

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

WITHROW NETWORKS INC.,
Patent Owner.

IPR2025-00775
Patent 10,771,849 B2

Before MICHAEL R. ZECHER, JUSTIN T. ARBES, and
MARY C. HOFFMAN, *Administrative Patent Judges*.

ARBES, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Petitioner, Google LLC, filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–9 of U.S. Patent No. 10,771,849 B2 (Ex. 1001, “the ’849 patent”) pursuant to 35 U.S.C. § 311(a).

On September 29, 2025, the Board instituted an *inter partes* review as to all challenged claims on all grounds of unpatentability asserted in the Petition. Paper 12 (“Decision on Institution” or “Dec. on Inst.”). Patent Owner, Withrow Networks Inc., filed a Patent Owner Response (Paper 27, “PO Resp.”), Petitioner filed a Reply (Paper 34, “Reply”), and Patent Owner filed a Sur-Reply (Paper 39, “Sur-Reply”). An oral hearing was held on July 13, 2026, and a transcript of the hearing is included in the record (Paper 48, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–9 of the ’849 patent are unpatentable.

B. Related Matters

The parties indicate that the ’849 patent is the subject of *Withrow Networks Inc. v. Google LLC*, No. 5:24-cv-03203-PCP (N.D. Cal.) (“the district court case”), which has been stayed pending resolution of this proceeding. *See* Pet. 1; Paper 44, 2; Ex. 2002 (Order denying motion to dismiss under 35 U.S.C. § 101).

C. The ’849 Patent

The ’849 patent, titled “Multimedia System for Mobile Client Platforms,” issued on September 8, 2020, from U.S. Patent Application No. 16/181,285, filed on November 5, 2018. Ex. 1001, codes (21), (22), (45), (54). The ’849 patent is a continuation of U.S. Patent Application No. 15/016,821, filed on February 5, 2016, and issued as U.S. Patent No. 10,171,873 B2 (“the ’873 patent”). *Id.* at code (63). The ’873 patent is

a continuation of U.S. Patent Application No. 11/107,952, filed on April 18, 2005, which was abandoned. *Id.*

The '849 patent generally relates to “issues of the wireless Internet, specifically to methods of multimedia transmission and playback for mobile clients.” Ex. 1001, 1:6–8. The '849 patent states that “[v]ideo and audio playback exist on certain cell phone handsets,” but current ways of “distributing multimedia data over the wireless Internet to mobile clients [were] constrained by existing wireless bandwidth, and the real-time decoding, processing and displaying of multimedia content with limited hardware capabilities.” *Id.* at 1:12–17, 1:21–22.

The '849 patent purports to address this need by efficiently creating transmittable multimedia objects and optimizations for digital video decoding. Ex. 1001, 2:64–65, 4:7–8. Figure 1, reproduced below, illustrates a distributed network for multimedia-on-demand. *Id.* at 4:61–5:7.

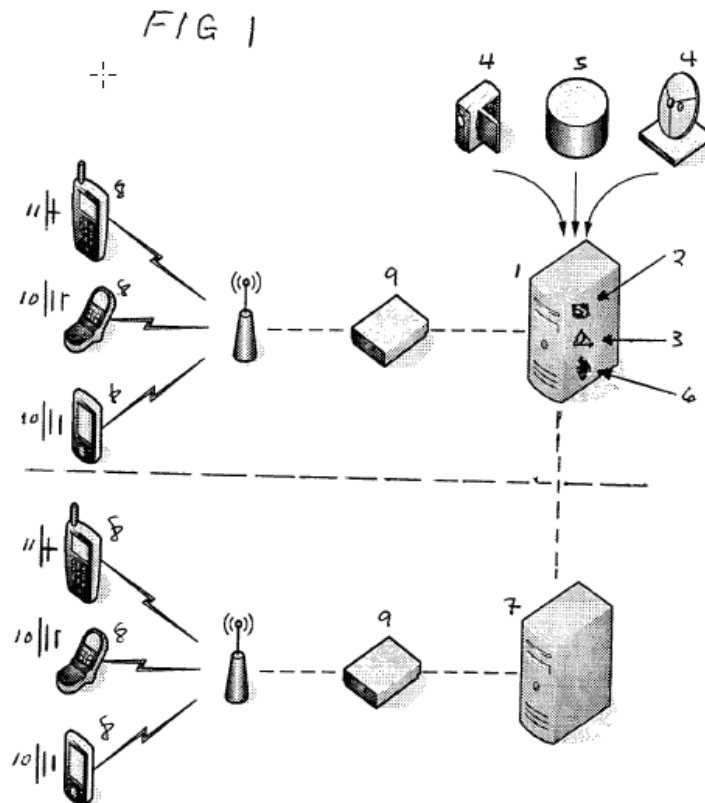


Figure 1 illustrates centralized content server system 1 that utilizes transcoder 2 to parse received audio and video content, which multimedia object creator 3 uses to create multimedia objects from live broadcast 4. *Id.* at 6:18–22, 8:58–60. Centralized content server system 1 also is capable of transcoding and creating multimedia objects from archived multimedia files 5. *Id.* at 6:18–22.

D. Illustrative Claim

Claims 1, 6, and 7 of the '849 patent are independent. Ex. 1001, 19:19–39, 20:1–44. Claims 2–5, 8, and 9 depend from claim 1. *Id.* at 19:40–57, 20:45–56. Claim 1 recites (with letter designations used in the Petition to refer to the various limitations):

1. A method comprising:

[a.i] receiving audio and video segments encoded in a digital encoding format and with an encoding rate; [a.ii] wherein, said audio and video segments are associated with object parameters and supplied host path identification to form multimedia objects;

[b.i] requesting by a multimedia player, transmission of said multimedia objects; [b.ii] wherein said multimedia objects are located using http and received by said multimedia player from servers using a wireless connection;

[c.i] playing back received multimedia objects by the multimedia player; [c.ii] wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, [c.iii] autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by

[c.iv] utilizing optimized decoding processes to maintain quality playback.

E. Evidence of Record

The challenges to patentability in the instant *inter partes* review are based on the following prior art:

U.S. Patent No. 6,389,473 B1, filed Mar. 24, 1999, issued May 14, 2002 (Ex. 1003, “Carmel”);

U.S. Patent No. 7,096,481 B1, filed Mar. 31, 2000, issued Aug. 22, 2006 (Ex. 1016, “Forecast”);

U.S. Patent No. 7,099,389 B1, filed Dec. 10, 2002, issued Aug. 29, 2006 (Ex. 1061, “Yu”);

U.S. Patent No. 7,398,312 B1, filed Mar. 29, 2000, issued July 8, 2008 (Ex. 1051, “Guo”);

Shih-Hao Wang *et al.*, *A Platform-Based MPEG-4 Advanced Video Coding (AVC) Decoder With Block Level Pipelining*, Proceedings of the 2003 Joint Conference of the Fourth International Conference on Information, Communications & Signal Processing and Fourth Pacific-Rim Conference on Multimedia, vol. 1, pp. 51–55 (2003) (Ex. 1007, “Wang”);

Martin Wolters *et al.*, *A Closer Look Into MPEG-4 High Efficiency AAC*, Audio Engineering Society (AES), 115th AES Convention, Convention Paper 5871, pp. 1–16 (2003) (Ex. 1041, “Wolters”); and

Marco Mattavelli & Sylvain Brunetton, *Computational Graceful Degradation for Video Decoding*, Signal Processing IX: Theories and Applications, Proceedings of Eusipco-98 Ninth European Signal Processing Conference, vol. IV, pp. 2309–2312 (1998) (Ex. 1004, “Mattavelli”).

Petitioner filed a declaration from Nathaniel Polish, Ph.D. (Ex. 1002) with its Petition. Patent Owner filed a declaration from Matthew Goldman (Ex. 2014) with its Response. Also submitted as evidence are transcripts of depositions of Dr. Polish (Ex. 2015) and Mr. Goldman (Ex. 1085), as well as

a transcript of a deposition of Mr. Goldman in the district court case (Ex. 1080) and a declaration from Mr. Goldman in an *ex parte* reexamination (Control No. 90/019,622) unrelated to the '849 patent (Ex. 1081).

F. Asserted Grounds

Petitioner asserts that claims 1–9 of the '849 patent would have been obvious on the basis of prior art patents and printed publications under 35 U.S.C. § 103(a):¹

Claims Challenged	35 U.S.C. §	References/Basis
1–9	103(a)	Carmel, Mattavelli
1–9	103(a)	Carmel, Wang
1–9	103(a)	Carmel, Wang, Wolters
1–9	103(a)	Carmel, Wang, Wolters, Guo, Yu, Forecast
1–9	103(a)	Carmel, Mattavelli, Guo, Yu, Forecast

II. ANALYSIS

A. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art for a challenged patent, we look to “1) the types of problems encountered in the art; 2) the

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Because the challenged claims of the '849 patent have an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103. *See* Ex. 1001, codes (22), (63).

prior art solutions to those problems; 3) the rapidity with which innovations are made; 4) the sophistication of the technology; and 5) the educational level of active workers in the field.” *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 666–67 (Fed. Cir. 2000). “Not all such factors may be present in every case, and one or more of them may predominate.” *Id.* at 667.

