latency-gc-a6fa96f06eb7/.
- Rich McCormick, *Periscope Users Can Now Save Their Live-streamed Broadcasts Forever*, TECHCRUNCH (May 5, 2016), https://www.theverge.com/2016/5/5/11595244/how-to-save-periscopes-live-streams
- Richard Nieva, *Facebook Live-streaming Brings the Love and the Wow, with a Side of Sepia*, CNET (Apr. 6, 2016), https://www.cnet.com/tech/mobile/facebook-live-streaming-tool-adds-filters-and-reactions/
- Richard Sandomir, *The Innovation That Grew and Grew*, N.Y. Times, June 12, 2014
- Rip Empson, *Baseball's Digital Trifecta and How America's Pastime is Setting the Pace for Sports Online*, TECHCRUNCH (Nov. 4, 2013), https://web.archive.org/web/20131110013907/http://techcrunch.com:80/2013/11/04/baseballs-digital-trifecta-and-how-americas-pastime-is-setting-the-pace-for-sports-online/.
- Rob Manson, *Getting Started with WebRTC* (Sep. 2013)
- Salvatore Loreto & Simon Pietro Romano, *Real-Time Communication with WebRTC*, (Oct. 16, 2016)
- Second Screen App, KAAZING, https://web.archive.org/web/20130818005342/http://developer.kaazing.com/portfolio/second-screen-application/
- Second Screen App, KAAZING, https://web.archive.org/web/20130914172647/http://developer.kaazing.com:80/portfolio/second-screen-application
- Randall Stewart & Chris Metz, *SCTP: new transport protocol for TCP/IP*, 5 IEEE 64, (2001)
- Richard Clark, *Real-Time Data, The Kaazing Websocket Gateway Opens Up the Power* (2014)
- *Real-Time Second Screen Connectivity*, http://www.kaazing.com/solutions/real-time-second-screen-connectivity/ (November 10, 2016)
- Sam Dutton, *Get started with WebRTC*, web.dev. (Jul. 23, 2012), https://web.dev/articles/webrtc-basics

- Shalini Kurian, *High Performing Native Chat on Twitch*, TWITCH BLOG (July 15, 2016), https://blog.twitch.tv/en/2016/07/15/high-performing-native-chat-on-twitch-79c1492eca06/.
- *Skybet Go Live with the Betstream Advanced Football Module*, BOOLABUS BLOG (Oct. 12, 2015), https://web.archive.org/web/20151023033718/http://www.boolabus.com/2010/10/skybet-live-football/
- Socket.IO Broadcasting events, SOCKET.IO, https://socket.io/docs/v4/broadcasting-events/
- Socket.IO Docs, SOCKET.IO https://web.archive.org/web/20150401041027/http:/socket.io/docs
- Socket.IO Documentation, SOCKET.IO, https://socket.io/docs/v4/
- Socket.IO on PubNub, PUBNUB https://web.archive.org/web/20150924221323mp_/http:/www.pubnub.com/socket.io
- *Sportingbet in:play*, BOOLABUS BLOG (Apr. 5, 2010), https://web.archive.org/web/20151023063447/http://www.boolabus.com/2010/04/sportingbet-inplay/
- Stefan Saroiu et al., *An analysis of Internet Content Delivery Systems*, ACM SIGOPS Operating System Review, Vol. 36 (Dec. 31, 2002), https://doi.org/10.1145/844128.84415
- Steve Kovach, *Stream Live Baseball Games to Your iPad with MLB At Bat*, BUS. INSIDER (Mar. 31, 2011), https://www.businessinsider.com/stream-live-baseball-games-with-mlb-at-bat-2011-3
- *Streaming Engine Documentation*, WOWZA MEDIA SYS., https://web.archive.org/web/20150311225020/http://www.wowza.com:80/products/streaming-engine/documentation
- *The Backbone of Periscope: Wowza Streaming Engine*, WOWZA BLOG (Nov. 17, 2015), https://web.archive.org/web/2017031416431/https://www.wowza.com/blog/the-backbone-of-periscope-wowza-streaming-engine
- *The Beginner's Guide to Periscope for Bloggers*, FABULOUS BLOGGING, https://www.fabulousblogging.com/2015/08/the-beginners-guide-to-periscope-for-bloggers/.
- *WebRTC*, TutorialsPoint SimplyEasyLearning (2015), www.tutorialspoint.com
- *Twitch API Overview*, TWITCH DEV (2017), https://web.archive.org/web/20170325170124/https://dev.twitch.tv/docs
- *Twitch Engineering: An Introduction and Overview*, TWITCH BLOG (Dec. 18, 2015), https://blog.twitch.tv/en/2015/12/18/twitch-engineering-an-introduction-and-overview-a23917b71a25/

- *Twitch Engineering: An Introduction and Overview*, TWITCH BLOG (Dec. 18, 2015), https://blog.twitch.tv/en/2015/12/18/twitch-engineering-an-introduction-and-overview-a23917b71a25/

- *Twitch iOS 9 Multitasking Support Is Here!*, TWITCH BLOG (Oct. 14, 2015), https://blog.twitch.tv/en/2015/10/14/twitch-ios-9-multitasking-support-is-here-a6364debed5f/
- *Twitch Live Annotations FAQ*, TWITCH BLOG (July 1, 2014), https://blog.twitch.tv/en/2014/07/01/twitch-live-annotations-faq-6db54fadeede/
- *Update: Chat Replay is Now Live!*, TWITCH BLOG (Mar. 2, 2016), https://blog.twitch.tv/en/2016/03/02/update-chat-replay-is-now-live-aac0b82305b6/.
- Vanessa Wang, Frank Salim, and Peter Moskovits, *The Definitive Guide to HTML5 WebSocket* (Feb. 13, 2013)

- Victoria Pimentel & Bradford G. Nickerson, *Communicating and Displaying Real-Time Data with WebSocket*, 16 IEEE (2012)
- *Watch and Chat in Full Screen with Theater Mode*, TWITCH BLOG (Dec. 16, 2014), https://blog.twitch.tv/en/2014/12/16/watch-and-chat-in-full-screen-with-theater-mode-321238b7bd38/
- WOWZA MEDIA SYSTEMS, TECH-GUIDE: BUILDING A LIVE MOBILE STREAMING APP (2016)
- WOWZA MEDIA SYSTEMS, THE HISTORY OF STREAMING
- WOWZA MEDIA SYSTEMS, WOWZA STREAMING ENGINE OVERVIEW (Feb. 2014)
- WOWZA MEDIA SYSTEMS, WOWZA STREAMING ENGINE USER'S GUIDE 4.0 (2007–2014)
- WOWZA MEDIA SYSTEMS, WOWZA STREAMING ENGINE USER'S GUIDE 4.1 (2006–2015)
- WOWZA MEDIA SYSTEMS, WOWZA STREAMING ENGINE USER'S GUIDE 4.7.5 (2007–2018)
- Yoree Koh & Evelyn M. Rusli, *Twitter Acquires Live-Video Streaming Startup Periscope*, WALL ST. J. (Mar. 9, 2015), http://www.wsj.com/articles/twitter-acquires-live-video-streaming-startup-periscope-1425938498

* * *

Genius Sports reserves the right to rely on any prior art references identified or cited by PANDA, Sportradar, the named inventors of the Asserted Patents, the United States Patent and Trademark Office or other national or international patent office or similar authority, or party to any other proceeding involving the Asserted Patents or any related patents or continuation applications stemming from the Asserted Patents or the applications to which they claim priority.

Genius Sports' investigation is ongoing, and Genius Sports reserves the right to identify new or additional references as its investigation continues. For example, Genius Sports expects that this disclosure may be amended or supplemented based on additional prior art identified during discovery of which Genius Sports was not aware despite its diligence at the time these contentions were prepared.

III. ANTICIPATION

Pursuant to Patent Rule 3-3(b), Genius Sports contends that each Asserted Claim is invalid as anticipated by one or more prior art references identified above, as demonstrated in the following claim charts provided pursuant to Pursuant to Patent Rule 3-3(c). Those claim charts identify certain exemplary prior art disclosures for each limitation of the Asserted Claims and are

not necessarily exhaustive. Where Genius Sports cites to a particular figure in a reference, the citation should be understood to encompass the corresponding caption and description of the figure and any text relating to the figure in addition to the figure itself. Similarly, where a cited portion of text refers to a figure, the citation should be understood to include the figure as well.

A. '687 Patent

Reference	Anticipated Claims	Exhibit(s)
Ellis	1–30	A-1, A-1S[2]
Herzog	1–30	A-2, A-2S
Spivey	1–30	A-3, A-3S
Mitic	1–30	A-4, A-4S
Bota	1–30	A-5, A-5S
Dengler	1–30	A-6, A-6S
Ma	1–30	A-7, A-7S
OneTwoSee	1–30	A-8, A-8S
Mukherjee	1–30	A-9, A-9S
Mandyam	1–30	A-10, A-10S
Apple HLS	1–30	A-11, A-11S
Betstream	1–30	A-12, A-12S
MLB At Bat	1–30	A-13, A-13S
Facebook Live	1–30	A-14, A-14S
Cromarty '751	1–30	A-15
Perlman	1–30	A-16
Grubbs	1–30	A-18
Basso	1–30	A-20
Good '534	1–30	A-21
Lemmons	1–30	A-22
Good '113	1–30	A-23
Good '780	1–30	A-24
Wowza	1–30	A-25
Kaazing	1–30	A-26
YouTube Live	1–30	A-27
Twitch	1–30	A-28
Houle	1–30	A-29
Kedenburg	1–30	A-30
Yang	1–30	A-31
Mate	1–30	A-32
Hesselman	1–30	A-33

[2] Exhibits A-1–A-14 address Claims 1–9, 19–25, and 27–30 of the '687 Patent. Supplemental Exhibits A-1S–A-14S address Claims 10–18 and 26 of the '687 Patent.

Reference	Anticipated Claims	Exhibit(s)
Red5 Pro	1–30	A-34
Pusher	1–30	A-35
PubNub	1–30	A-35
RabbitMQ	1–30	A-35
Redis	1–30	A-35
ZeroMQ	1–30	A-35
CloudAMQP	1–30	A-35
Socket.io	1–30	A-35

B. ’697 Patent

Reference	Anticipated Claims	Exhibit(s)
Ellis	1–30	B-1, B-1S[3]
Herzog	1–30	B-2, B-2S
Spivey	1–30	B-3, B-3S
Mitic	1–30	B-4, B-4S
Bota	1–30	B-5, B-5S
Dengler	1–30	B-6, B-6S
Ma	1–30	B-7, B-7S
OneTwoSee	1–30	B-8, B-8S
Mukherjee	1–30	B-9, B-9S
Mandyam	1–30	B-10, B-10S
Apple HLS	1–30	B-11, B-11S
Betstream	1–30	B-12, B-12S
MLB At Bat	1–30	B-13, B-13S
Facebook Live	1–30	B-14, B-14S
Cromarty ’751	1–30	B-15
Perlman	1–30	B-16
Grubbs	1–30	B-18
Basso	1–30	B-20
Good ’534	1–30	B-21
Lemmons	1–30	B-22
Good ’113	1–30	B-23
Good ’780	1–30	B-24
Wowza	1–30	B-25
Kaazing	1–30	B-26
YouTube Live	1–30	B-27
Twitch	1–30	B-28
Houle	1–30	B-29
Kedenburg	1–30	B-30

[3] Exhibits B-1–B-14 address Claims 1–9, 19–25, and 27–30 of the ’697 Patent. Supplemental Exhibits B-1S–B-14S address Claims 10–18 and 26 of the ’697 Patent.