Petitioner argues that at the relevant time of the invention claimed in the ’849 patent (April 2005),² a person of ordinary skill in the art would have had “at least a bachelor’s degree in computer science, computer engineering, electrical engineering, or an equivalent field requiring learning computation principles, and two years of work experience in networking or streaming media systems, particularly audio and video, over the Internet,” where “[a]dditional education could compensate for less practical experience and vice versa.” Pet. 5–6 (citing Ex. 1002 ¶¶ 18–23). In the Decision on Institution, the Board agreed with and applied Petitioner’s proposed definition. Dec. on Inst. 9–11. Patent Owner proposes a very similar definition of “a bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and two to three years of experience in the design or development of (1) video processing systems, audio processing systems, and/or the equivalent; and (2) networking and communications systems, or the equivalent,” where “[a]dditional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” PO Resp. 23

² Petitioner states that it “uses [the earliest possible priority date of April 18, 2005] as the priority date of the challenged claims.” Pet. 6. Patent Owner agrees that the “earliest effective filing date” of the challenged claims is April 18, 2005. PO Resp. 19. The ’849 patent is expired. *See* Ex. 1001, codes (63), (*); Paper 8, 33.

(citing Ex. 2014 ¶ 61). Patent Owner states, however, that “the analysis would be the same under either level” of ordinary skill in the art. *Id.*

Based on the full record developed during trial, including our review of the ’849 patent and the types of problems and solutions described in the ’849 patent and cited prior art, we maintain the previously adopted definition of the level of ordinary skill in the art, but remove the term “at least” to avoid unnecessary ambiguity. Our analysis herein, however, would be the same under either party’s proposed definition.

B. Claim Interpretation

We interpret the claims of the challenged patent

using the same claim construction standard that would be used to construe the [claims] in a civil action under 35 U.S.C. [§] 282(b), including construing the [claims] in accordance with the ordinary and customary meaning of such [claims] as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Petitioner states in the Petition that it “does not presently contend that any term requires express construction.” Pet. 6. Patent Owner “does not believe any terms of the ’849 [p]atent require express constructions for purposes of” this proceeding. PO Resp. 24; Sur-Reply 11. The Board did not interpret any terms in the Decision on Institution. Dec. on Inst. 8. We agree that no terms require express interpretation to determine whether Petitioner has met its burden to prove unpatentability of the challenged claims. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“Because we need only construe terms ‘that are in controversy, and *only to the extent necessary* to resolve the controversy,’ we need not construe

[a particular claim limitation] where the construction is not ‘material to the . . . dispute.’” (emphasis added) (citation omitted)).

We note two points, however. First, both parties accuse the other of taking inconsistent positions on claim interpretation in this proceeding and the district court case. Patent Owner argues that Petitioner proposed various claim interpretations and argued that certain terms are indefinite in the district court case, but proposes no interpretations here. PO Resp. 23–24 (citing Ex. 2013, 6–12).³ Patent Owner contends that Petitioner violated 37 C.F.R. § 42.104(b)(3), which requires a petition to “[p]rovide a statement of the precise relief requested,” including “[h]ow the challenged claim is to be construed,” and the Board should “reject Petitioner’s attempt to advance inconsistent claim constructions” in different proceedings, citing *Revvo Technologies, Inc. v. Cerebrum Sensor Technologies, Inc.*, IPR2025-00632, Paper 20 at 3–5 (Director Nov. 3, 2025) (precedential). PO Resp. 60–61; Sur-Reply 11–12. Petitioner responds that Patent Owner forfeited its argument by failing to raise it prior to institution; “while the outer bounds of certain terms . . . are not well-defined, the teachings of the asserted references fall within the central core of these terms”; and it is Patent Owner and its expert, Mr. Goldman, who have taken different positions regarding the scope of the claims. Reply 30–31.

As explained herein, we are able to assess the parties’ arguments regarding the prior art and determine whether Petitioner has met its burden to prove unpatentability without expressly interpreting any claim terms. *See infra* Sections II.D–G. To the extent Patent Owner’s argument is for

³ The district court case was stayed prior to any ruling on claim interpretation. The parties filed a copy of their Joint Claim Construction and Prehearing Statement (Ex. 2013) from the district court case.

discretionary denial of the Petition, such a contention is improper at this stage. *See Berkshire Hathaway Energy Co. v. Birchtech Corp.*, IPR2025-00274, Paper 81 at 3 (Director Mar. 27, 2026) (“*Berkshire Hathaway*”) (“[T]he Board correctly determined that it lacked the authority in these [*inter partes* reviews] to terminate parallel proceedings challenging the same patents because, under current policy, the Director makes determinations on discretionary issues.”); *ResMed Corp. v. Cleveland Med. Devices, Inc.*, IPR2025-00158, Paper 44 at 4–6 (PTAB May 18, 2026) (denying authorization to file a motion to terminate based on alleged inconsistent claim interpretation positions, citing *Berkshire Hathaway*).

Second, each of independent claims 1 and 6 recite “utilizing optimized decoding processes to maintain quality playback.” Ex. 1001, 19:38–39, 20:19–21. In the Decision on Institution, the Board noted that the phrase “to maintain quality playback” might be considered a statement of intended purpose (claim 1) or intended use (claim 6) that would not limit the scope of the claims, and invited the parties to address the issue during trial. Dec. on Inst. 25–26. Patent Owner argues that the phrases are not statements of intended purpose or use. PO Resp. 61–69; Sur-Reply 22–24. Petitioner disputes Patent Owner’s showing. Reply 32. We need not resolve whether “to maintain quality playback” in the claims is a statement of intended purpose or use because we determine that the prior art relied on by Petitioner teaches the relevant limitations regardless, for the reasons explained herein. *See infra* Sections II.D–G.

C. Legal Standards

To prevail in its challenge to the patentability of claims 1–9 of the ’849 patent, Petitioner must demonstrate that the claims are unpatentable

by a preponderance of the evidence. 35 U.S.C. § 316(e). “In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). This burden of persuasion does not shift to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015); *see also In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016) (“Where, as here, the only question presented is whether due consideration of the four *Graham* factors renders a claim or claims obvious, no burden shifts from the patent challenger to the patentee.”).

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a)). The question of obviousness is resolved on the basis of underlying factual determinations, including “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; and “the level of ordinary skill in the pertinent art.” *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Additionally, objective indicia of nonobviousness, such as “commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.”⁴ *Id.* When

⁴ Patent Owner states that its predecessor company’s “technology was immediately recognized as groundbreaking” and licensed to others, but does

conducting an obviousness analysis, we consider a prior art reference “not only for what it expressly teaches, but also for what it fairly suggests.”

Bradium Techs. LLC v. Iancu, 923 F.3d 1032, 1049 (Fed. Cir. 2019).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. An obviousness determination based on a combination of references requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (quoting *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012)); *see KSR*, 550 U.S. at 418 (for an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does”).

“Although the *KSR* test is flexible, the Board ‘must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to *how* or *why* the references would be combined to produce the claimed invention.’” *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (quoting *Kinetic Concepts*, 688 F.3d at 1368) (alteration in original). Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of

not identify or argue any objective indicia of nonobviousness in this proceeding. *See* PO Resp. 8–11.

obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); accord *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation[] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (quoting *In re Lee*, 277 F.3d 1338, 1342 (Fed. Cir. 2002))); *Magnum Oil*, 829 F.3d at 1380 (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

D. Alleged Obviousness Based on Carmel and Mattavelli

1. Carmel

Carmel is directed to “network data communications” and “real-time multimedia broadcasting over a network.” Ex. 1003, 1:10–12. Figure 2 of Carmel, reproduced below, illustrates a computer broadcast network in accordance with one embodiment. *Id.* at 5:43–45.

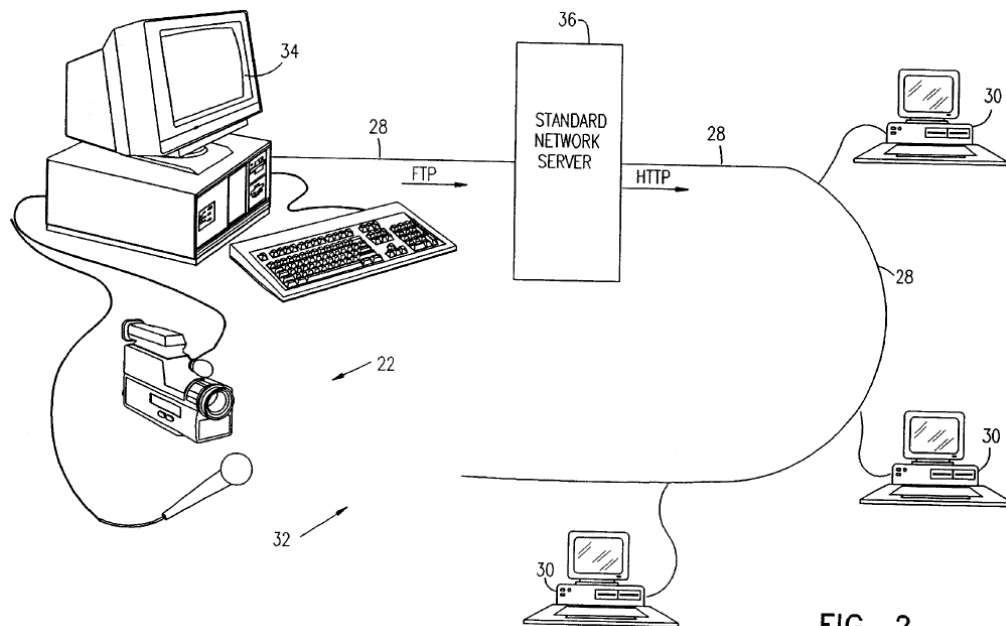


FIG. 2

Figure 2 illustrates computer system 32 that remotely broadcasts a multimedia sequence over network 28. *Id.* at 6:24–27. Computer system 32 includes transmitting computer 34 that generates the sequence, a plurality of clients 30, and network server 36, all of which communicate over network 28. *Id.* at 6:28–31. After preparing the multimedia sequence, computer 34 uploads the sequence over network 28 using the Internet File Transfer Protocol (“FTP”) or other Internet protocols. *Id.* at 6:50–54. The sequence is preferably generated and compressed in real-time and may include an interview program, an entertainment event, a sports event, or a pre-recorded sequence. *Id.* at 6:57–60. Clients 30 connect to network server 36 and receive the sequence substantially in real-time. *Id.* at 7:4–5. Clients 30 preferably download the sequence using the Hypertext Transfer Protocol (“HTTP”) or other Internet protocols. *Id.* at 7:5–9. Because HTTP is widely used by modern web browsers, “clients 30 will typically need only [to] add a Java applet or plug-in to their existing web browsers . . . in order to receive and play back the broadcast.” *Id.* at 7:12–17.

Figure 3D of Carmel is reproduced below.

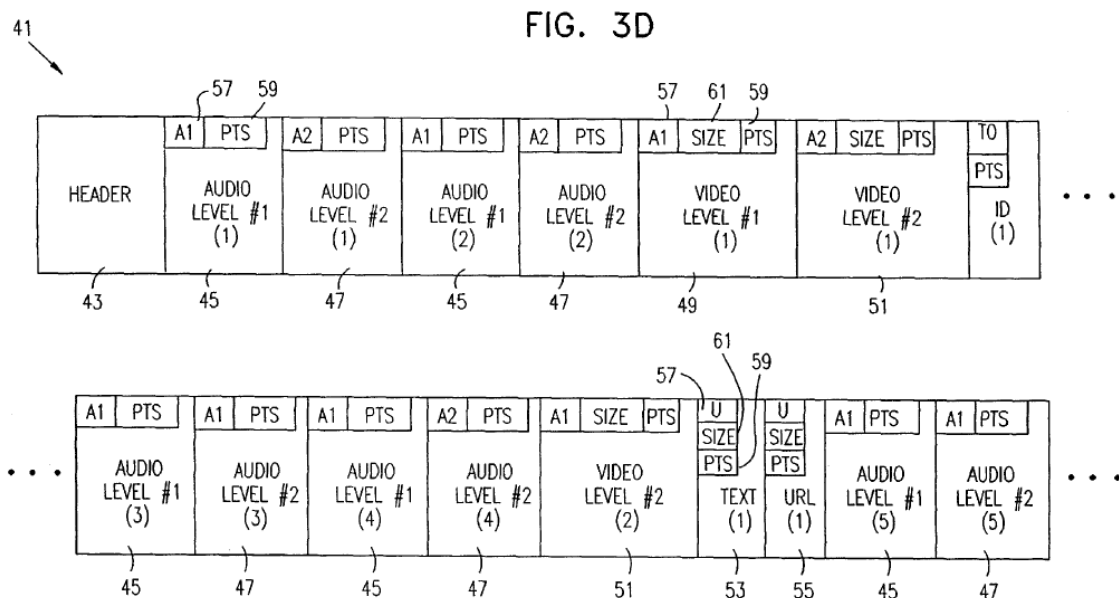


Figure 3D depicts an exemplary file format for multi-level data stream 41, divided into audio slices 45, 47 and video slices 49, 51, where each slice is identified by level identifier 57, presentation time stamp (PTS) index 59, and, as appropriate, size identifier 61. Ex. 1001, 8:42–50. Carmel discloses that

[e]ach time slice in stream 41 includes multimedia data at multiple quality levels. There are two such levels in the example shown in FIG. 3D, identified as level #1 and level #2, but a larger number of levels may also be used. Typically, the audio and video data in level #1, contained in slices 45 and 49, are more highly compressed relative to the data in slices 47 and 51 of level #2. In consequence, the level #1 slices have smaller data volume than the level #2 slices and can therefore be transmitted over a lower-bandwidth data link, while maintaining the required slice timing indicated by time stamps 59. The lower data-rate transmission generally comes at the expense of inferior sound and/or image quality. Size identifier 61 describes the size of those slices in stream 41 that have a fixed size associated therewith, wherein typically the size (or the corresponding resolution) of the level #1 video slices is smaller than that of the level #2 slices.

Id. at 8:56–9:5. “Each of clients 30 chooses or is assigned the quality level appropriate to the bandwidth of its link on network 28 to server 36,” as shown in Figure 6B. *Id.* at 9:6–9.

Figure 6B of Carmel is reproduced below.

FIG. 6B

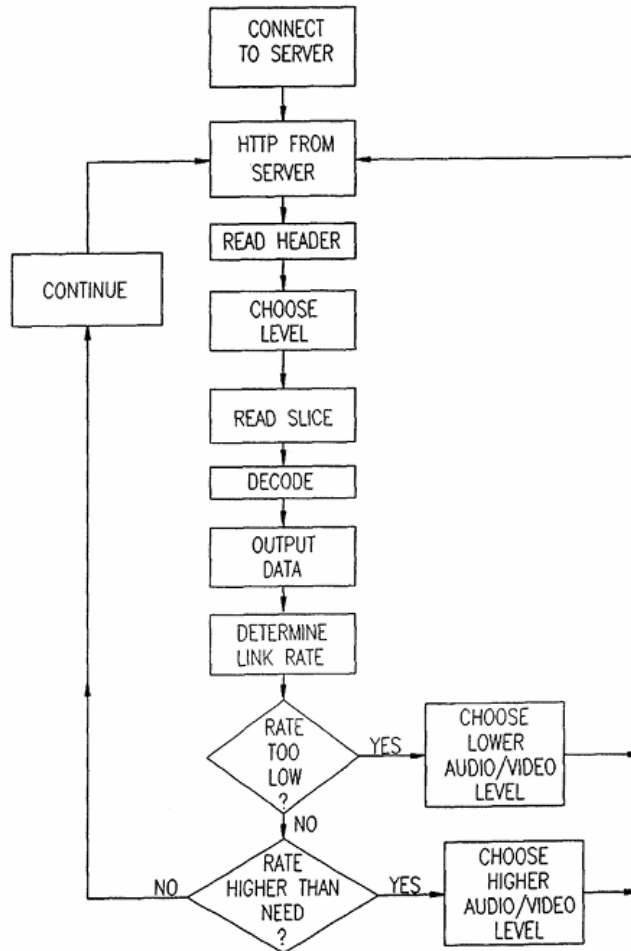


Figure 6B depicts “a flow chart illustrating the operation of clients 30 in downloading and playing back multi-level data stream 41 . . . transmitted from server 36.” Ex. 1003, 10:64–67. Carmel discloses that

each client 30 connects to the server, generally using a single HTTP link. After reading header 43 and, preferably, making an initial assessment of the link bandwidth, the client selects one of the available quality levels in the stream. Responsive to the selection, server 36 begins to transmit data slices at the chosen quality level. The slices are received, decoded and output by the client.

Periodically, client 30 makes an assessment of the rate of data transfer over the link from the server and, if necessary, changes the quality level accordingly. For example, if the rate is low, such that time stamps 59 indicate that the slices need to be played as fast as or faster than they are being received, the client will preferably select a lower quality level if one is available. On the other hand, if the rate is substantially higher than what is needed to receive the successive slices on time, the client may select a higher quality level to take advantage of the available bandwidth.

Id. at 10:67–11:18.

2. *Mattavelli*

Mattavelli generally relates to Computational Graceful Degradation (“CGD”). Ex. 1004, 2309.⁵ Specifically, Mattavelli discusses a more efficient usage of hardware processing power to provide results of possibly lower visual quality, but respecting real-time constraints when required processing needs exceed the available processing resources. *Id.* Mattavelli states that its techniques can be applied to decoding of compressed video sequences encoded using Motion Picture Experts Group 4 (“MPEG-4”). *Id.* Mattavelli concludes that simulations show successful implementation of the CGD approach for MPEG-4 video decoding. *Id.* at 2312.

3. *Independent Claim 1*

Petitioner argues that Carmel and Mattavelli collectively teach all of the limitations of claim 1, and that it would have been obvious to combine

⁵ Petitioner provides persuasive evidence sufficient to show that Mattavelli, Wang, and Wolters are prior art printed publications under 35 U.S.C. § 102(b). *See* Pet. 10–12; Ex. 1054; Ex. 1063 ¶¶ 26–106. Patent Owner does not argue otherwise in its Response.

the references' teachings to achieve the method of claim 1, relying on the testimony of Dr. Polish as support. Pet. 13–55 (citing Ex. 1002). Patent Owner responds that the references do not teach certain limitations of claim 1. PO Resp. 31–47.

a) Undisputed Issues: Preamble, Limitations 1[a.i]–1[c.i], and Motivation to Combine

To the extent the preamble is treated as limiting, Petitioner contends that Carmel teaches a “method” because it discloses “[a] method for real-time broadcasting from a transmitting computer to one or more client computers over a network.” Pet. 13 (quoting Ex. 1003, code (57)).

Limitation 1[a.i] recites “receiving audio and video segments encoded in a digital encoding format and with an encoding rate.” Ex. 1001, 19:20–21. Petitioner argues that Carmel teaches a data stream of multimedia data that includes a combination of video and audio/sound, where the data stream comprises a series of data slices and each slice contains a segment of video and audio data. Pet. 13–14 (citing Ex. 1003, 2:29–40, 7:18–25). Petitioner contends that Carmel’s clients 30 connect to network server 36 and receive the multimedia sequence substantially in real-time. *Id.* at 17 (citing Ex. 1003, 7:4–5, 7:12–17, 10:64–11:22). According to Petitioner, Carmel’s receiving of a multimedia sequence that includes segments of video and audio data in real-time constitutes “receiving audio and video segments.” *Id.*

Petitioner further argues that Carmel’s encoding step 80 in Figures 5 and 7 compresses multimedia data using any suitable compression method known in the art, such as GSM 6.10 (audio), H.263 (video), and MPEG standards (audio and video). Pet. 15–16 (citing Ex. 1003, 11:23–52, Figs. 5,

7). That is, Petitioner alleges that Carmel’s different compression methods teach the limitation “encoded in a digital encoding format.” *Id.*

Petitioner argues that encoding the slices includes encoding slices at a plurality of different quality levels such that the files corresponding to a given one of the slices have a different, respective data size for each of the quality levels. Pet. 16–17 (citing Ex. 1002 ¶¶ 124–126; Ex. 1003, 3:5–13, 4:39–47, 5:15–18). According to Petitioner, Carmel’s encoding at different quality levels teaches the limitation “encoded in a digital encoding format . . . with an encoding rate.” *Id.* (citing Ex. 1002 ¶¶ 124–126; Ex. 1003, 3:5–13, 4:39–47, 5:15–18).