Reference	Anticipated Claims	Exhibit(s)
Yang	1–30	B-31
Mate	1–30	B-32
Hesselman	1–30	B-33
Red5 Pro	1–30	B-34
Pusher	1–30	B-35
PubNub	1–30	B-35
RabbitMQ	1–30	B-35
Redis	1–30	B-35
ZeroMQ	1–30	B-35
CloudAMQP	1–30	B-35
Socket.io	1–30	B-35

C. ’218 Patent

Reference	Anticipated Claims	Exhibit
Ellis	1–30	C-1
Herzog	1–30	C-2
Spivey	1–30	C-3
Mitic	1–30	C-4
Bota	1–30	C-5
Dengler	1–30	C-6
Ma	1–30	C-7
OneTwoSee	1–30	C-8
Mukherjee	1–30	C-9
Mandyam	1–30	C-10
Apple HLS	1–30	C-11
Betstream	1–30	C-12
MLB At Bat	1–30	C-13
Facebook Live	1–30	C-14
Cromarty ’751	1–30	C-15
Perlman	1–30	C-16
Grubbs	1–30	C-18
Basso	1–30	C-20
Good ’534	1–30	C-21
Lemmons	1–30	C-22
Good ’113	1–30	C-23
Good ’780	1–30	C-24
Wowza	1–30	C-25
Kaazing	1–30	C-26
YouTube Live	1–30	C-27
Twitch	1–30	C-28
Houle	1–30	C-29
Kedenburg	1–30	C-30
Yang	1–30	C-31

Reference	Anticipated Claims	Exhibit
Mate	1–30	C-32
Hesselman	1–30	C-33
Red5 Pro	1–30	C-34
Pusher	1–30	C-35
PubNub	1–30	C-35
RabbitMQ	1–30	C-35
Redis	1–30	C-35
ZeroMQ	1–30	C-35
CloudAMQP	1–30	C-35
Socket.io	1–30	C-35

D. ’088 Patent

Reference	Anticipated Claims	Exhibit
Ellis	1–34	E-1
Herzog	1–34	E-2
Spivey	1–34	E-3
Mitic	1–34	E-4
Bota	1–34	E-5
Dengler	1–34	E-6
Ma	1–34	E-7
OneTwoSee	1–34	E-8
Mukherjee	1–34	E-9
Mandyam	1–34	E-10
Apple HLS	1–34	E-11
Betstream	1–34	E-12
MLB At Bat	1–34	E-13
Facebook Live	1–34	E-14
Cromarty ’751	1–34	E-15
Perlman	1–34	E-16
Levinson	1–34	E-17
Grubbs	1–34	E-18
Abulikemu	1–34	E-19
Basso	1–34	E-20
Good ’534	1–34	E-21
Lemmons	1–34	E-22
Good ’113	1–34	E-23
Good ’780	1–34	E-24
Wowza	1–34	E-25
Kaazing	1–34	E-26
YouTube Live	1–34	E-27
Twitch	1–34	E-28
Houle	1–34	E-29
Kedenburg	1–34	E-30

Reference	Anticipated Claims	Exhibit
Yang	1–34	E-31
Mate	1–34	E-32
Hesselman	1–34	E-33
Red5 Pro	1–34	E-34
Pusher	1–34	E-35
PubNub	1–34	E-35
RabbitMQ	1–34	E-35
Redis	1–34	E-35
ZeroMQ	1–34	E-35
CloudAMQP	1–34	E-35
Socket.io	1–34	E-35

IV. OBVIOUSNESS

A. Obviousness in View of Identified References

Pursuant to Patent Rule 3-3(b), to the extent that any Asserted Claim is not anticipated by the prior art references identified above, Genius Sports contends that each Asserted Claim is rendered obvious by one or more references identified above based on the express, implied, or inherent disclosures of each reference alone or in combination with the knowledge of a POSITA, at least based on the exemplary disclosures identified in Appendices A–C, and E. Genius Sports contends that a POSITA would have relied on the complete reference, along with other publications and the POSITA's general knowledge for context in understanding and interpreting any specific statement or disclosure within a reference. Genius Sports may therefore rely upon uncited portions of the references, on other publications, and/or on expert testimony to provide context and to demonstrate how a POSITA would have understood and interpreted the cited portions of each reference or to establish that a POSITA would have been motivated to modify or combine certain of the cited elements or disclosures to render the Asserted Claims obvious.

B. Obviousness Combinations

The Asserted Claims are invalid at least because it would have been obvious for a POSITA to combine the teachings of the prior art references above and thereby obtain the alleged inventions

of the Asserted Patents. Such combination is the result of at least one of the following: (1) the application of known methods to yield predictable results; (2) a simple substitution of one known element for another to obtain predictable results; (3) the application of a known technique to a known method ready for improvement to yield predictable results; (4) choosing a finite number of identified, predictable solutions (*i.e.*, obvious to try); or (5) the combination of results from known work prompting a variation of it based on design incentives or other market forces, where the variations would have been predictable to a POSITA.

In particular, a POSITA would have been motivated to combine the disclosures of either Ellis, Herzog, or Houle with corresponding disclosures from one or more of Spivey, Mitic, Bota, Dengler, Ma, Mukherjee, Mandyam, Cromarty '751, Perlman, Levinson, Grubbs, Abulikemu, Basso, Lemmons, Good '534, Good '113, Good '780, Kedenburg, Yang, Mate, Hesselman, MLB at Bat, Facebook Live, Betstream, OneTwoSee, and Wowza for the following reasons.[4]

First, all of the prior art identified in Appendices A–C and E relate to the same technical subject matter. In particular, each reference describes methods and/or systems for streaming video and/or event data to one or more users, including video and event data relating to live events such as sporting events, such that video and/or event data are transmitted synchronously. *See, e.g.*, Ellis at Abstract ("Systems and methods for enhanced sports-related media content access and display are provided. … An interactive scoreboard may also be displayed with various game status and alert icons. The interactive scoreboard may allow a viewer to quickly tune between high-interest

[4] The identified references are illustrative and similar teachings may be found in other references identified in these contentions and any supplements thereto. Genius Sports reserves the right to rely on other references identified in these contentions and any supplements thereto for such similar teachings. Genius Sports further incorporates the obviousness rationales articulated in IPR2024-01305, IPR2024-01307, IPR2024-01308, IPR2024-01309, IPR2024-01311, IPR2025-00251, and IPR2025-00252.

sporting events. Sports-specific features, such as wagering and fantasy league support, are also provided."); Herzog at Abstract (a mobile device "receive[s] live video and audio data" as well as "live meta-data" from a "communication network" and "time synchronize[s] the selected meta-data with the video and audio data for simultaneous display"); Houle at Abstract ("The present disclosure provides systems and methods for synchronizing data streams…. The client computing device also can synchronize the video stream with the metadata stream, based on the offset between the first timecode and the second timecode"), ¶ 39 (disclosing streaming video and metadata to multiple users in synchronous manner); Spivey at Abstract (disclosing an "apparatus to broadcast live event data in real-time" including "a subscription component … to receive a topic entry from a message queue server, and to push the topic entry to a subscribed client device substantially simultaneously with the message queue server receiving the topic entry from a live data source"); Mitic at Abstract (disclosing systems and methods for "pushing live media to a client" using a "websocket interface … to facilitate a websocket session with the client" such that "media segments" are pushed "to the client device substantially in real time during the websocket session"); Bota at Abstract ("generating and distributing overlay streams in real time over an overlay stream distribution channel that overlays events of a video stream distributed in a separate video channel"); Dengler at Abstract (describing a "live event management system" for providing event updates "in real time or substantially real time"); Ma ¶ 5 ("delivering live content (live video and/or audio) as streaming media over the Internet"); Mukherjee at Abstract (providing streaming content by "receiving a first request from a first client device and a second request from a second client device for an event to be streamed"); Mandyam at 25:41–26:10 (disclosing a "livecasting engine" allowing "[m]ultiple end-users … to simultaneously consume" an information stream in real time, including "sports scores"); Cromarty '751 at 2:62–65 ("Central broadcast node 1005

contains appropriate software to transcode received audio, video, and data into a format that is capable of being transmitted through wireless network interface 1015 to personal monitoring device 1050"); Basso at Abstract ("A plurality of multimedia data streams that are being provided via an internet protocol (IP) network is received, wherein each multimedia data stream carries multimedia content . . . The metadata is provided in real-time in a metadata stream to a plurality of user devices, via the IP network."); Levinson at Abstract ("A system and method for simultaneous real time video streaming … through a server to recipient mobile devices or other video displays … and to enable responses from those recipients, for security, personal, entertainment or commercial applications."); Abulikemu at Abstract ("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. The live video and audio including the user-generated content can be streamed to users over the internet or via more traditional broadcasting methods such as over-the-air (OTA) broadcast, satellite, cable, etc."); Grubbs ¶ 35 ("methods and systems wherein users may create and broadcast live streaming video, which may be embedded with other digital content streams, over a network through use of multiple communicating servers interconnected and be able to edit and composite such live streaming video and other digital content streams simultaneous to their broadcast over a network and to multiple viewers on multiple platforms."); Perlman at Abstract ("The method further includes broadcasting the twitch action video game or real-time application in one or more streams of real-time compressed digital video from the hosting service center to one or more viewing client devices over the Internet. The method also includes selectively overlaying, by the hosting service center, feedback data (e.g., text, comments, audio, etc.) from one or more of the viewing client devices onto the one or more streams of real-time compressed digital video."); Good '534 ¶ 15 ("The

system 100 includes a media server 102 that is communicatively coupled to one or more publishing devices . . . and to one or more viewing devices . . . The media server 102 may receive one or more media streams from the publishing device 120 and may provide one or more media streams to the viewing devices 140, 160, and 180."); Apple HLS, HTTP Live Streaming Overview at 1 (HTTP Live Streaming allows "[s]treaming live events" including "video over HTTP from an ordinary web server"); Kaazing, Technical Overview at 3 ("Kaazing WebSocket Gateway is a platform for building web applications that require low latency, full-duplex communication between an end node, such as a browser or desktop, and a server. Using Kaazing WebSocket Gateway, web applications running within any browser can connect to real-time data over a reliable, bidirectional connection."); Wowza at WOWZA00067 ("Wowza Streaming Engine™, formerly known as Wowza Media Server®, is robust, customizable, and scalable server software that powers reliable streaming of high-quality audio and video to any device anywhere. This release of the server software has a new name as well as new and updated features that continue to future-proof and simplify online video delivery by expanding its ability to stream video to any screen using any streaming protocol, streamlining server administration, and providing enhanced scalability, flexibility, and reliability."); Good '113 at 1:31–49 ("Systems and methods of inserting graphic overlays … into a stream are disclosed. Advantageously, overlays may be inserted by a media server that acts as a transcoding intermediary between a live stream provider and a destination device. … The media server may provide a flexible, application programming interface (API)-driven framework for overlays. …")[5]; Kedenburg at Abstract ("Systems, methods, and non-transitory computer-readable media can provide an interface through which a live content stream

[5] Good '780 is a continuation of Good '113 and thus substantively shares the same Abstract and Specifications. For example, this quote can also be cited as Good '780 at 1:41–59.

is presented, the live content stream being accessed through a content provider system."); Kedenburg ¶ 8 ("[T]he merged live content stream is presented to users in an interface that includes a first region and a second region, wherein the broadcaster's live content stream is shown in the first region, and wherein the user's different live content stream is shown in the second region."); Yang at 4:9–15 ("The multimedia input is streamed over the Internet to an end–user, such as a viewer of the live event," where streaming "may refer to a process of delivering multimedia content in a manner such that the content is received by and presented to a viewer device."); Mate at 3 ("A multiparty videoconference system coupled with synchronized content streaming may provide the *virtual presence* of the participants in a mobile TV room."); Hesselman at 54 (disclosing "an open and intelligent service platform that allows applications to easily combine media and services from different network infrastructures, and enables consumers to easily share them in an integrated way").

Each of the references solves the same or similar problems that the Asserted Patents claim to have solved, namely, providing video and/or event data to multiple users over the Internet quickly and at scale. *See, e.g.*, Ellis ¶ 39 ("Any suitable number of users may have one or more user equipment devices, such as user equipment 102, coupled to content source 130, data sources 140, and supplemental content source 120."); Herzog ¶ 49 ("The solutions integrator 44 publishes the video imagery, related audio and meta-data that are received from the content provider 42 onto the content delivery network 47 for presentation to users/consumers of the content."); Houle at Abstract, ¶¶ 38–39; Spivey ¶ 27 ("using topic queues and open duplex communication connections" to "increase the speed at which live event data (e.g. sports scores and breaking news), are broadcast to mobile devices"); Mitic ¶ 4 (one goal of the disclosed adaptive live media streaming system is "to reduce the overall end-to-end delay so that the media as viewed by the end

consumer is as close as possible in time to reality"); Bota at Abstract (describing streams that are "distributed to subscriber recipient components via a unicast channel in order to enhance user viewing" by using a "publisher subscriber component and caching techniques" to allow for "low latency, high availability unicasting based real time overlay distribution system for a large numbers of concurrent overlay recipients"); Dengler at 3:15–17 (its live event management system allows events to be "automatically synchronized, in real time, to each of the recorded video streams, in a frame-accurate manner"); Ma ¶ 5 (disclosing techniques "deliver, in a scalable and cost-effective manner, live and time-shifted streaming of content over the Internet" to "a large number of endpoints"); Mukherjee ¶ 32 (using a "group-write operation" to enable an edge server to access a buffer once and "perform multiple write and copy operations based off this single access to memory" so as to serve "tens of thousands of client devices"); Mandyam at 25:62–65 (allowing multiple end users to "access information that is guaranteed to arrive within a certain period of time"); Apple HLS, HTTP Live Streaming Overview at 10 (permitting "dynamic switching between streams of different data rates in response to changing connection speeds" thereby allowing for "continuous broadcasts"); Cromarty '751 at 2:28–30, 50–54 (disclosing transmitting "information (data) and audio and video transmissions . . . via a wireless signal to the personal monitoring devices" using a "[n]etwork interface 1010 represent[ing] a broadband connection that is used for communicating with information resources . . . through the Internet . . . ."); Basso at Abstract ("A plurality of multimedia data streams that are being provided via an internet protocol (IP) network is received . . . [t]he metadata is provided in real-time in a metadata stream to a plurality of user devices, via the IP network."); Levinson ¶ 3 ("simultaneous video streaming from multiple mobile devices or other sources through a server to recipient mobile devices or other video displays"); Abulikemu ¶ 10 ("Embodiments of the disclosure are 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. The live video and audio including the user-generated content can be streamed to users over the internet or via more traditional broadcasting methods such as over-the-air (OTA) broadcast, satellite, cable, etc. This can 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."); Grubbs ¶ 35 ("methods and systems wherein users may create and broadcast live streaming video, which may be embedded with other digital content streams, over a network through use of multiple communicating servers interconnected and be able to edit and composite such live streaming video and other digital content streams simultaneous to their broadcast over a network and to multiple viewers on multiple platforms."); Perlman at Abstract ("The method further includes broadcasting the twitch action video game or real-time application in one or more streams of real-time compressed digital video from the hosting service center to one or more viewing client devices over the Internet. The method also includes selectively overlaying, by the hosting service center, feedback data (e.g., text, comments, audio, etc.) from one or more of the viewing client devices onto the one or more streams of real-time compressed digital video."). Good '534 ¶ 15 ("The system 100 includes a media server 102 that is communicably coupled to one or more publishing devices (e.g., an illustrative publishing device 120) and to one or more viewing devices (e.g., illustrative viewing devices 140, 160, and 180). The media server 102 may receive one or more media streams from the publishing device 120 and may provide one or more media streams to the viewing devices 140, 160, and 180."); Lemmons ¶ 38 ("The method 400 may further include automatically publishing the stream to the first publishing destination and to the second publishing destination, at 406. Publishing the stream may include transmitting the stream in accordance with

a protocol identified in the entry and /or by a profile identified by the entry (e.g., the RTMP, RTP, and/or MPEG-TS protocols)."); Good '113 ("Systems and methods of inserting overlays into a stream are disclosed. A media server may receive a stream. The media server may selectively add one or more images (e.g., graphics and/or text) to the stream prior to scaling the stream to produce one or more scaled streams. … The scaled streams may be encoded for adaptive streaming to a computing device."); Good '780 (same); Kaazing, Real-Time Data at 3 ("[Websocket] . . . transports TCP/IP-based protocols cleanly and safely across the web. Browser-based (and native) clients can then implement these protocols and have the same flexible client-server communications as if they were together on a LAN."); Wowza at WOWZA00071 ("Wowza Streaming Engine™ is high-performance, extensible, and fully interactive media streaming software platform that provides live and on-demand streaming, chat, and remote recording capabilities to a wide variety of media player technologies."); Kedenburg ¶ 23 ("A user (e.g., a viewer) operating a computing device can access the live content stream through the content provider. In response, the content provider encodes and provides data corresponding to the live content stream to the user's computing device over a network (e.g., the Internet) in real-time."); Kedenburg ¶ 28 ("The live stream module 106 can utilize any generally known techniques that allow for live streaming of content including, for example, the Real Time Messaging Protocol (RTMP)"); Yang at 6:55–59 ("a web server configured to receive incoming multimedia input for streaming audio, video, and other data (e.g., Real–Time Messaging Protocol (RTMP), Real–Time Streaming Protocol (RTSP), and MPEG–Transport Stream (TS))."); Mate at 5 ("For the transport of the multimedia data (video and audio), RTP (Real time Transport Protocol) [12] over UDP is used in order to ensure a real time communication," and "HTTP [15] is used as the protocol for the control channel."); Hesselman at 57 ("The iSession Manager supports different communication

protocols so that clients from different technology domains can interact with it," including "HTTP for Internet, mobile, and TV clients," "SIP for IMSbased TV clients," and "HTTP and RSTP URLs."). It therefore would have been obvious to a POSITA at the time of the alleged invention, based on his or her own knowledge, the explicit and implicit teachings of the prior art references, and/or the nature of the claimed invention and the problem(s) purportedly being solved, to look to and/or combine the references to arrive at the claimed inventions of the Asserted Patents, rendering them obvious. To the extent that any suggestion, motivation, or teaching is required, it is provided by the identified prior art itself as well as the knowledge of a POSITA.

Second, the prior art identified in Appendices A–C and E disclose complementary means of achieving the common goal of synchronizing multiple forms of data, including video and metadata, and including transmission of data to one or more users. For example, each of Ellis, Herzog, and Houle disclose systems for transmitting live video and related event data to viewers over the Internet. *See, e.g.*, Ellis ¶ 45 ("Content source 130 and supplemental content source 120 may be configured to transmit signals to user equipment 102 over any suitable communications paths" which "may be transmitted as a broadcast, multicast, unicast, or any other suitable transmission stream."); Herzog ¶ 3 (disclosing "a capability of receiving multiple sources of live information that are related to each other" such as "video that is streamed live from the Internet" and to "simultaneously view other information, such as meta-data, that provides additional information related to" the video); Houle ¶ 21 ("client computing device may request information from a remote server communicatively coupled to the client computing device via a network such as the Internet"), ¶ 22 ("In some implementations, the data streams may relate to video game data. For example, one of the data streams may include video data showing gameplay for the video game. The second data stream may include metadata related to the video game. In some

implementations, the metadata may relate to the positions of players or other objects within the video game."). Ellis, Herzog, and Houle each indicate that multiple users may view one or more different live events and receive related event information, and disclose various systems for transmitting such information, but do not disclose the underlying details of the transmission mechanism for receiving video and data. *See, e.g.*, Ellis ¶ 45 (signals from content source for video and supplemental content source for event information "may be transmitted as a broadcast, multicast, unicast, or any other suitable transmission stream"), ¶ 74 (such content may be "delivered on a particular network address (e.g., multicast address) on which an IP socket is currently joined"); Herzog ¶¶ 45–46 (disclosing "multiple video/audio streams" from "different imaging sources"), ¶ 49 ("The solutions integrator 44 publishes the video imagery, related audio and meta-data that are received from the content provider 42 onto the content delivery network 47 for presentation to users/consumers of the content."); Houle ¶ 43 ("Referring again to FIG. 1, the spectator client devices 150 may receive a video stream from the live streaming system 140, and may receive a metadata stream from the data streaming engine 139…. In some implementations, the spectator client devices 150 also may be receive additional data streams from the data streaming engine 139 (e.g., a third data stream, a fourth data stream, a fifth data stream, a sixth data stream, a seventh data stream, etc.), and some or all of the data streams may be interrelated to one another over time."). In view of this, a POSITA would have looked to complementary disclosures in other prior art references to supply the details of backend systems for transmitting video and event data to multiple users. For example, a POSITA would have looked to Spivey to provide an "apparatus to broadcast live event data in real-time" including a "subscription component … to receive a topic entry from a message queue server, and to push the topic entry to a subscribed client device substantially simultaneously with the message queue server receiving

the topic entry from a live data source." Spivey at Abstract. Similarly, a POSITA would have looked to Mitic to provide a "media server" through which "live media can be pushed to the client using a persistent socket connection over HTTP" (referred to in Mitic as a "websocket connection") in order to "reduce end-to-end delay." Mitic ¶¶ 6–7. Likewise, a POSITA would have looked to Bota to provide "overlay distribution components" to "publish a set of overlay streams in real time via a second channel" in the form of "overlay messages that correspond to the events of the live video stream presented in the first channel, in which the set of overlay messages enhance the user viewing of the live video stream of events occurring in real time." Bota at 1:47–63. Moreover, a POSITA would have looked to Dengler to supply a live event management system that aggregates event information and synchronizes it "with a corresponding video stream." Dengler at 10:21–35; *see also id.* at 8:12–26. A POSITA would have also looked to Ma to supply a live streaming system that transports live video for multiple concurrent live events from the encoding process via a CDN to multiple users. Ma ¶¶ 30–43, 54. Similarly, a POSITA would have looked to Mukherjee to provide a CDN to "provide live streaming content" to users via an "origin server" and a series of "edge servers." Mukherjee ¶¶ 28–31. A POSITA would have also looked to Mandyam to provide a "livecasting engine" for delivering real-time sports scores in separate streams for each sports match, with each stream having separate "channels" for videos and scores, among other information. Mandyam at 25:62–26:10. A POSITA would have further looked to the "block diagram of exemplary components of a metadata server" for generating and transmitting real-time metadata to client devices. Basso at 4:30–32, 4:64–5:3, Fig. 2. A POSITA would have looked to Levinson's server that "simultaneously transmits videos from multiple sender devices to requesting recipient devices and other designated recipient devices." Levinson at Abstract. A POSITA would have looked to Abulikemu's "central server 100," which "can offer