Limitation 1[a.ii] recites that “said audio and video segments are associated with object parameters and supplied host path identification to form multimedia objects.” Ex. 1001, 19:21–24. As noted above, Petitioner argues that Carmel’s segments/slice of video and audio data are “audio and video segments.” Pet. 14 (citing Ex. 1003, 7:18–25); *see also id.* at 18 (relying on the arguments pertaining to limitation 1[a.i]). Petitioner contends that each slice has a corresponding file and each file has one or more timestamps. *Id.* at 18–19 (citing Ex. 1003, 7:23–31). Petitioner argues that, for multi-level streams, each multimedia slice includes size identifier 61 and header 43 that includes data, such as a title, author, copyright, formats of data in the data stream, the duration of the multimedia sequence represented by the stream, and a description of available stream levels and associated data sizes. *Id.* at 19 (citing Ex. 1003, 8:42–55, Fig. 3D). Petitioner alleges that Carmel’s timestamps, size identifier, and data in header 43 are “object parameters” that are associated with audio and video segments. *Id.* at 18–19 (citing Ex. 1003, 7:23–31, 8:42–55, Fig. 3D).

Petitioner further argues that, in Carmel, the sequence of multimedia slices and files created by computer 34 is uploaded to network server 36 using FTP or other Internet protocols. Pet. 22 (citing Ex. 1003, 6:50–7:3, Figs. 2, 4). Petitioner contends that, when uploading the slices/files to network server 36, computer 34 opens a plurality of links, each link having its own Uniform Resource Locator (“URL”). *Id.* at 23 (citing Ex. 1003, 9:17–19). Moreover, Petitioner asserts that clients 30 connect to network server 36 to download the sequence using HTTP or other Internet protocols. *Id.* (citing Ex. 1003, 7:4–17). According to Petitioner, Carmel’s use of URLs and Internet protocols, such as FTP and HTTP, for downloading and uploading multimedia slices/files teaches the limitation “supplied host path identification.” *Id.* at 22–24 (citing Ex. 1003, 6:50–7:3, 7:4–17, 9:17–19, Figs. 2, 4). Petitioner argues that Carmel teaches both encoded slices of multimedia data at multiple quality levels being saved within a single file and embodiments where each encoded slice is saved as a separate file. *Id.* at 19–20 (citing Ex. 1003, 5:15–18, 8:42–9:5). Petitioner alleges that, whether Carmel’s slices are saved within a single file or as a separate file, Carmel’s file or files teaches the limitation “form a multimedia object.” *Id.*

Limitation 1[b.i] recites “requesting by a multimedia player, transmission of said multimedia objects.” Ex. 1001, 19:25–26. As noted above, Petitioner alleges that, whether Carmel’s slices are saved within a single file or as a separate file, Carmel’s file or files are “multimedia objects.” Pet. 19–20 (citing Ex. 1003, 5:15–18, 8:42–9:5). Petitioner argues that Carmel teaches receiving and playing back a broadcast using a Java applet or plug-in on a client’s web browser. *Id.* at 26 (citing Ex. 1003, 7:12–17, 10:27–35). Petitioner alleges that Carmel’s Java applet or plug-in is a “multimedia player” and Carmel’s broadcast is a “transmission.” *Id.*

Petitioner further argues that the client selects one of the available quality levels in the stream, which constitutes “requesting,” as recited in limitation 1[b.i]. *Id.* at 26–27 (citing Ex. 1003, 10:64–11:22, Fig. 6B).

Limitation 1[b.ii] recites that “said multimedia objects are located using http and received by said multimedia player from servers using a wireless connection.” Ex. 1001, 19:26–28. Petitioner argues that Carmel’s Java applet or plug-in is a “multimedia player” and, whether Carmel’s slices are saved within a single file or as a separate file, Carmel’s file or files are “multimedia objects.” Pet. 19–20, 26 (citing Ex. 1003, 5:15–18, 7:12–17, 8:42–9:5). Petitioner contends that Carmel’s downloading the data stream from the server using HTTP teaches the limitation “wherein said multimedia objects are located using http and received by said multimedia player.” *Id.* at 28 (citing Ex. 1003, 2:11–15, 7:4–9, 10:35–47, Fig. 6B).

As for the “wireless connection” limitation, Petitioner argues that Carmel teaches the use of a wireless connection between a client and server via its incorporation by reference of both U.S. Patent No. 5,841,432 (Ex. 1009, “Carmel ’432”) and U.S. Patent No. 6,397,230 B1 (Ex. 1010, “Carmel ’230”). Pet. 31 (citing Ex. 1003, 2:41–46, 6:65–7:3). That is, by relying on Carmel ’432 and Carmel ’230, Petitioner argues that Carmel teaches connecting computers through virtual communication lines, such as wireless communications. *Id.* at 31–32 (citing Ex. 1009, 3:21–35, 3:43–53; Ex. 1010, 11:50–57).

Regarding the “servers” limitation, Petitioner also argues that, if limitation 1[b.ii] requires a plurality of servers, Carmel together with the knowledge of a person of ordinary skill in the art renders such an arrangement obvious. Pet. 32 (citing Ex. 1002 ¶¶ 165–166). According to Petitioner, a person of ordinary skill in the art would have been motivated to

include two or more of Carmel's servers 36 hosting copies of the sequence of multimedia objects to provide a faster, more robust, adaptable system that would ensure sufficient bandwidth/download rates, thereby resulting in client 30 (and the multimedia player thereon) receiving the series of multimedia objects in the proper sequence with only a minimal necessary transmission delay. *Id.* (citing Ex. 1003, 10:48–63). Petitioner argues that the receipt of multimedia data from multiple host servers would have various benefits, such as having a more stable and scalable streaming output and reducing latency, which were known in the art. *Id.* at 32–33 (citing Ex. 1002 ¶ 166).

Limitation 1[c.i] recites “playing back received multimedia objects by the multimedia player.” Ex. 1001, 19:29–30. Petitioner argues that Carmel teaches receiving and playing back a broadcast using a Java applet or plug-in on a client's web browser. Pet. 33–34 (citing Ex. 1003, 7:12–17). Again, Petitioner alleges that Carmel's Java applet or plug-in is a “multimedia player” and, whether Carmel's slices are saved within a single file or as a separate file, Carmel's file or files are “multimedia objects.” *Id.* at 19–20, 33–34 (citing Ex. 1003, 5:15–18, 7:12–17, 8:42–9:5). Petitioner argues that Carmel teaches client computers decoding the sequence and playing back the data stream responsive to indices of the files, which Petitioner alleges constitutes “playing back received multimedia objects by the multimedia player.” *Id.* at 33–35 (citing Ex. 1003, 3:66–4:2, Fig. 6B).

Finally, Petitioner explains in detail why and how a person of ordinary skill in the art would have had reason to combine the teachings of Carmel and Mattavelli, with a reasonable expectation of success. *See* Pet. 50–55. Specifically, an ordinarily skilled artisan would have modified Carmel's system to use “Mattavelli's CGD techniques to optimize the decoding of

received slices of audio and video data for playback,” which would result in more efficient network bandwidth usage and improved playback of multimedia data streams. *Id.* at 50, 52–53, 55. Petitioner contends that Carmel and Mattavelli are both directed to processing multimedia data playback “for the appreciation of a user,” while providing the highest perceived audio and video output quality possible in view of system constraints to ensure playback continuity. *Id.* at 50–51 (citing Ex. 1003, 7:35–49, 10:48–54, 11:9–18, Figs. 3D, 6B; Ex. 1004, 2309–10). Petitioner argues that Carmel and Mattavelli both pertain to compression of multimedia data using well-known coding and compression standards for video streaming. *Id.* at 51 (citing Ex. 1003, 7:25–26, 11:24–52; Ex. 1004, 2309–11).

Petitioner further asserts that a person of ordinary skill in the art would have appreciated that Carmel and Mattavelli “complement[]” each other because Carmel addresses constraints on available network bandwidth and Mattavelli addresses limits on available processing resources at the client/multimedia player. Pet. 52 (citing Ex. 1003, code (57), 7:36–41; Ex. 1004, 2309–2312). According to Petitioner, an ordinarily skilled artisan would have been motivated to combine the complementary teachings in Carmel and Mattavelli to create a more robust streaming system that addresses both bandwidth constraints and client processing limits to provide the best possible playback experience. *Id.* (citing Ex. 1002 ¶¶ 212–215). Petitioner also contends that Mattavelli teaches that merely optimizing transmission bandwidth is not sufficient and is potentially harmful, which provides an express motivation to combine Carmel’s and Mattavelli’s complementary teachings to ensure that different, related links in the streaming playback chain are optimized together. *Id.* at 53 (citing Ex. 1002

¶¶ 216–217; Ex. 1004, 2310). And, in Petitioner’s view, Carmel contains an express disclosure that would have motivated a person of ordinary skill in the art to incorporate Mattavelli’s complementary teachings regarding decoding because Carmel states that multimedia playback is achieved “preferably with only a minimal necessary transmission *and decoding delay*.” *Id.* at 53–54 (quoting Ex. 1003, 10:50–54; citing Ex. 1002 ¶ 218).