live streaming of the event as captured by the plurality of cameras including the broadcasting system's cameras 102 and the viewers' cameras 104. The central server can also offer different live commentaries by one or more of the official commentators, independent commentators, and/or viewers. The central server can provide the different views and commentaries via a network (e.g., internet or satellite network) to a viewer's device (e.g., viewer device 108, 110, and/or 112) and allow the viewer to select the view(s) and/or commentaries to watch/listen." Abulikemu ¶ 13. A POSITA would have looked to Grubbs's "methods and systems wherein users may create and broadcast live streaming video, which may be embedded with other digital content streams, over a network through use of multiple communicating servers interconnected and be able to edit and composite such live streaming video and other digital content streams simultaneous to their broadcast over a network and to multiple viewers on multiple platforms." Grubbs ¶ 35. A POSITA would have looked to Perlman's hosting service center, which is configured to "broadcast[] the twitch action video game or real-time application in one or more streams of real-time compressed digital video … to one or more viewing client devices over the Internet." Perlman at Abstract. A POSITA would have also looked to Good '534's "media server" enabled by "wired and/or wireless [network] interfaces . . . to communicate data via a network, such as the Internet." Good '534 ¶ 17. A POSITA would have further looked to Lemmons' "media server," which "is configured to send and receive data from various other devices (e.g., via a network, such as a local area network (LAN) or the Internet)." Lemmons ¶ 10. A POSITA would have looked to Good '113's Media Servers for its discussion of dynamic overlays and distribution network. Good '113 at 9:57–10:16 ("When, enabled this option may cause the media server to periodically check for updates to the overlay image. The time period for checking for updates may be programmable by a user or may be fixed (e.g., 750 milliseconds). For example, the "Check For Updates" option for the scoreboard

overlay is enabled. As data for the scoreboard changes (e.g., the current score changes), an updated image for the scoreboard may be pushed to the storage location identified by the image path for the scoreboard. By checking for updates to the scoreboard image, up-to-date scoreboard information may be inserted into the rendition 310."). *See also* Good '780 at 10:14–25. Likewise, a POSITA would have looked to Apple HLS for its description of a "server component" for "encoding" input streams into digital formats, "encapsulating them in a format suitable for delivery, and preparing the encapsulated media for distribution" and a "distribution component" consisting of "standard web servers" that "accept[] client requests and deliver[] prepared media and associated resources to the client." Apple HLS, HTTP Live Streaming Overview at 4. Further, a POSITA would have looked to Kaazing for its WebSockets, given that "[i]f you have an existing protocol, you can simply replace TCP packets directly with WebSocket frames." Kaazing Real-Time Data at 3. Also, a POSITA would have looked to Wowza's customizable Media Server for content distribution and video stream editing functions. Wowza at WOWZA00077–78 ("Wowza Transcoder is a real-time video transcoding and transrating solution that provides the ability to ingest a live stream, decode the video and audio, and then re-encode the stream for delivery to desired playback devices. … You can apply static GIF, JPEG, PNG, and BMP overlay images to streams and customize the location, size, alignment, and opacity of the image to achieve stationary image effects such as a watermark to your video."). A POSITA would have looked to Kedenburg for the ability to merge live content streams. *See* Kedenburg ¶ 7 ("[T]he systems, methods, and non-transitory computer readable media are configured to cause the live content stream broadcast to be merged with a different live content stream being broadcasted using a computing device of the user, wherein the viewers accessing the live content stream are shown the merged live content stream."); A POSITA would have looked to Yang's CDN for content distribution. *See* Yang at

7:32–36 ("A CDN 204 may include a large distributed system of proxy servers deployed in one or more datacenters via the Internet," which "may be used to provide and serve content, such as multimedia content, to end–users with a viewer device."). A POSITA would have looked to Mate's ability to combine media into a single stream to provide to users. *See* Mate at 4 ("Real time audio and video interaction feed may be created by sending the locally captured interaction media from a mobile to a central node (the videoconference server) which combines them into a single video stream which is then sent back to each of the clients"). A POSITA would have looked to Hesselman for its ability to support multi-user sessions and synchronize content. *See* Hesselman at 57 ("The novelty of the iNEM4U session management enablers is that they support multi-user sessions across domains, support synchronization of media streams across technology domains, and provide the ability to record and replay sessions."). Accordingly, a system including the interactive video and event information components of Ellis, Herzog, or Houle and the implementation details of one or more of Spivey, Mitic, Bota, Dengler, Ma, Mukherjee, Mandyam, Cromarty '751, Basso, Levinson, Grubbs, Abulikemu, Perlman, Good '534, Good '113, Good '780, Kedenburg, Yang, Mate, Hesselman, Apple HLS, Kaazing, and Wowza would have been an obvious combination of prior art elements according to known methods to yield predictable results.

Third, it would have been obvious to combine certain elements found in the prior art because doing so would have required that a POSITA merely to choose from a finite number of identified, predictable solutions, with a reasonable expectation of success. For example, Ellis, Herzog, and Houle each disclose mechanisms for transmitting video and related event information from a source system to one or more end users who may select among multiple different live event broadcasts. *See, e.g.*, Ellis ¶ 41 ("sports-related information is provided to user equipment 102 as a plurality of real-time data feeds" and "[e]ach data feed may be individually accessed or

subscribed to by user equipment"), ¶ 42 ("sports-related information may be … provided to content source 130 or directly to user equipment 120 over communications paths"); Herzog ¶ 49 ("The solutions integrator 44 publishes the video imagery, related audio and meta-data that are received from the content provider 42 onto the content delivery network 47 for presentation to users/consumers of the content."); Houle ¶ 43 ("the spectator client devices 150 may receive a video stream from the live streaming system 140, and may receive a metadata stream from the data streaming engine 139.… In some implementations, the spectator client devices 150 also may be receive additional data streams from the data streaming engine 139 (e.g., a third data stream, a fourth data stream, a fifth data stream, a sixth data stream, a seventh data stream, etc.), and some or all of the data streams may be interrelated to one another over time."). A POSITA would have looked to complementary disclosures in other prior art references that disclose identified and predictable solutions. For example, in order to implement Ellis's, Herzog's, or Houle's system, a POSITA would have had a reasonable expectation of success in using Spivey's system of "topic queues and open duplex communication connections" employing a "message queue server device" that may be implemented using "open source message broker software" to broadcast "data from a live event (e.g., news event, a gaming event, sporting event, etc.)" to multiple users "in real-time." Spivey ¶¶ 27, 58. Similarly, a POSITA would also have reasonably expected success in using the standards-based streaming mechanisms disclosed by Mitic, such as "MPEG-DASH" and "HTTP Live Streaming (HLS)." Mitic ¶ 37. Likewise, a POSITA would have had a reasonable expectation of success in employing Bota's "overlay distribution system" for "low latency, high availability unicasting based real time overlay distribution … to distribute overlay streams to a very large number of concurrent overlay recipients 204 (e.g., subscriber clients)" because it employs a predictable networking structure including "publishers," "distributor components" and

"subscribers." Bota at 5:53–6:3. Moreover, a POSITA would have reasonably expected to successfully implement the server-based live event management system of Dengler, which automatically synchronizes video and event data in real time. Dengler at 3:15–17. A POSITA would also have had a reasonable expectation of success in using Ma's system, based in part on well-known live streaming protocols such as RTMP, RTSP/RTP, and HTTP Live Streaming (HLS), to implement the live video distribution aspects of Ellis, Herzog, or Houle. Ma ¶ 65. Similarly, a POSITA would have reasonably expected success in using routine CDN topology of Mukherjee to implement video distribution aspects of Ellis, Herzog, or Houle. Mukherjee ¶¶ 29–31. A POSITA would have also expected to successfully implement Mandyam's livecasting engine in the context of Ellis, Herzog, or Houle because Mandyam's system uses "standard network protocols such as … Transmission Control Protocol/Internet Protocol (TCP/IP), and the like." Mandyam at 8:46–57. A POSITA would have also reasonably expected success in implementing Cromarty '751 because it discloses a "transcoding operation" whereby a client device "perform[s] scaling and cropping 1050 based on its own screen size," as a client device in Ellis, Herzog, and Houle would. Cromarty '751 at 3:23–31. Similarly, a POSITA would have had a reasonable expectation of success in implementing Basso because it discloses "continuously multicasting" metadata within an IP network, much like Ellis, Herzog, and Houle. A POSITA would have had a reasonable expectation of success in implementing Levinson's use of "SOCKETS, HTTP Uploads, RTP, RTSP, RTMP and/or MQTT" and any "other protocols for communication, transfer and receipt of data may also be used." Levinson at Abstract. A POSITA would have had a reasonable expectation of success in implementing Abulikemu's "central server 100," which "can offer live streaming of the event as captured by the plurality of cameras including the broadcasting system's cameras 102 and the viewers' cameras 104." Abulikemu ¶ 13. A

POSITA would have had a reasonable expectation of success in implementing Grubbs's "methods and systems wherein users may create and broadcast live streaming video, which may be embedded with other digital content streams, over a network through use of multiple communicating servers interconnected and be able to edit and composite such live streaming video and other digital content streams simultaneous to their broadcast over a network and to multiple viewers on multiple platforms." Grubbs ¶ 35. A POSITA would have had a reasonable expectation of success in implementing Perlman's hosting service center, which is configured to "broadcast[] the twitch action video game or real-time application in one or more streams of real-time compressed digital video … to one or more viewing client devices over the Internet." Perlman at Abstract. Further, in order to implement Ellis's, Herzog's, or Houle's system, a POSITA would have had a reasonable expectation of success in using Good '534's "origin media server" that "perform[s] stream processing (e.g., encoding or transcoding) and protocol-level functions . . . to generated output data to be provided to one or more media server," which ultimately publishes digital content to a "destination viewing device." Good '534 ¶ 35. Further, a POSITA would have had a reasonable expectation of success in implementing Lemmons' "media server" because, as with Ellis, Herzog, and Houle, the server "publishes a stream to multiple destinations [i.e., playback devices]" via "a network, such as a local area network (LAN) or the Internet." Lemmons ¶ 10. Similarly, Good '113 contemplates its system being used with contemporary streaming protocols. Good '113 at 3:14–27 ("The media server 150 may support communication (e.g., adaptive streaming and non-adaptive streaming) protocols including, but not limited to, hypertext transfer protocol (HTTP) live streaming (HLS), HTTP dynamic streaming (HDS), smooth streaming, and MPEG dynamic adaptive streaming over HTTP (MPEG-DASH) (also known as international organization for standardization (ISO)/international electrotechnical commission

(IEC) 23009-1). The media server 150 may also support real time messaging protocol (RTMP) (and variants thereof), real-time streaming protocol (RTSP), real-time transport protocol (RTP), and MPEG-2 transport stream (MPEG-TS). Additional audio formats, video formats, coder/decoders (CODECs), and/or protocols may also be supported."). *See also* Good '780 at 3:25–38. Likewise, a POSITA would have had a reasonable expectation of successfully implementing Apple's HTTP Streaming Architecture because it "uses HTTP," is "automatically supported by nearly all edge servers, media distributors, caching systems, routers, and firewalls," permits serving video "ordinary web server" without requiring special server software. Apple HLS, HTTP Live Streaming Overview at 2. Similarly, a POSITA would have had a reasonable expectation of successfully implementing Kaazing's WebSocket Gateway because it uses HTTP and enables clients to "implement [TCP/IP]-based protocols and have the same flexible client-server communications as if they were together on a LAN . . . using the same security models and ports as HTTP, ensuring maximum compatibility with the web." Kaazing Real-Time Data at 3. A POSITA would have had a reasonable expectation of success using any of Wowza's systems because they are compatible with most all streaming types, including those mentioned above. Wowza at WOWZA00071 ("The Streaming Engine can deliver content to many popular media players such as Adobe Flash Player; Microsoft Silverlight player; Apple iPhone, iPad, and iPod touch and Apple QuickTime player (version 10 or later); Android smartphones and tablets; and IPTV/OTT set-top boxes. Wowza Streaming Engine includes support for many streaming protocols including Adobe HTTP Dynamic Streaming (Adobe HDS), Apple HTTP Live Streaming (Apple HLS), Microsoft Smooth Streaming, MPEG-DASH streaming, MPEG-2 Transport Streams (MPEG-TS), Real Time Messaging Protocol (RTMP), Real Time Streaming Protocol (RTSP), and Real-time Transport Protocol (RTP)."). A POSITA would have had a reasonable

expectation of successfully implementing Kedenburg's architecture that provides live content streams to users after user selection. *See* Kedenburg ¶ 29 ("[T]he user may select an option to view a live content stream and, in response, the social networking system can send data corresponding to the live content stream to a computing device of the user."). Similarly, a POSITA would have had a reasonable expectation of successfully implementing Yang's server architecture utilizing HTTP, RTMP, RTSP, and MPEG-Transport Stream standard protocols. *See* Yang at 6:44–59. Similarly, a POSITA would have also reasonably expected success in using the standards-based streaming mechanisms disclosed by Mate, such as HTTP, SIP, and RTP. Mate at 5. A POSITA also would have had a reasonable expectation of success of implementing Hesselman's iNEM4U platform, which supports different communication protocols, such as HTTP, SIP, and RTSP. *See* Hesselman at 57. Therefore, augmenting the systems of Ellis, Herzog, or Houle to include the messaging or streaming protocols of one or more of Spivey, Mitic, Bota, Dengler, Ma, Mukherjee, Cromarty '751, Basso, Levinson, Grubbs, Abulikemu, Perlman, Good '534, Good '113, Good '780, Kedenburg, Yang, Mate, Hesselman, Apple HLS, Kaazing, and Wowza would have been obvious to try.