Patent Owner in its Response does not dispute that Carmel and Mattavelli teach the preamble and limitations 1[a.i]–1[c.i], or that a person of ordinary skill in the art would have been motivated to combine the references’ teachings in the manner asserted by Petitioner.⁶ Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *Dynamic Drinkware*, 800 F.3d at 1378 (discussing the burden of proof in *inter partes* review). Having reviewed Carmel and Mattavelli, on the complete trial record, we agree with Petitioner’s analysis, as supported by the testimony of

⁶ Patent Owner argued at the hearing that a person of ordinary skill in the art would not have been motivated to combine Carmel and Mattavelli, citing pages 14–18 of its Sur-Reply. *See* Tr. 35:16–37:16. That argument, however, does not appear in Patent Owner’s papers. Patent Owner did not dispute the issue of motivation to combine Carmel and Mattavelli in its Response. Then, in its Sur-Reply, Patent Owner argued that Mattavelli does not teach certain aspects of limitations 1[c.ii]–[c.iv], such as “adjustment of playback.” *See* Sur-Reply 14–18. We consider Patent Owner’s Sur-Reply arguments to the extent they are properly responsive to arguments made in Petitioner’s Reply, but do not consider Patent Owner’s new arguments made for the first time at the hearing. *See* 37 C.F.R. §§ 42.23(b), 42.70; *infra* Sections II.D.3.b–d; *Dell Inc. v. Acceleron, LLC*, 884 F.3d 1364, 1369 (Fed. Cir. 2018) (the “Board was obligated to dismiss [the petitioner’s] untimely argument . . . raised for the first time during oral argument”); Patent Trial and Appeal Board Trial Practice Guide § II.M (last updated Dec. 12, 2025), *available at* <https://www.uspto.gov/patents/ptab/trial-practice-guide> (“During an oral hearing, a party . . . may only present arguments relied upon in the papers previously submitted.”).

Dr. Polish, which we credit. *See* Pet. 13–35, 50–55; Ex. 1002 ¶¶ 113–172, 209–222.

b) Disputed Limitation 1[c.iii]

After reciting the step of “playing back received multimedia objects by the multimedia player,” claim 1 recites “wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by” performing three actions:

- (1) “selecting a plurality of said multimedia objects that reflect available network bandwidth”;
- (2) “autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification”; and
- (3) “utilizing optimized decoding processes to maintain quality playback.”

Ex. 1001, 19:29–39. Consistent with the parties’ arguments during trial, we first address “autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification,” as recited in limitation 1[c.iii]. *Id.* at 19:34–37. Petitioner makes various arguments premised on Carmel alone and on the combination of Carmel and Mattavelli, which we address in turn. *See* Pet. 40–45; Ex. 1002 ¶¶ 186–198.

(1) Carmel

Petitioner argues that Carmel’s client makes an initial “selection” of a quality level, then periodically “makes an assessment of the rate of data transfer over the link from the server and, if necessary, changes the quality level accordingly,” such as by selecting a lower quality level “if the [data

transfer rate] is low, such that [the timestamps] indicate that the slices need to be played as fast or faster than they are being received.” Pet. 41–42 (quoting Ex. 1003, 10:64–11:22, Fig. 6B).

Petitioner further contends that the assessment of whether the data transfer rate is sufficient for the “currently selected bitrate/quality level” is performed using “multimedia object parameters” (timestamps and slice size/quality parameters), and the client identifies and locates slices at a particular quality level using slice identifiers and “host path identification” for the slices. Pet. 40–43 (citing Ex. 1003, 8:42–9:9, 10:64–11:22, Fig. 6B). Petitioner also relies on portions of Carmel pertaining to synchronization, arguing that Carmel describes “how slice timestamps (*i.e.*, object parameters) are used to assess whether the available network bandwidth is sufficient to keep up with the multimedia playback and maintain fluidity and quality.” *Id.* at 43. For example, Carmel discloses that “clients 30 . . . monitor the time codes as the file is received, in order to ensure that the transmission or reception is ‘keeping up’ with the input of the data to the computer,” and take steps to adjust the data reception rate and/or vary the compression levels “to adjust the data streaming rate to the available bandwidth.” Ex. 1003, 7:28–49. Also, “[t]ime stamps in the data stream are used to synchronize the data, so that the multimedia sequence is played back just as it was input at computer 34, preferably with only a minimal necessary transmission and decoding delay.” *Id.* at 10:48–63; *see* Pet. 43 (also citing Ex. 1003, 9:49–52, 10:64–11:22). Finally, Petitioner argues that adjusting selection and playback is performed “autonomously” (*i.e.*, “without server-side direction or intervention”) because client 30 “is the entity that chooses, selects, and adjusts (when needed or beneficial) the quality level of the multimedia slices that it downloads and receives for playback in a

manner that reflects the available network bandwidth.” Pet. 43–44 (citing Ex. 1003, 10:27–31, 10:64–67, 11:1–15, Fig. 6B).

Patent Owner responds that the portions of Carmel relied upon by Petitioner only teach “adjusting the quality level of the data stream,” not adjusting “playback” of multimedia objects. PO Resp. 31–33 (citing Ex. 2014 ¶¶ 96–99). Patent Owner argues that “adjust[ing] the data streaming rate to the available bandwidth” in Carmel does not constitute adjusting playback. *Id.* at 33 (quoting Ex. 1003, 7:28–49). Likewise, Patent Owner argues that Carmel’s statement that the sequence of slices is played back “[j]ust as it was input at computer 34” only indicates that “media is played in the same order as it was input,” not that playback is adjusted. *Id.* (quoting Ex. 1003, 10:50–54). Patent Owner contends that Petitioner improperly equates the *selection* of multimedia objects (at a particular quality level) with their *playback*, when the claim recites them separately (i.e., “adjusting said selection and playback”). Sur-Reply 2–4. Patent Owner further argues that “Carmel adjusts only which stream segment the client requests from the server. It says nothing about adjusting playback of multimedia objects after those objects have been received.” *Id.* at 3 (citing Ex. 1003, 10:64–11:22, Fig. 6B). Patent Owner provides two examples of ways it believes that playback can be adjusted (neither of which is present in Carmel according to Patent Owner): (1) adjusting frame size “to display correctly on different screen sizes,” and (2) choosing to “delay playback” until memory buffers are filled or to “begin playback immediately” while requesting the next object concurrently. *See* PO Resp. 31–32 (citing Ex. 1001, 3:38–43); Sur-Reply 2–3 (emphasis omitted) (quoting Ex. 1001, 8:48–57).

We agree with Patent Owner in part. The action of selecting a different quality level in Carmel is, by itself, merely adjusting the “selection” of multimedia objects. *See* Ex. 1003, 3:8–13 (“The client . . . monitors the data transfer rate of a data link . . . and *selects* the level that is appropriate to the link bandwidth. If the monitored data transfer rate changes during transmission, the quality level is preferably *reselected* accordingly.” (emphasis added)), 11:2–18 (the client “selects one of the available quality levels in the stream” and later can “select” a lower or higher quality level as necessary), Fig. 6B (depicting steps of “Choose Lower Audio/Video Level” and “Choose Higher Audio/Video Level,” and separate steps of “Decode” and “Output Data”); Pet. 34–35 (identifying the “Decode” and “Output Data” steps as playback).

But that is not all that Carmel discloses. As Petitioner correctly points out, Carmel teaches that three rates—“(i) the encoding data rate/quality level, (ii) the transmission/download rate, and (iii) the playback rate—should generally match and teaches techniques (including the multi-level streaming embodiment) for achieving this balance in its improved real-time streaming system.” *See* Pet. 39–40, 43, 52; Reply 8. Carmel discloses that “the one or more client computers decode the sequence and *play back* the data stream responsive to the indices of the files, *at a replay rate generally equal to the data rate.*” Ex. 1003, 3:66–4:2 (emphasis added), 5:22–25 (disclosing the same), claims 8, 26 (disclosing the same). Thus, Carmel teaches a connection between the data rate and replay rate for playing back the sequence, and adjusting the replay rate so that the two are “generally

equal.”⁷ *See id.* Similarly, Carmel’s client monitors timestamps of slices as they are received “to ensure that the . . . reception is ‘keeping up’ with the input of the data to the computer” and can take steps to “increase the data . . . reception rate” or vary the “compression level of the data” as necessary, reflecting a connection between the data rate and download rate. *Id.* at 7:36–49. Carmel also discloses the following:

Responsive to a user input, client 30 selects an appropriate starting slice and begins to download and decode (decompress) files 42, 44, 46, etc. In the case of a multimedia stream, client 30 reconstructs and outputs the multimedia data for the appreciation of a user. *Time stamps in the data stream are used to synchronize the data, so that the multimedia sequence is played back just as it was input at computer 34*, preferably with only a minimal necessary transmission and decoding delay.

⁷ Carmel uses various terms in its written description, such as “data rate,” “sample rate,” “upload rate,” “download rate,” “transmission rate,” “reception rate,” “data streaming rate,” “data transfer rate,” “replay rate,” and “data replay rate.” *See generally* Ex. 1003. We primarily refer herein to the “data rate” (the rate, e.g., amount of data per unit of time, assigned to the data stream), “download rate” (the rate at which the data stream is transmitted from the server to the client), and “replay rate” (the rate at which the data stream is played back at the client). *See id.* at 3:29–39 (describing “providing at the transmitting computer a data stream having a given data rate,” “dividing the stream into a sequence of slices,” “encoding the slices in a corresponding sequence of files,” and “uploading the sequence to a server at an upload rate generally equal to the data rate of the stream, such that the one or more client computers can download the sequence over the network from the server at a download rate generally equal to the data rate”), 3:66–4:2, 5:22–25; Ex. 1081 ¶¶ 25 (noting that “data rate” was interpreted in litigation involving Carmel to mean “an amount of data (*i.e.* number of bits) per unit of time”), 39 (testifying that Carmel “describes how a transmitting computer can encode the multimedia stream at multiple quality levels (assigned data rates) through the use of compression techniques,” where “the assigned data rate may vary based on the network conditions”).

Id. at 10:45–54 (emphasis added). These portions of Carmel demonstrate the link between data rate, download rate, and playback rate.

We find particularly persuasive the testimony of Patent Owner’s expert, Mr. Goldman, who submitted a declaration in an *ex parte* reexamination of Carmel (Control No. 90/019,622).⁸ Ex. 1081. That testimony is relevant here because Mr. Goldman expressed his opinion as to what Carmel discloses. Specifically, he testified that

[Carmel] ensures real-time delivery of multimedia streams by maintaining the upload (Claim 1), download (Claim 1) and replay (Claim 8) rates so they are generally equal to the assigned (given) data rate of the stream. For instance, [Carmel] discloses an embodiment whereby the amount of data generated by the transmitting computer over a period of time (e.g., 10 seconds) is uploaded to a server within 10 seconds and is subsequently downloaded within 10 seconds by the client computer. Hence, there is a balance of flow between the production, transmission, and consumption of a real-time multimedia stream, resulting in a stable and scalable operation. [Carmel] provides explicit steps for rate control, balancing the given data rate provided at the transmitting computer, the upload rate, download rate, and replay rate, including techniques for adjusting these rates synergistically, through selectable compression choices and other techniques. The invention’s rate control techniques are employed when the rates of the upload and download are slow compared to the data rate(s) of the multimedia stream(s), or when the upload and download rates are faster than the data rates of the multimedia streams.

Ex. 1081 ¶ 41 (emphasis added; original emphasis omitted) (citing Ex. 1003, 11:9–22); *see also id.* ¶ 26 (stating that Carmel “discloses client-driven, *rate-controlled*, real-time streaming of multimedia, using common Internet

⁸ The reexamination declaration was filed on May 27, 2025, after the filing of the Petition in this proceeding. Thus, the first opportunity for the parties to address it was in their substantive papers filed during trial.

communication protocols, without the need for a dedicated or customized broadcast server/system” (emphasis added)); Ex. 1085, 30:8–16 (Mr. Goldman agreeing that “at least one of the purposes of Carmel is to ensure real[-]time delivery of the multimedia streams by maintaining the upload, download, and replayed rates so that they’re generally equal to the assigned or given data rate of the stream”). Mr. Goldman’s reading of Carmel is consistent with the portions cited above and confirms that Carmel does more than select a new quality level—it teaches synchronizing the replay rate with the data rate so the two are generally equal. *See* Ex. 1081 ¶¶ 26, 41. In other words, a change in the data rate results in an adjustment to the replay rate as well. *See id.*

Patent Owner argues that the term “replay rate” in Carmel does not refer to playback. Sur-Reply 9–10. According to Patent Owner, “[r]eplay rate is the cadence at which bits are consumed by the player,” whereas “playback is the rendered output the user perceives, which depends on additional steps—such as decoding, frame timing, scaling, and rendering.” *Id.* at 9; Tr. 34:2–14 (arguing that “playback . . . encompasses the entire look and feel of what the user is observing and perceiving,” whereas “[t]he replay rate just goes to the speed of the . . . output data stream”).

Carmel, however, expressly connects “replay rate” to playback, as it discloses that the data stream is played back “at” the replay rate. *See* Ex. 1003, 3:66–4:2 (“the one or more client computers decode the sequence and play back the data stream responsive to the indices of the files, at a replay rate generally equal to the data rate”), 5:22–25 (disclosing the same), claims 8, 26 (disclosing the same); Tr. 18:11–19:12. Patent Owner also does not point to any support for its position on the meaning of “replay rate,” and neither party contends that it is a recognized term of art. *See* Sur-Reply 9;

Tr. 20:8–10, 40:17–22. Given the express statement in Carmel, Mr. Goldman’s testimony about the “replay rate” recited in Carmel’s claim 8, and the lack of any evidence to the contrary, we are persuaded that “replay rate” in Carmel refers to the playback rate. Therefore, because changing the playback rate is one way to adjust playback, as Patent Owner acknowledges, we are persuaded that Carmel teaches adjusting playback as recited in limitation 1[c.iii]. *See* Tr. 33:15–21 (Patent Owner agreeing that “[c]hang[ing] the playback rate . . . would be adjusting playback”).

Finally, we note that at various points in its analysis, Petitioner relies on Patent Owner’s district court complaint, opposition to Petitioner’s motion to dismiss under 35 U.S.C. § 101, and slide presentation for the opposition in the district court case, asserting that Patent Owner’s arguments in the district court case are inconsistent with what it argues in this proceeding. *See, e.g.*, Reply 4–8 (citing Exs. 1055, 1083, 1084). Petitioner does not explain sufficiently, and we do not see, how Patent Owner’s arguments regarding alleged infringement of the ’849 patent are relevant to our inquiry here: determining whether Carmel teaches or suggests adjusting playback. *See id.* Petitioner merely points to certain aspects of Patent Owner’s complaint, including some addressing standards that came into effect after Carmel issued, and states that they are the same as Carmel. *See id.* Further, to the extent Petitioner’s contention is that the district court materials show that Patent Owner is taking inconsistent positions on claim interpretation, neither party identified “adjusting . . . playback” for interpretation in the district court case and neither party offers any proposed interpretations in this proceeding. *See* Ex. 2013; *supra* Section II.B. And, as Patent Owner correctly points out, the § 101 eligibility inquiry is analytically distinct from obviousness under § 103. *See* Sur-Reply 7; *see also Two-Way Media Ltd. v.*

Comcast Cable Commc'ns, LLC, 874 F.3d 1329, 1340 (Fed. Cir. 2017) (stating that “[e]ligibility and novelty are separate inquiries”). Therefore, we give no weight to the cited papers from the district court case in conducting our analysis regarding this limitation.

For the reasons explained above, we are persuaded that Petitioner presents sufficient evidence to support a finding that Carmel teaches “autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification,” as recited in limitation 1[c.iii].

(2) Combination With Mattavelli

Petitioner argues in the alternative that the combination of Carmel and Mattavelli teaches limitation 1[c.iii], relying on Mattavelli as teaching adjusting playback. Pet. 44–45. Petitioner incorporates its arguments regarding limitation 1[c.iv], discussed further below, and contends that Mattavelli discloses “techniques where the decoder/media player uses object parameters (including, *e.g.*, decoding complexity metadata that is available with the MPEG-4 standard) to determine when and by how much to *adjust the decoding/playback* of received video segments.” *Id.* (emphasis added) (citing Ex. 1004, 2309, 2311–12); *see infra* Section II.D.3.d. Specifically, Mattavelli teaches a CGD approach for video decoding where “degraded, less computationally intensive algorithms and processes for decoding compressed multimedia data are used during periods where the decoding processing needs exceed the available processing resources,” such that “the visual quality of the video output is possibly temporarily degraded to ensure that the fluidity or real-time continuity of the playback is maintained.” Pet. 46 (citing Ex. 1004, 2309, 2312). For example, Petitioner asserts that

Mattavelli describes the inverse discrete cosine transform (IDCT) as an example of a decoding process that “can be simplified to save computational resources when needed.” *Id.* at 47 (citing Ex. 1004, 2309–10).

Patent Owner responds that the cited portions of Mattavelli do not teach adjusting playback “according to the multimedia object parameters and supplied host path identification” because Mattavelli instead teaches executing CGD in the decoding process based on “predicted decoding time” and “complexity information.” PO Resp. 33–34 (citing Ex. 1004, 2309–11; Ex. 2014 ¶ 100); Sur-Reply 18–19. Mattavelli’s complexity information also does not drive the “selection” of multimedia objects according to Patent Owner. Sur-Reply 19.

Petitioner, however, relies on the combined teachings of Carmel and Mattavelli to account for limitation 1[c.iii]—Carmel for “object parameters” and “supplied host path identification” (introduced in limitation 1[a.ii], which Patent Owner does not dispute) and adjusting the “selection” of multimedia objects, and Mattavelli for adjusting “playback” of those objects. *See* Pet. 18–26, 40–45. Patent Owner’s contention that Mattavelli does not teach the full limitation, therefore, is inapposite. *See Palo Alto Networks, Inc. v. Centripetal Networks, LLC*, 122 F.4th 1378, 1386 (Fed. Cir. 2024) (“Where, as here, the grounds for obviousness are based on a specific combination of references, arguments that ‘attack the disclosures of the two references individually’ lack merit. . . . [References asserted in an obviousness combination] must be read together, not in isolation.”); *In re Mouttet*, 686 F.3d 1322, 1333 (Fed. Cir. 2012) (holding that “the test for obviousness is what the combined teachings of the references would have suggested to those having ordinary skill in the art”).

Regardless, we agree with Petitioner and Dr. Polish that Mattavelli's decoding complexity metadata also constitutes "multimedia object parameters" because it is provided as part of the MPEG-4 standard and used to determine when and how much to adjust playback. *See* Pet. 44–45; Ex. 1002 ¶ 197; Ex. 1004, 2309 (stating that "the best performances are achieved when complexity prediction information provided as side information by the video standard is available," which is "included in the new MPEG-4 standard"), 2311 (describing how Mattavelli's process "exploit[s] the complexity information carried by the frames or [video object plane (VOP)] headers, like it can be done for MPEG-4 systems," by "predict[ing] the decoding time needed for the current frame or VOP" and "on the basis of the predicted decoding time and on the complexity information, . . . execut[ing] only the CGD algorithms that are just necessary to not exceed the target decoding time").