Fourth, combining certain elements disclosed in the prior art would have been obvious because doing so would have required only the simple substitution of one known element for another to obtain predictable results. For example, Ellis, Herzog, and Houle each disclose interchangeable hardware and software components to act as a source for event information to be transmitted to users. *See, e.g.*, Ellis ¶ 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.");

Herzog ¶ 60 (event-related meta-data may be provided by "any server, such as server 31, or server 33, or server 25 delivering data as shown in FIG. 1 in system 10"); Houle ¶ 70 ("some embodiments may provide multiple ones of any or each of those components and these components may be provided on either a standalone machine or, in some embodiments, on multiple machines in a distributed system."). Predictably, therefore, a POSITA could simply substitute portions of the systems of Ellis, Herzog, or Houle with those disclosed in other prior art references. For example, it would have been obvious to substitute any of the elements described above with any combination of the Live Data Access Server, Message Queue Server, and/or Live Data Source(s) of Spivey, which are similarly involved in transmitting live event data to users and may be configured in any manner. *See* Spivey ¶ 34 ("FIG. 1 illustrates a block diagram for a system 100 for broadcasting live data in real-time. … Although the system 100 shown in FIG. 1 has a limited number of elements in a certain topology, it may be appreciated that the system 100 may include more or fewer elements in alternate topologies as desired for a given implementation."). Likewise, a POSITA could predictably substitute the servers of Ellis, Herzog, or Houle with Mitic's media server, which is simply "a general HTTP server configured for adaptive streaming." Mitic ¶ 7. Similarly, it would have been obvious to substitute the servers of Ellis, Herzog, or Houle with the overlay distribution system of Bota, which can take the form of a "two-tier client server model or a multi-tier model" and include processes "localized on one computer and/or distributed between two or more computers." Bota at 13:1–5, 14:14–17. Moreover, a POSITA would have predictably been able to implement Dengler's live event management system in the context of Ellis, Herzog, or Houle because Dengler's system employes generic server hardware and software components. Dengler at 6:26–67. A POSITA would have also achieved predictable results by implementing Ma's scalable live streaming system to handle video transmission in Ellis, Herzog, or Houle

because it relies on well-understood components such as HTTP servers and RTSP/RTP servers. Ma ¶¶ 90–96. This is the same for Good '113's and '780's Media Servers and Wowza's Wowza Streaming Engine, while implementing receiving additional data from Spivey, Ellis, Herzog, and Houle's supplemental content sources. *See* Good '113 at 3:14–27; Good '780 at 3:25–38; Wowza at WOWZA00071. Likewise, a POSITA could predictably substitute one or more servers of Ellis, Herzog, or Houle with the CDN system of Mukherjee, at least because its edge servers are described as comprising ordinary hardware and processing components and interface with other devices "using any of a number of known communication methods," including well-known live streaming protocols such as "RTSP … or any other suitable live streaming application." Mukherjee ¶¶ 35, 82–84. A POSITA would have also found it predictable to substitute one or more servers in Ellis, Herzog, or Houle with Mandyam's livecasting engine, which relies on generic servers that leverage standard Internet technologies. Mandyam at 8:29–8:57, 11:8–29. A POSITA would have also predictably substituted the ERP server in Herzog or the MQS and LSDS in Ellis, or the streaming component in Houle with the "central broadcast node" in Cromarty '751, as they perform the same function: "coordinat[ing] the wireless transmission of audio, video, and data content to personal monitoring devices." Cromarty '751 at 2:30–32, Fig. 7. In the same vein, it would have been obvious to substitute the servers in Ellis, Herzog, and Houle with Basso's "content servers" and "metadata servers" that "provide multiple multimedia data streams" and stream "generate[d] metadata, including real-time metadata . . . relating to the multimedia data streams" to client devices. Basso at 3:20–24, 42–46, Fig. 1. 48. It also would have been obvious to substitute the "media server" in Good '534 for the origin server in Herzog (*i.e.*, the socket server), as the media server similarly "performs stream processing . . . to generate output data to be provided (e.g., 'pushed') to a CDN" and, ultimately, "viewing devices." Good '534 ¶ 40.

Likewise, it would have been obvious to substitute the "media server" in Lemmons for the socket server in Ellis, Herzog, and Houle because it also "communicate[s] with one or more playback devices 170 (e.g., devices that are configured to output a display of a stream of content)" using "a network, such as a local area network (LAN) or the Internet." Lemmons ¶ 10. Similarly, a POSITA would have obtained predictable results by implementing Apple's HLS architecture, which is based on IETF standards and uses ordinary web server software, to implement video distribution to multiple users as in Ellis, Herzog, or Houle. Apple HLS, HTTP Live Streaming Overview at 1–2. It also would have been obvious to substitute the "Second Screen Application" in Kaazing for the graphical user interface in Ellis, Herzog, and Houle, as Kaazing's Second Screen Application similarly ". . . provides a synchronized viewing experience between a primary screen . . . and a secondary screen . . . ." Kaazing Second Screen App 8-18-2013 at 1. Likewise, a POSITA would have predictably substituted one or more servers of Ellis, Herzog, or Houle with the content provider module of Kedenburg, which "can be implemented, in part or in whole, as software, hardware, or any combination thereof." Kedenburg ¶ 26. A POSITA would have also obtained predictable results by implementing Yang's live multimedia content service, to transmit live event streams to users. *See* Yang at 3:64–4:16, 4:35–52. Similarly, a POSITA would have predictably substituted one or more servers of Ellis, Herzog, or Houle with Mate's Interaction Server, which "creates a new media stream by combining the interaction media received from every client wishing to participate to the same virtual shared space with the TV content stream received from the Content Provider." *See* Mate at 3–4. A POSITA would have also obtained predictable results by implementing Hesselman's iNEM4U platform, which supports "multi-user sessions involving clients, content sources, and interactive value services from different

technology domains" using various communication protocols, like HTTP, SIP, and RTSP. *See* Hesselman at 56, 57.

Fifth, it would have been obvious to combine certain elements found in the prior art because doing so would have required only the use of known techniques to improve a known or similar devices, methods, or systems ready for improvement in the same way. For example, Ellis, Herzog, and Houle each disclose mechanisms for transmitting video and related event information from a source system to one or more end users who may select among multiple different live event broadcasts. *See, e.g.*, Ellis ¶¶ 41–42; Herzog ¶¶ 3, 45–46, 49; Houle ¶¶ 24, 35, 38–43. A POSITA would have readily adapted techniques from other prior art references to improve upon the systems of Ellis, Herzog, and Houle. For example, it would have been obvious to adapt Spivey's methods of pushing live event data to multiple users from topic queues corresponding to live events (including sporting events) to either Ellis's, Herzog's, or Houle's systems of transmitting live event data to users, at least because Spivey's methods reduce the time delay of providing such data. *See, e.g.*, Spivey ¶ 96 ("[L]ive data access server 130 may push the data payload to client device 110, and to any other connected client devices that also requested that topic" and "the data payload of the topic entry may be pushed to the subscribed connected client devices substantially simultaneously with the message queue server receiving the topic entry from a live data source, e.g. with a time delay of 100 milliseconds or less."). Similarly, it would have been obvious to adapt Mitic's persistent bidirectional websocket session to the systems of either Ellis, Herzog, or Houle because doing so would have permited a "live media programming stream" to be "delivered to the client device substantially in real time … whereby undesirable characteristics such as delay and/or latency … are eliminated or reduced." Mitic ¶ 7. Likewise, it would have been obvious to adapt the overlay distribution system of Bota to Ellis's, Herzog's, or Houle's systems of

transmitting live event data to users, at least because Bota's system "supports a very large number of users, and has a high availability and low latency," thereby ensuring "the latency between the real event and overlays, and consequently between the live video stream and the overlay stream is kept substantially non-existent." Bota at 4:1–21. Moreover, it would have been obvious to implement Dengler's live event management system in the context of Ellis, Herzog, or Houle to permit the combined system to automatically synchronize video and event data in real time. Dengler at 3:15–17. A POSITA would have also been motivated to improve the systems of Ellis, Herzog, or Houle with Ma's scalable live streaming system because its techniques "deliver, in a scalable and cost-effective manner, live and time-shifted streaming of content over the Internet" to "a large number of endpoints." Ma ¶ 5. Similarly, it would have been obvious to incorporate the "group-write operation" at edge servers in a CDN as described by Mukherjee to improve the video transmission components of Ellis, Herzog, or Houle because, according to Mukherjee, doing so "eliminate[s] … redundant data processing" and achieves "an edge server efficiency of 80–90%" leading to "more live streaming data" that can be served to users and resulting in "reduced operating cost due to savings in hardware and maintenance." Mukherjee ¶¶ 12, 13, 63–67. It also would have been obvious to a POSITA that the systems of Ellis, Herzog, or Houle would be improved by implementing Mandyam's "livecasting engine," which allows "[m]ultiple end-users … to simultaneously consume" information include sports scores and live video in real time. Mandyam at 25:41–26:10. Similarly, it would have been obvious to adapt the data transmission systems in Ellis, Herzog, and Houle to steam multiple feeds to multiple devices simultaneously, as does the system in Cromarty '751. Cromarty '751 at 3:55–60 (disclosing transmitting "video, audio and auxiliary data" through "multiple feeds simultaneously" to mobile devices). It would also have been obvious to use Basso's "[v]arious methods . . . to synchronize the metadata within

metadata stream 380 with content carried in multimedia data streams" in the system of Ellis, Herzog, and Houle to deliver live event information synchronized with the video stream. Basso at 7:16–18. It would have been obvious to adapt Levinson's architecture so that the system "simultaneously transmits videos from multiple sender devices to requesting recipient devices and other designated recipient devices." Levinson at Abstract. It would have been obvious to adapt Abulikemu's "central server 100," which "can offer live streaming of the event as captured by the plurality of cameras including the broadcasting system's cameras 102 and the viewers' cameras 104. The central server can also offer different live commentaries by one or more of the official commentators, independent commentators, and/or viewers. The central server can provide the different views and commentaries via a network (e.g., internet or satellite network) to a viewer's device (e.g., viewer device 108, 110, and/or 112) and allow the viewer to select the view(s) and/or commentaries to watch/listen." Abulikemu ¶ 13. It would have been obvious to adapt Grubbs's "methods and systems wherein users may create and broadcast live streaming video, which may be embedded with other digital content streams, over a network through use of multiple communicating servers interconnected and be able to edit and composite such live streaming video and other digital content streams simultaneous to their broadcast over a network and to multiple viewers on multiple platforms." Grubbs ¶ 35. It would have been obvious to adapt Perlman's hosting service center, which is configured to "broadcast[] the twitch action video game or real-time application in one or more streams of real-time compressed digital video … to one or more viewing client devices over the Internet." Perlman at Abstract. It also would have been obvious to a POSITA that the systems of Ellis, Herzog, or Houle would be improved by implementing Good '534's "origin media server," which leverages a "packet generator/processor 208, a stream encoder 210, [and] a stream decoder 212" to "perform stream processing (e.g., encoding or

transcoding) and protocol-level functions with respect to the received BMS 230 to generate output data to be provided to one or more edge media server 240." Good '534 ¶ 35. Similarly, it would have been obvious to adapt the data transmission systems in Ellis, Herzog, and Houle to stream multiple feeds to multiple devices simultaneously, as does the system in Lemmons. Lemmons ¶ 4 ("When multiple streams being received by the media server match entries in the publishing map, the media server may publish each stream to multiple publishing destinations. The described techniques may therefore enable automatic push publication of multiple received streams to multiple publishing destinations at the same time."). It would have been obvious to adapt Good '113's scaling and encoding system into Ellis, Herzog, or Houle because doing so would have allowed the combined system to generate dynamic overlays specific to the live content the user is watching, e.g., football, and send a stream to "multiple destinations with destination specific overlays." Good '113 at 7:24–53, 9:57–10:16. *See also* Good '780 at 7:33–62, 9:66–10:25. It would have also been obvious to adapt Apple's HLS architecture including a CDN with edge servers for video distribution in Ellis, Herzog, or Houle because doing so would have allowed the combined system to support "multiple alternate streams at different bit rates" such that each client viewer could "switch streams intelligently as network bandwidth changes." Apple HLS, HTTP Live Streaming Overview at 1–2. Likewise, it would have been obvious to adapt the graphical user interfaces in Ellis, Herzog, and Houle with that in Kaazing's Second Screen Application, as it enables users to keep scores related "their bet[s] and wager[s]" on the "leaderboard," and further "demonstrates two-way real-time interaction: questions pushed to mobile devices, as well as viewers displayed on the leaderboard." Kaazing Second Screen App 8-18-2013 at 1. It would have been obvious to adapt Wowza's Streaming Engine including its transcoder functions and distribution system in Ellis, Herzog, or Houle because doing so would have allowed the combined

system to support "Load Balancing" and overlays such that more content could be delivered to more devices. Wowza at WOWZA00119, 00137, 00201–02. Similarly, it would have been obvious to adapt Kedenburg's content provider module "configured to provide access to various content items" and stream merge module in Ellis, Herzog, or Houle. *See* Kedenburg ¶¶ 25, 33. It also would have been obvious to adapt Yang's live multimedia content service in Ellis, Herzog, or Houle to "provide failover capabilities" and distribute live event video streams to viewers using unique identifiers. Yang at Abstract, 2:42–51. Additionally, it would have been obvious to adapt Mate's Interaction Server, which places high importance on real time processing and allows users to utilize a text chat while streaming. *See* Mate at 5. It would have been obvious to adapt Hesselman's iNEM4U sessions to the systems of either Ellis, Herzog, or Houle because they support multi-user interaction and synchronization of media streams. *See* Hesselman at 57–59 ("The iNEM4U platform also includes support for synchronizing the playout of a stream at different clients in different technology domains," and "timebounded delivery of the shared experience streams and events from one client to another is required so that the users can relate the comments, reactions and ideas of other users correctly with the primary stream.").

In addition, it would have been obvious for a POSITA to extend any of the prior art products identified above, including at least Betstream, Facebook Live, MLB At Bat, Kaazing, OneTwoSee, Wowza, YouTube Live, Twitch, Pusher, PubNub, RabbitMQ, Redis, ZeroMQ, CloudAMQP, Socket.io, and Red5 Pro based on the teachings of one or more of the prior art patents and publications identified above. To the extent any prior art product identified above does not satisfy a limitation, it would have been obvious for a POSITA to configure the prior art product in such a manner as disclosed by one or more of the prior art products and prior art patents and publications identified above and disclosed in Appendices A–C and E. As just one non-limiting

example, it would have been obvious for a POSITA to combine any system that supplied live video streams over the Internet from multiple broadcasters to multiple viewers (*e.g.*, Red5 Pro, Twitch, Wowza, or YouTube Live) with any system designed to transmit text information from publishers to subscribers (*e.g.*, PubNub, Pusher, RabbitMQ, CloudAMQP, Redis, Socket.IO, or ZeroMQ). Furthermore, it would have been obvious for a POSITA to take any of the foregoing systems (alone or in combination) that paired the transmission of live video with chat rooms corresponding to a live video stream and apply the same functionality to the use case of pairing the transmission of live video for a sporting event with the transmission of event information, including score updates. Genius Sports' investigation into the functioning and operation of prior art products and services, which is information uniquely in the possession of third parties, is ongoing. Accordingly, Genius Sports reserves the right to supplement its contentions based on information produced by such third parties in response to subpoenas.

C. Secondary Considerations

Notwithstanding the factors, motivations and exemplary combinations identified above, and notwithstanding the nascent stage of discovery in this case, Genius Sports contends that an analysis of secondary considerations further supports that each of the Asserted Claims is obvious.

PANDA contends secondary considerations support a finding of non-obviousness, PANDA's Supp. Responses to First Set of Interrogatories at 32–37, but PANDA fails to demonstrate that any nexus exists between such indicia and the claimed subject matter. PANDA claims its "patented technologies" include a "video-based social network targeting consumers (SportsCastr) and a B2B software solution designed for major enterprises, sports media, affiliates, and betting operators (PANDA Studio)." Dkt. 81 ¶ 14. But PANDA has not provided sufficient information to assess whether such products embody any Asserted Claims, whether such products

are commercially successful, and if so, whether their commercial success is tied to the patented features rather than other, unpatented aspects of the product.

Similarly, although PANDA claims to have received "numerous accolades and awards for its products and services" and claims that its "technology and platform have been featured in dozens of mainstream and trade publications and TV broadcasts," *id.* ¶ 15, PANDA has not provided any evidence of such accolades, awards, or coverage, nor of any nexus between such accolades, awards, or coverage and the claimed subject matter of the Asserted Patents. In the absence of such evidence, PANDA cannot establish a nexus between any alleged industry praise and the claimed invention. *See Robert Bosch, LLC v. Iancu*, 778 Fed. Appx. 871, 881 (Fed. Cir. 2019) (upholding PTAB's decision to give minimal weight to evidence of industry praise because patent owner provided "no description of these awards, copies of them, or persuasive evidence as to what these awards were for and how specifically they relate to the claimed invention.").

To the extent PANDA alleges that any long felt but unresolved needs, failure of others, teaching away from the claimed subject matter by the prior art, recognition of a problem in the prior art, or skepticism of experts supports a finding of non-obviousness (PANDA cites no evidence), numerous prior art patents, publications, and products described above demonstrate that technology for the synchronization of live streaming video with related event information was widely available long before the earliest priority date of the Asserted Patents, further supporting the obviousness of PANDA's claimed inventions. "Independently made, simultaneous inventions, made within a comparatively short space of time, are persuasive evidence that the claimed apparatus was the product only of ordinary mechanical or engineering skill." *George M. Martin Co. v. Alliance Mach. Sys. Int'l LLC*, 618 F.3d 1294, 1305 (Fed. Cir. 2010).

PANDA's claims of copying by others are also insufficient to overcome the overwhelming evidence of obviousness. PANDA has not established copying, let alone a nexus between the allegedly copying products and the claimed invention. Genius Sports reserves the right to supplement its contentions regarding secondary considerations as discovery progresses.

V. INDEFINITENESS, INSUFFICIENT WRITTEN DESCRIPTION, AND LACK OF ENABLEMENT

Pursuant to Patent Rule 3-3(d), Genius Sports contends that one or more Asserted Claims fail to satisfy the enablement, definiteness, and/or written description requirements of 35 U.S.C. § 112 for the reasons described below. The claims and limitations identified herein are not intended to be exhaustive, but instead illustrate examples of the various ways in which the Asserted Claims are indefinite, lack sufficient written description, or are not enabled. Genius Sports has relied upon PANDA's apparent interpretation of the claims as evidenced, for example, by the Complaint and PANDA's Second Supplemental Infringement Contentions. Genius Sports reserves the right to supplement its contentions regarding the failure of the Asserted Claims to comply with one or more provisions of 35 U.S.C. § 112 based on additional information obtained during discovery as the case progresses, including any express or implied changes in PANDA's infringement contentions and/or its interpretation of the Asserted Claims.

A. Socket Server/Event Socket

The common specification of the Asserted Patents does not contain an enabling description of the claimed "socket server," nor does the specification contain a written description sufficient to show that the inventors were in possession of a "socket server" having the functionality recited in the Asserted Claims. *See, e.g.*, '687 Patent, claims 1, 2, 4, 5, 7, 9, 19–25; '697 Patent, claims 1, 2, 4–6, 9, 19–25; '218 Patent, claims 1, 3, 4, 7, 10, 12, 15, 16; '088 Patent, claims 1, 5, 8, 13, 18, 24, 29, and 30. In particular, the Asserted Claims require, among other things, the socket server

to have a "first event socket," "at least one first event socket," "first socket," or "socket," and in certain claims "at least one second event socket." *Id.* The claims require, among other things, certain information to be transmitted "between" an event socket of the socket server to a viewer client device. *E.g.*, '687 Patent, claim 1. The same event socket of the socket server transmits information both to a "first viewer client device of the first plurality of viewer devices" via "a first event information Internet communication channel," *e.g. id.*, as well as, in certain claims, a "first viewer client device of the second plurality of viewer devices" via a "second event information Internet communication channel," *e.g. id.*, claim 2.

However, to the extent that PANDA contends that the Asserted Patents claim a "novel socket server architecture … counter to the then-conventional understanding and use of sockets," Dkt. 81 ¶ 11, distinct from conventional systems for transmitting information to multiple users over the Internet, the common specification of the Asserted Patents does not provide written description sufficient to disclose such a novel socket server architecture or to demonstrate that the inventors were in possession of the full scope of the claimed subject matter, nor do the disclosures contain sufficient information to enable a POSITA to make and use the claimed invention without undue experimentation.

Instead, the Asserted Patents describe the socket server in only generic terms, stating that the one or more socket servers "facilitate communication, to one or more broadcaster client devices and one or more viewer client devices, of synchronized event information retrieved by the control server [] and associated with video-based commentary relating to a particular event" and that "one or more sockets of the socket server(s) dedicated to the particular event allow respective client devices to establish an event information channel with the socket server(s), such that the event information (e.g., in the form of 'event messages') is shared in a synchronized manner by all

broadcasters/viewers following the particular event." '687 Patent at 20:10–21.[6] The Asserted Patents do not define a "socket," "event socket," or "socket server," except to note that in "one aspect" the "connections between a given client device and a particular socket of a socket server are persistent authenticated connections." '687 Patent at 20:55–57. The Asserted Patents do not otherwise disclose any particular structure or describe any functionality regarding the operations of the socket server or event sockets.