Patent Owner also argues that Mattavelli does not use the term "playback." PO Resp. 34. We are persuaded that the modified decoding process Mattavelli describes constitutes adjusting playback of multimedia objects, even though it does not use the specific term "playback."

Importantly, Patent Owner acknowledges that making "changes . . . to the decoding process" is one way to adjust playback. Tr. 35:2–11; *see also* Sur-Reply 9 (arguing that playback "depends on . . . decoding"). The Specification of the '849 patent refers to such changes as "shortcuts" and expressly ties them to playback, disclosing, for example, that

the decoder maintains a state information list of short-cuts, related to perceived frame rate in a sorted list starting with those that will decrease output quality the least, to those that will decrease output quality the most but have the most impact on decoding speed. The client player-decoder dynamically adjusts

how many shortcuts must be taken. These short-cuts are specifically designed to *drastically reduce the number of computations necessary at certain critical steps in the video decoding process at the cost [of] video output quality*. This . . . allows users to experience multimedia *playback* despite the limitations of the device they may be using.

Ex. 1001, 4:8–23 (emphasis added). The Specification further discloses that “[o]n very limited devices short-cuts in the decoding process must be made to allow the device to maintain synchronicity between the audio and video *playback*.” *Id.* at 13:64–67 (emphasis added). “[S]hort-cut optimization processing by the video decoding process . . . allows video decoding to scale in complexity based on the processing power of the device being used.” *Id.* at 13:60–14:5, Fig. 13. A “highest quality” results in the full “correct image”; a “medium quality” requires “certain time consuming short-cuts . . . with some impact on image quality”; and a “low quality” requires “drastic reductions in display quality . . . to improve processing time.” *Id.* at 14:6–15. These disclosures also are consistent with the prosecution history of the ’849 patent, where the applicant stated that making changes to optimize decoding can impact playback. *See* Ex. 1008, 582 (arguing that “[m]aintaining smooth quality *playback* . . . involves dynamic player executed configurations and optimized *decoding*” (emphasis added)). Therefore, performing Mattavelli’s CGD techniques when needed, which reduces the number of computations performed at the expense of video quality (just like those described in the ’849 patent Specification), constitutes adjusting playback, as recited in limitation 1[c.iii].

Petitioner’s alternative arguments relying on the combination of Carmel with Mattavelli to account for limitation 1[c.iii] are persuasive.

(3) Conclusion

Petitioner’s explanation as to how Carmel, as well as the combination of Carmel and Mattavelli, teach limitation 1[c.iii], supported by the testimony of Dr. Polish, which we credit, is persuasive. *See* Pet. 40–49; Ex. 1002 ¶¶ 186–195, 197–198, 201–205. Based on the full trial record, we find that Carmel and Mattavelli teach limitation 1[c.iii].

c) Disputed Limitation 1[c.ii]

Limitation 1[c.ii] recites that “the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth.” Ex. 1001, 19:30–34. As explained above, Petitioner argues that Carmel’s Java applet or plug-in is a “multimedia player” and, whether Carmel’s slices are saved within a single file or as a separate file, Carmel’s file or files are “multimedia objects.” Pet. 19–20, 26 (citing Ex. 1003, 5:15–18, 7:12–17, 8:42–9:5). Petitioner contends that Carmel refers to the multimedia data stream as a “sequence” and uses timestamps to ensure proper synchronization and proper playback in sequential order, which Petitioner maps to the limitation “wherein the multimedia player is configured to play multimedia objects in a sequence.” *Id.* at 35–36 (citing Ex. 1003, 2:1–21, 7:4–8, 7:18–31, 12:6–12). Petitioner asserts that each of Carmel’s clients 30 is capable of reconstructing and outputting the multimedia data “for the appreciation of a user” so that the multimedia sequence is played back “just as it was input at computer 34” in a proper sequence. *Id.* at 36–37 (emphasis omitted) (quoting Ex. 1003, 10:48–54). Petitioner alleges that Carmel’s “proper sequence” disclosures teach that “fluidity” is “maintained.” *Id.* (citing Ex. 1003, 10:48–54,

12:6–12, 13:29–35). Also, according to Petitioner, Carmel’s teachings are consistent with “the goal of maintaining playback fluidity/continuity and the highest possible or practicable audio and video playback quality (in view of resource constraints) when streaming multimedia content,” which “was well-known and something that those in the field generally sought to achieve.” *Id.* at 37 (citing Ex. 1002 ¶ 178).

Petitioner further argues that Carmel teaches that each time slice in stream 41 includes multimedia data at multiple quality levels. Pet. 37–38 (citing Ex. 1003, 8:42–9:9, Fig. 3D). Petitioner contends that Carmel teaches level 1 slices having a smaller data volume than the level 2 slices and, therefore, level 1 slices are transmitted over a lower bandwidth data link, while maintaining the required slice timing indicated by timestamps. *Id.* (citing Ex. 1003, 8:42–9:9, Fig. 3D).

Petitioner alleges that Carmel’s transmission over a lower bandwidth data link teaches the limitation “multimedia objects that reflect available network bandwidth.” Pet. 37–40 (citing Ex. 1003, 7:35–41, 8:42–9:9, 10:64–11:9, Fig. 3D). Petitioner argues that Carmel’s lower data rate transmission usually is at the expense of inferior sound or image quality, and each of clients 30 chooses the quality level appropriate to the bandwidth of its link on network 28 to network server 36, which Petitioner alleges teaches the limitation “video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth.” *Id.*⁹

⁹ Petitioner also again cites Patent Owner’s district court complaint in support of its contentions for limitation 1[c.ii]. Pet. 39 (citing Ex. 1055,

Patent Owner disputes whether Carmel and Mattavelli teach that “fluidity” is “maintained” by performing the three actions recited in claim 1.¹⁰ See PO Resp. 34–45 (citing Ex. 2014 ¶¶ 102–122). Patent Owner argues that “[f]luidity” refers to the smoothness and continuity of playback as perceived by the viewer, specifically the absence of jitter, freezes, or choppiness,” where “[a] video is fluid only when playback is sufficiently stable and proceeds without interruptions or irregular timing.” *Id.* at 34 (citing Ex. 2013, 8; Ex. 2014 ¶ 102; Ex. 2027, 2; Ex. 2028, 3). Carmel does not teach maintaining fluidity, according to Patent Owner, because it never uses the term and merely “playing back data slices in the same sequence they were input does not guarantee that the playback will be fluid. . . . A video may have data in the correct order yet lack fluidity and quality due to buffering, system delays, client device processor bottlenecks, or frame dropping.” *Id.* at 35–36; Sur-Reply 12–13.

Patent Owner further contends that the portions of Carmel cited by Petitioner pertaining to matching the data rate of the incoming slices have nothing to do with maintaining fluidity of playback. PO Resp. 37–38 (citing

50–52); Reply 16–19. For the reasons explained above, we give no weight to the district court papers when determining whether the references teach the limitations of claim 1. See *supra* Section II.D.3.b.(1).

¹⁰ Patent Owner also makes various arguments regarding maintaining “video quality” and “audio quality.” PO Resp. 42–47. We address those arguments in connection with limitation 1[c.iv] below. See *infra* Section II.D.3.d; PO Resp. 63 (asserting that “to maintain quality playback” in limitation 1[c.iv] “modifies, and refers back to, the earlier limitation ‘wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained’” (limitation 1[c.ii])); Ex. 2014 ¶ 83; Ex. 1085, 44:7–13 (Mr. Goldman testifying that “quality playback” in limitation 1[c.iv] “refers to fluidity, audio quality, and video quality,” as recited earlier in limitation 1[c.ii]).

Ex. 1003, 6:58–59, 7:35–41). Nor does Carmel’s description of receiving data at a rate to keep up with a live broadcast. *Id.* at 39. Rather, in Patent Owner’s view,

[r]eal-time broadcasting is not a proxy for fluidity and quality. . . . Additional factors, like the availability of enough memory and processing power at client 30 to buffer and playback the video, or the capabilities of the multimedia player and decoder, will help determine whether the playback itself is fluid regardless of whether the video is broadcast real-time.

Id. (citing Ex. 1008, 582; Ex. 2014 ¶ 109; Ex. 2029, 2–3); Sur-Reply 10–11.

Finally, Patent Owner argues that, to the extent Petitioner relies on the goal of maintaining playback fluidity being well-known and something a person of ordinary skill in the art would want to achieve, that rationale is generic, one of skill in the art “would not understand how to maintain fluidity, video quality, or audio quality in the claimed manner,” and Petitioner does not explain how one of skill in the art would understand fluidity to be maintained by performing the three steps. PO Resp. 39–41.

We find the above arguments unavailing. As an initial matter, Patent Owner takes the position that, “[i]n order for playback to be fluid, the three steps claimed in the ’849 [p]atent must be taken. . . . Otherwise, other issues could impact fluidity.” PO Resp. 35. That is consistent with the language of claim 1 reciting how fluidity, video quality, and audio quality are maintained, i.e., “by” performing the three steps. *See* Ex. 1001, 19:30–33. We are persuaded, for the reasons explained herein, that Carmel and Mattavelli teach the three steps, which are the conditions Patent Owner contends must be met “[i]n order for playback to be fluid.” *See* PO Resp. 35.