Moreover, the Asserted Patents state that implementations described in the common specification "may be implemented using hardware, software or a combination thereof," and that "software code can be executed on any suitable processor or collection of processors, whether provided in a single computer or distributed among multiple computers." '687 Patent at 53:64–54:2; *see also id.* at 54:53–59 ("[I]t should be appreciated that according to one aspect, one or more computer programs that when executed perform methods of the present invention need not reside on a single computer or processor, but may be distributed in a modular fashion amongst a number of different computers or processors to implement various aspects of the present invention."). In particular, according to the Asserted Patents, the "various servers and other computing devices of the broadcast/viewing servers and memory storage devices shown for example in FIGS. 2 and 3, may comprise one or more processors, one or more memory devices or systems communicatively coupled to the one or more processors (e.g., to store software code and other data), and one or more communication interfaces communicatively coupled to the one or more processors[.]" '687 Patent at 55:16–25.

---

[6] Because the Asserted Patents share a common specification with respect to the subject matter addressed in this Section, citations herein to exemplary disclosures of one Asserted Patent should be understood to apply equally to the other Asserted Patents.

Accordingly, and to the extent that PANDA contends that the claimed socket server and event sockets or sockets are novel, unconventional, and/or distinct from the generic networking components described in the common specification of the Asserted Patents, such claims are not supported by the specification.

To the extent a POSITA would have appreciated that the claimed methods and systems can be used to transmit event information to multiple viewer client devices from one or more event sockets or sockets in a socket server, that appreciation could only have come from what was already disclosed in or obvious over the prior art, not from the written description of such capabilities in the Asserted Patents.

B. Means for Transmitting Event or Score Information to Viewer Client Devices

Claim 27 of the '687 Patent recites a "means for transmitting the first event information to at least the first viewer client device via a first event information communication channel that is different from the first video communication channel." Claim 27 of the '697 Patent similarly recites "means for transmitting the first score information to at least the first viewer client device via a first event information communication channel that is different from the first video communication channel." Genius Sports contends these limitations invoke 35 U.S.C. § 112(f) but the Asserted Patents fail to specify any corresponding structure in the specification, and such limitations are therefore indefinite as amounting to impermissible pure functional claiming.

PANDA apparently contends that the scope of the "means for transmitting" limitations are equivalent for the purposes of infringement to limitations reciting the transmission of event or score information between an event socket of a socket server and a viewer client device. *See, e.g.*, Second Supp. Infr. Cont., Ex. 1, at 855 (limitation 27C, citing to discussion of limitation 19C.2 without further analysis). PANDA also apparently contends that a socket server having multiple

event sockets according to the Asserted Claims was not a well-known structure to a POSITA. *See* Dkt. 81 ¶¶ 9–11.

However, as explained above, the Asserted Patents do not describe the structure, operation, or functionality of the socket server or event sockets in anything other than generic and functional terms. *See, e.g.*, '687 Patent 20:10–21 (socket server "facilitate[s] communication" and shares event information "in a synchronized manner"), 53:64–54:2 (system may be implemented "using hardware, software or a combination thereof" and the "software code can be executed on any suitable processor or collection of processors, whether provided in a single computer or distributed among multiple computers"), 54:53–59 (The "one or more computer programs that when executed perform methods of the present invention need not reside on a single computer or processor, but may be distributed in a modular fashion amongst a number of different computers or processors to implement various aspects of the present invention."), 55:16–25 (The "various servers and other computing devices of the broadcast/viewing servers and memory storage devices shown for example in FIGS. 2 and 3, may comprise one or more processors, one or more memory devices or systems communicatively coupled to the one or more processors (e.g., to store software code and other data), and one or more communication interfaces communicatively coupled to the one or more processors so as to implement the various specific and inventive functionality described herein.").

Claim 27 of the '687 Patent and Claim 27 of the '697 Patent, as well as the Asserted Claims depending from those claims, are invalid because there is no disclosed structure for the "means for transmitting" the information recited by the claims, which include functions that, according to the common specification of the Asserted Patents, may be implemented using any combination of hardware and software, including code "executed on any suitable processor" or collection of

processors in a single or distributed computer system, coupled to "one or more communication interfaces." '687 Patent at 53:64–54:2, 54:53–59, 55:16–25. However, merely reciting a generic computer or analogous term is insufficient without disclosing a corresponding procedural algorithm. The Asserted Patents do not disclose a procedural algorithm clearly linked to the claim functionality of the "means for transmitting," rendering those limitations indefinite.

C. Means for Providing the First Copy to the First Viewer Client Device

Claim 27 of the '697 Patent recites a "system for providing a first copy of a first broadcaster's live stream of digital content including first live sporting event video-based commentary from a first broadcaster client device to a first viewer client device" comprising, among other elements, "means for providing the first copy to the first viewer client device via a first video communication channel." Claim 27 of the '687 Patent similarly recites a "system for providing, to a first viewer client device, a first copy of a first live stream of digital content relating to a first live sporting event" comprising, among other elements, "means for providing the first copy to the first viewer client device via a first video communication channel." Genius Sports contends these limitations invoke 35 U.S.C. § 112(f) but the Asserted Patents fail to specify any corresponding structure in the specification, and such limitations are therefore indefinite as amounting to impermissible pure functional claiming.

Claim 27 of the '697 Patent and Claim 27 of the '687 Patent, as well as the Asserted Claims depending from those claims, are invalid because there is no disclosed structure for the "means for providing" recited by the claims, which include functions that, according to the common specification of the Asserted Patents, may be implemented using any combination of hardware and software, including code "executed on any suitable processor" or collection of processors in a single or distributed computer system, coupled to "one or more communication interfaces." '687 Patent at 53:64–54:2, 54:53–59, 55:16–25. However, merely reciting a generic computer or

analogous term is insufficient without disclosing a corresponding procedural algorithm. The Asserted Patents do not disclose a procedural algorithm clearly linked to the claim functionality of the "means for providing," rendering those limitations indefinite.

D. Means for Retrieving Event Information

Claim 27 of the '697 Patent recites a "system for providing a first copy of a first broadcaster's live stream of digital content including first live sporting event video-based commentary from a first broadcaster client device to a first viewer client device" comprising, among other elements, "means for periodically retrieving, via the Internet and from an event information provider, first event information germane to a first live sporting event." Claim 27 of the '687 Patent similarly recites a "system for providing, to a first viewer client device, a first copy of a first live stream of digital content relating to a first live sporting event" comprising, among other elements, "means for retrieving, via the Internet, first event information germane to a first live sporting event." Genius Sports contends these limitations invoke 35 U.S.C. § 112(f) but the Asserted Patents fail to specify any corresponding structure in the specification, and such limitations are therefore indefinite as amounting to impermissible pure functional claiming.

Claim 27 of the '697 Patent and Claim 27 of the '687 Patent, as well as the Asserted Claims depending from those claims, are invalid because there is no disclosed structure for the "means for retrieving" recited by the claims, which include functions that, according to the common specification of the Asserted Patents, may be implemented using any combination of hardware and software, including code "executed on any suitable processor" or collection of processors in a single or distributed computer system, coupled to "one or more communication interfaces." '687 Patent at 53:64–54:2, 54:53–59, 55:16–25. However, merely reciting a generic computer or analogous term is insufficient without disclosing a corresponding procedural algorithm. The

Asserted Patents do not disclose a procedural algorithm clearly linked to the claim functionality of the "means for retrieving," rendering those limitations indefinite.

E. Means for Transmitting and Receiving Chat Information

Claim 28 of the '697 Patent recites a system comprising "means for transmitting and receiving first chat information regarding the first live sporting event video-based commentary included in the first broadcaster's live stream of digital content via at least one first chat/system event Internet communication channel that is different from the first video communication channel and the first event information communication channel." Claim 28 of the '687 Patent similarly recites a system comprising "means for transmitting and receiving first chat information regarding the first live sporting event via at least one first chat/system event Internet communication channel that is different from the first video communication channel and the first event information channel." Genius Sports contends these limitations invoke 35 U.S.C. § 112(f) but the Asserted Patents fail to specify any corresponding structure in the specification, and such limitations are therefore indefinite as amounting to impermissible pure functional claiming.

Claim 28 of the '697 Patent and Claim 28 of the '687 Patent are invalid because there is no disclosed structure for the "means for transmitting and receiving" recited by the claims, which include functions that, according to the common specification of the Asserted Patents, may be implemented using any combination of hardware and software, including code "executed on any suitable processor" or collection of processors in a single or distributed computer system, coupled to "one or more communication interfaces." '687 Patent at 53:64–54:2, 54:53–59, 55:16–25. However, merely reciting a generic computer or analogous term is insufficient without disclosing a corresponding procedural algorithm. The Asserted Patents do not disclose a procedural algorithm clearly linked to the claim functionality of the "means for transmitting and receiving," rendering those limitations indefinite.

F. Means for Updating

Claim 29 of the ’697 Patent recites the system of claim 27 wherein the “means for periodically retrieving” (addressed above) further includes “means for updating the first score information and queueing an asynchronous message including the updated first score information for transmission on the first event information communication channel.” Claim 29 of the ’687 Patent similarly recites the system of wherein the “means for retrieving” (also addressed above) further includes “means for updating the first event information and queueing an asynchronous message including the updated first event information for transmission on the first event information communication channel.” Genius Sports contends these limitations invoke 35 U.S.C. § 112(f) but the Asserted Patents fail to specify any corresponding structure in the specification, and such limitations are therefore indefinite as amounting to impermissible pure functional claiming.

Claim 29 of the ’697 Patent and Claim 29 of the ’687 Patent are invalid because there is no disclosed structure for the “means for updating” recited by the claims, which include functions that, according to the common specification of the Asserted Patents, may be implemented using any combination of hardware and software, including code “executed on any suitable processor” or collection of processors in a single or distributed computer system, coupled to “one or more communication interfaces.” ’687 Patent at 53:64–54:2, 54:53–59, 55:16–25. However, merely reciting a generic computer or analogous term is insufficient without disclosing a corresponding procedural algorithm. The Asserted Patents do not disclose a procedural algorithm clearly linked to the claim functionality of the “means for updating,” rendering those limitations indefinite.

G. Terms Lacking Antecedent Basis

The ’687 Patent at Claim 20 recites a “third video Internet communication channel between the plurality of media sources and the second viewer client device of the first plurality of viewer

client devices," a "fourth video Internet communication channel between the plurality of media sources and the second viewer client device of the second plurality of viewer client devices," a "third event information Internet communication channel between the at least one first event socket of the at least one socket server and the second viewer client device of the first plurality of viewer devices," and a "fourth event information Internet communication channel between the at least one second event socket of the at least one socket server and the second viewer client device of the second plurality of viewer devices." Claim 19, from which Claim 20 depends, recites only a "first Internet communication channel between the plurality of media sources and the first viewer client device of the first plurality of viewer client devices," a "second Internet communication channel between the plurality of media sources and the first viewer client device of the second plurality of viewer client devices," a "third Internet communication channel between at least one first event socket of the at least one socket server and the first viewer client device of the first plurality of viewer devices," and a "fourth Internet communication channel between at least one second event socket of the at least one socket server and the first viewer client device of the second plurality of viewer devices." Claim 19 does not recite any "video Internet communication channel[s]" or "event information Internet communication channel[s]," and therefore claim 20 lacks antecedent basis for those terms, rendering the claim indefinite.

The '687 Patent at Claim 22, which depends indirectly from Claim 19 via Claim 21, likewise recites a "third video Internet communication channel between the plurality of media sources and the second viewer client device of the first plurality of viewer client devices," a "fourth video Internet communication channel between the plurality of media sources and the second viewer client device of the second plurality of viewer client devices," a "third event information Internet communication channel between the at least one first event socket of the at least one socket

server and the second viewer client device of the first plurality of viewer devices," and a "fourth event information Internet communication channel between the at least one second event socket of the at least one socket server and the second viewer client device of the second plurality of viewer devices" without antecedent basis, rendering the claim indefinite for the same reasons.

The '697 Patent at Claim 20 recites a "third video Internet communication channel between the plurality of media sources and the second viewer client device of the first plurality of viewer client devices," a "fourth video Internet communication channel between the plurality of media sources and the second viewer client device of the second plurality of viewer client devices," a "third event information Internet communication channel between the at least one first event socket of the at least one socket server and the second viewer client device of the first plurality of viewer devices," and a "fourth event information Internet communication channel between the at least one second event socket of the at least one socket server and the second viewer client device of the second plurality of viewer devices." Claim 19, from which Claim 20 depends, recites only a "first Internet communication channel between the plurality of media sources and the first viewer client device of the first plurality of viewer client devices," a "second Internet communication channel between the plurality of media sources and the first viewer client device of the second plurality of viewer client devices," a "third Internet communication channel between at least one first event socket of the at least one socket server and the first viewer client device of the first plurality of viewer devices," and a "fourth Internet communication channel between at least one second event socket of the at least one socket server and the first viewer client device of the second plurality of viewer devices." Claim 19 does not recite any "video Internet communication channel[s]" or "event information Internet communication channel[s]," and therefore claim 20 lacks antecedent basis for those terms, rendering the claim indefinite.

The ’697 Patent at Claim 22, which depends indirectly from Claim 19 via Claim 21, likewise recites a “third video Internet communication channel between the plurality of media sources and the second viewer client device of the first plurality of viewer client devices,” a “fourth video Internet communication channel between the plurality of media sources and the second viewer client device of the second plurality of viewer client devices,” a “third event information Internet communication channel between the at least one first event socket of the at least one socket server and the second viewer client device of the first plurality of viewer devices,” and a “fourth event information Internet communication channel between the at least one second event socket of the at least one socket server and the second viewer client device of the second plurality of viewer devices” without antecedent basis, rendering the claim indefinite for the same reasons.

The ’088 Patent at Claim 13 recites “*the* at least one first display of *the* first client device,” but the only previously-discussed display recited in Claim 13 is located on the *second* client device. *See* ’088 Patent at Claim 13 (“a second client device that includes at least one first display”). Claim 13 thus lacks antecedent basis for this term, rendering the claim indefinite.

The ’088 Patent at Claim 24 recites “*the* at least one first display of *the* first client device,” but the only previously-discussed display recited in Claim 24 is located on the *second* client device. *See* ’088 Patent at Claim 24 (“a second client device that includes at least one first display”). Claim 24 thus lacks antecedent basis for this term, rendering the claim indefinite.

The ’687 Patent at Claim 22 recites “the first live sporting event video-based commentary” and “the second live sporting event video-based commentary.” There is a lack of antecedent basis for these terms. Claim 19, from which Claim 22 depends, recites “a first live stream of digital content relating to a first live sporting event” and “a second live stream of digital content relating

to a second live sporting event," thus making it unclear whether the live streams recited in Claim 19 require "video-based commentary." Thus, Claim 22 is indefinite.

The '218 Patent at Claim 22 recites "the first video communication channel." Although Claim 21, from which Claim 22 depends, recites first and second "communication channels," there is a lack of antecedent basis for "the first video communication channel," making it unclear whether "the first video communication channel" is referring to a previously recited communication channel or is reciting a different communication channel. Thus, Claim 22 is indefinite.

The '218 Patent at Claim 28 recites "the third video communication channel." Although Claims 27 and 21, from which Claim 28 depends, recite first, second, third, and fourth "communication channels," there is a lack of antecedent basis for "the third video communication channel," rendering Claim 28 indefinite.

The '218 Patent at Claim 18 recites "a first stream of digital content." However, Claim 16, from which Claim 18 depends, already recites "a first stream of digital content," making it unclear whether Claim 18 is reciting an additional stream of digital content or is just referring back to the first stream previously recited in Claim 16. Thus, Claim 18 and the claims dependent therefrom are invalid as being indefinite.

H. First Media Server Endpoint

The '088 Patent at Claim 31 requires that the third client device "connect[s] 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." Given that Claim 31 requires that the third client device connects to the *second* media server endpoint, it is unclear why the communication channel that is established by that connection would be at the *first* media server endpoint. It is further unclear why the communication channel allowing the

third client device to receive the first copy of the composite outgoing stream would be connected to the *first* media server endpoint, given that Claim 24, from which Claim 31 depends, recites that the *first* media server endpoint "provide[s] a first copy of the audio/video feed" while the *second* media server endpoint "provide[s] a first copy of the composite outgoing stream." Thus, Claim 31 is indefinite.

I. A Second Socket Address of the First Real-Time Information Socket

The '218 Patent at Claim 10 recites "a second socket address of the first real-time information socket." However, the claims do not recite a first socket address of the first real-time information socket, making it unclear whether the claims require a first socket address. Thus, Claim 10 and the claims depending therefrom are indefinite.

J. Wherein in A), the Second Instructions

The '218 Patent at Claim 29 recites "[t]he method of claim 28, wherein in A), the second instructions…." However, Claim 28 does not recite step "A)," and "second instructions" are only recited in step "B)," thus rendering Claim 29 indefinite.

K. Limitations Requiring Synchronization

Several Asserted Claims of the '218 and '088 Patents require synchronization of information transmitted to viewer client devices. *See* '218 Patent, Claims 4 ("the online gaming information is ***shared in a synchronized manner*** by the first viewer client device and the second viewer client device"), 6 (the control server is a "single point of entry for the system to obtain the first event information including the online gaming information ***to reduce synchronization errors*** between the first viewer client device and the second viewer client device"), 7 (the socket server "transmits the changes in the online gaming information to the first viewer client device and the second viewer client device via the first event socket ***to provide a single synchronized update and mitigate client-by-client latency and/or synchronization issues***"); '088 Patent, Claims 1, 8 ("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***").

However, sharing information "in a synchronized manner," "reduc[ing] synchronization errors" between devices, providing a "synchronized update," and "mitigat[ing] client-by-client latency and/or synchronization issues" are indefinite terms that do not inform a POSITA of their scope with reasonable certainty. In particular, each of the foregoing are terms of degree with no clear baseline provided by the claims or specification. The specification does not provide any boundaries for the degree of synchronization required, or the amount of reduction or mitigation of synchronization errors or issues necessary, to fall within the scope of the claims. The specification also fails to identify any parameters for acceptable latency mitigation in the context of transmitting online gaming information or event information. Rather, the specification's only disclosures of numerical values for latency are provided in the context of streaming live video, not event information. *See, e.g.*, '218 Patent at 26:25–36 (describing RTMP CDN servers that "introduce appreciably low latency (e.g., on the order of less than 150 milliseconds)," "appreciably low latency introduced by the media servers and RTMP CDN (e.g., on the order of about 500 milliseconds or even less)," and "client-introduced digital content latency (e.g., on the order of about one-to-two seconds for continuous streaming consumers)"); '088 Patent at 25:56–67 (same); '218 Patent at 40:31–34 ("significantly reduced HLS latency of approximately 8 to 12 seconds"); '088 Patent at 40:18–21 (same). Moreover, the latency figures provided as examples in the specification span orders of magnitude (from hundreds of milliseconds to tens of seconds) and are not provided any upper or lower bound. *See, e.g.*, '218 Patent at 26:25–36, 40:31–34; '088 Patent at 25:56–67, 40:18–21.

Accordingly, a POSITA would not be able to ascertain with reasonable certainty the degree of synchronization or latency, in either absolute or relative terms, required in order to practice the claims, rendering them indefinite.

VI. INELIGIBLE SUBJECT MATTER

Pursuant to the Court's Standing Order Regarding Subject-Matter Eligibility Contentions, Genius Sports contends that the Asserted Claims do not qualify as patent-eligible subject matter for the reasons explained in the charts attached hereto as Appendix D.

VII. DOCUMENT PRODUCTION

Pursuant to Patent Rule 3-4(a), Genius Sports has produced and/or made available for inspection source code, specifications, schematics, flow charts, artwork, formulas, or other documentation sufficient to show the operation of any aspects or elements of the products PANDA has accused of infringing the Asserted Patents, to the extent such information is in Genius Sports' possession, custody, or control and could be located after a reasonable search. Genius Sports' production of technical documentation may be found at the documents bearing production numbers GS_00000001–GS_00000240, GS_00001024–GS_00001273, GS_00003672–GS_00005076, GS_00006595–GS_00009613, and GS_00015290–GS_00017304. Genius Sports' source code has been made available for inspection pursuant to the terms of the Stipulated Protective Order (Dkt. 94).

Pursuant to Patent Rule 3-4(b), Genius Sports produced a copy of each item of prior art identified in its Initial Invalidity Contentions (3/14/2024), First Supplemental Invalidity Contentions (7/29/2024), and Second Supplemental Invalidity Contentions (12/9/2024). Genius Sports' production of this prior art may be found at the documents bearing production numbers GS_00000241–GS_00001023, GS_00001274–GS_00003671, GS_00009651–GS00013192, GS_00021220– GS_00024285.

Date: December 9, 2024

/s/ Jeanne M. Heffernan

Jeanne M. Heffernan
TBN 24128395
James John Lomeo
TBN 24118993
KIRKLAND & ELLIS LLP
401 Congress Avenue
Austin, TX 78701
(512) 678-9100
jheffernan@kirkland.com
james.lomeo@kirkland.com

Joshua L. Simmons (admitted *pro hac vice*)
KIRKLAND & ELLIS LLP
601 Lexington Avenue
New York, NY 10022
(212) 446-4800
joshua.simmons@kirkland.com

Patrick Arnett (admitted *pro hac vice*)
KIRKLAND & ELLIS LLP
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
(202) 389-5000
patrick.arnett@kirkland.com

Attorneys for Defendants Genius Sports Ltd., Genius Sports Media Ltd., Genius Sports Technologies Ltd., Genius Sports UK Ltd., Genius Sports Holdings Ltd., Genius Sports Group Ltd., Maven Topco Ltd., Maven Midco Ltd., Maven Debtco Ltd., and Maven Bidco Ltd.

CERTIFICATE OF SERVICE

I, Jeanne M. Heffernan, hereby certify that on December 9, 2024, this document was served on the persons listed below in the manner indicated:

BY EMAIL

Christopher C. Campbell (#444262 DC)
ccampbell@kslaw.com
KING & SPALDING LLP
1700 Pennsylvania Avenue, NW
Suite 200
Washington, DC 20006
(202) 626-5578

Matthew D. Wood (#24110548)
mwood@kslaw.com
KING & SPALDING LLP
500 West 2nd Street
Suite 1800
Austin, TX 78701
(512) 457-2000

Counsel for Plaintiff

/s/ Jeanne M. Heffernan
Jeanne M. Heffernan
TBN 24128395
James John Lomeo
TBN 24118993
KIRKLAND & ELLIS LLP
401 Congress Avenue
Austin, TX 78701
(512) 678-9100
jheffernan@kirkland.com
james.lomeo@kirkland.com

Joshua L. Simmons (admitted *pro hac vice*)
KIRKLAND & ELLIS LLP
601 Lexington Avenue
New York, NY 10022
(212) 446-4800
joshua.simmons@kirkland.com

Patrick Arnett (admitted *pro hac vice*)
KIRKLAND & ELLIS LLP
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
(202) 389-5000
patrick.arnett@kirkland.com

Attorneys for Defendants Genius Sports Ltd., Genius Sports Media Ltd., Genius Sports Technologies Ltd., Genius Sports UK Ltd., Genius Sports Holdings Ltd., Genius Sports Group Ltd., Maven Topco Ltd., Maven Midco Ltd., Maven Debtco Ltd., and Maven Bidco Ltd.