Despite the above statement, however, Patent Owner asserts that maintaining fluidity requires “smoothness and continuity of playback *as perceived by the viewer.*” PO Resp. 34 (emphasis added); Sur-Reply 15. Patent Owner characterizes fluid playback as without any “jitter, freezes, or choppiness,” “sufficiently stable and . . . without interruptions or irregular timing,” and “smooth, continuous, and free of stalls.” PO Resp. 34; Sur-Reply 10–11. The problem with that position is that Patent Owner points to no discernible way to measure whether playback is sufficiently “smooth” to be considered fluid, particularly given that smoothness according to Patent Owner depends on the perception of a particular viewer. Nevertheless, we analyze the wording used in the evidence of record to determine whether Petitioner has made a sufficient showing for limitation 1[c.ii], and find Petitioner’s arguments persuasive for three main reasons.

First, Petitioner’s explanation as to how Carmel maintains fluidity is consistent with how the Specification of the ’849 patent discusses fluidity. The term “fluid” appears only once in the Specification, in the following excerpt:

On the client side, the number of multimedia objects that can be buffered in memory is based on the size of the first multimedia object[.] The amount of free memory available and the processing of further multimedia objects in the sequence can be optional and dependent on whether the implementation allows the modification of object parameters between multimedia objects (such as the size of the visual frame or the sample rate of the audio stream). *The buffering and playback of multimedia objects in a synchronized fashion is critical to fluid playback.*

Ex. 1001, 3:36–45 (emphasis added).

Carmel has a very similar disclosure, describing playback of multimedia objects in a synchronized fashion through the use of slice indices

and timestamps. *See* Pet. 36–37; Reply 16; Ex. 1002 ¶¶ 175–177, 183. Carmel’s client “download[s] the data stream from the server” and “use[s] the slice indices of the frames to maintain proper synchronization of the playback” (i.e., playing the slices in the correct, sequential order). Ex. 1003, 2:11–17. The client “reconstructs and outputs the multimedia data *for the appreciation of a user*. Time stamps in the data stream are used to *synchronize the data*, so that the multimedia sequence is *played back just as it was input* at computer 34, preferably with only a minimal necessary transmission and decoding delay.” *Id.* at 10:48–54 (emphasis added); *see also id.* at 12:6–12 (disclosing that using shorter slice durations ensures that they are sent in the “proper sequence” and minimizes the impact of potential “drop-out” of a slice). Carmel also describes monitoring the time stamps to avoid lag and maintain continuity of playback at the best possible quality. *Id.* at 7:36–42 (clients 30 “monitor the time codes as the file is received, in order to ensure that the transmission or reception is ‘keeping up’ with the input of the data to the computer” and, “[i]n the event that a lag is detected, steps are taken to increase the data transmission or reception rate”), 10:59–63 (“the client compares the times stamped in the data stream to a local real-time clock and, if it determines that there is a significant lag in the time codes relative to the real-time clock, opens additional links with server 36 in order to increase the overall data rate”).

Thus, not only does Carmel disclose synchronized playback through the use of timestamps, it expressly connects that feature to what the user perceives. *See* Reply 13–14. The fact that the multimedia sequence in Carmel is able to be played back “just as” it was originally uploaded supports Petitioner’s contention that fluidity of playback is maintained. *See* Ex. 1003, 10:48–54. And Carmel’s statement that it does so “for the

appreciation of a user” further demonstrates that it would achieve fluid playback, with no gaps or interruptions that the user might not appreciate. *See id.*

Second, with respect to Patent Owner’s argument that “[r]eal-time broadcasting is not a proxy for fluidity and quality,” we agree with Petitioner that the ’849 patent and Mr. Goldman both use “real-time” to “characterize a streaming system that operates *fast enough* to provide fluid, quality playback” that matches live content as closely as possible. *See* Reply 15 (emphasis added) (quoting PO Resp. 39). For example, the ’849 patent Specification states that for “live content transcoding from a live audio/video stream, the transcoding of input media formats and the creation [of] multimedia objects is done in *real-time* and immediately deployed to every content server of the distributed system.” Ex. 1001, 3:63–67 (emphasis added). Mr. Goldman testifies that Carmel “ensures *real-time* delivery of multimedia streams” by synchronizing the upload, download, and reply rates to each other, where “there is a balance of flow between the production, transmission, and consumption of a real-time multimedia stream, resulting in a stable and scalable operation.” Ex. 1081 ¶ 41. He further characterizes Carmel’s “real-time broadcasting” as “seek[ing] to make the client’s experience of watching a video being broadcast in accordance with the method disclosed therein to be as close as possible to matching a ‘live’ or in-person experience.” *Id.* ¶ 46; *see also* Ex. 1085, 22:1–4 (Mr. Goldman agreeing that “the goal for fluidity of a video is that the viewer perception of the video matches the in-person experience”), 49:4–19 (Mr. Goldman agreeing that “real-time broadcasting” in paragraph 46 of his declaration “refers to the transmission of data to one or more clients matching the human perception of time” and Carmel “is trying to allow a client to have

the experience of watching a video that's . . . closest to the real[-]time fluid experience"). Thus, the fact that Carmel is able to play back multimedia fast enough to be in "real-time," to match a "live" or in-person experience as closely as possible, supports Petitioner's contention that it maintains fluidity of playback.

Third, as explained elsewhere in the Decision, Petitioner relies on Mattavelli's modified decoding processes for certain aspects of the steps by which fluidity, video quality, and audio quality are maintained: adjusting "playback" (limitation 1[c.iii]) and "utilizing optimized decoding processes to maintain quality playback" (limitation 1[c.iv]). *See supra* Section II.D.3.b.(2); *infra* Section II.D.3.d. In doing so, Petitioner explains "how the *combination* of Carmel's and Mattavelli's teachings work together in a complementary way to mitigate separate but related issues that can impact playback fluidity (and quality), including (1) variations in available network bandwidth and (2) processing and memory limitations in the decoder device." *See* Pet. 45–54; Reply 13. Carmel's disclosures pertaining to the former are discussed above. With respect to the latter, Mattavelli discloses that its CGD techniques are designed to "provide results of poorer quality when the results of the desirable quality cannot be obtained in real time. When the complexity of the task exceeds the available processing power, *real-time services*, possibly of degraded quality, are nevertheless guaranteed *respecting all real-time constraints*." Ex. 1004, 2309 (emphasis added), 2311–12 (describing a goal to "respect the real-time constraints with the lowest degradation in the video/audio content"). In other words, quality may be "temporarily degraded to ensure that the fluidity or real-time continuity of the playback is maintained." *See* Ex. 1002 ¶ 201, 204–205, 215–216. That

further supports Petitioner's position that the combined system of Carmel and Mattavelli would maintain fluidity of playback.

Petitioner's explanation regarding limitation 1[c.ii], supported by the testimony of Dr. Polish, which we credit, is persuasive. *See* Pet. 35–40, 50–54; Ex. 1002 ¶¶ 173–185, 201–205, 215–216. Based on the full trial record, we find that Carmel and Mattavelli teach limitation 1[c.ii].

d) Disputed Limitation 1[c.iv]

Limitation 1[c.iv] recites “utilizing optimized decoding processes to maintain quality playback.” Ex. 1001, 19:38–39. Petitioner argues that

Mattavelli teaches CGD methods where degraded, less computationally intensive algorithms and processes for decoding compressed multimedia data are used during periods where the decoding processing needs exceed the available processing resources, where the visual quality of the video output is possibly temporarily degraded to ensure that the fluidity or real-time continuity of the playback is maintained.

Pet. 46 (citing Ex. 1004, 2309, 2312). Petitioner contends that Mattavelli identifies decoding processes that can be simplified, such as the IDCT, and describes “two strategies for determining when (and to what extent) such CGD techniques should be employed: the first monitors the execution of the decoding processes and the second uses complexity information carried in the frames or VOP headers, as can be done in MPEG-4 systems.” *Id.* at 47–49 (citing Ex. 1004, 2309–12, Figs. 2–3). Therefore, according to Petitioner, Mattavelli teaches “maintaining the quality and fluidity of playback” via “optimized decoding processes” (i.e., CGD techniques). *Id.* at 48–49. Lastly, Petitioner argues that, if limitation 1[c.iv] requires both video and audio optimization, Mattavelli at least suggests doing so because video and audio compression share many of the same principles, and a

person of ordinary skill in the art “would have appreciated that the same CGD principles taught by Mattavelli would be beneficial to employ in circumstances where the audio decompression demands were high/complex but the decoder processing resources were overstretched.” *Id.* at 49–50 (citing Ex. 1004, 2311–12; Ex. 1002 ¶¶ 206–207).

Patent Owner does not dispute that Mattavelli’s CGD techniques constitute “optimized decoding processes,” but contends that they are not utilized “to maintain quality playback.” *See* PO Resp. 46–47. Patent Owner argues that Mattavelli’s decoding processes “degrade” playback quality, and degrading is not “maintain[ing]” fluidity and video quality (as recited in limitation 1[c.ii]) or “maintain[ing]” quality playback (as recited in limitation 1[c.iv]). *Id.* at 43–47 (citing Ex. 1004, 2309 (disclosing, for example, “provid[ing] results of possibly lower visual quality . . . when the required processing needs exceed the available processing resources” and a goal of “guarantee[ing] real-time video decoding with possible degradation of the image quality, . . . without lo[sing] parts of the image content”); Ex. 2014 ¶¶ 119–121); Sur-Reply 14–17 (citing Ex. 1001, 4:7–23; Ex. 1008, 582, 589).

Patent Owner further contends that “Petitioner conflates real-time continuity of playback with maintaining playback quality.” PO Resp. 46. According to Patent Owner,

[t]he fact that playback is in real-time does not mean that playback quality is maintained. These are two different concepts. Real-time implies that playback happens without substantial delay. Maintaining quality playback in the claims relates to optimized decoding processes. . . . A real-time broadcast may still be choppy or freeze during playback. . . . For example, live sports broadcasts sometimes freeze or skip frames.

In these cases, the broadcast may be real-time, but quality playback is not maintained.

Id. (citing Ex. 2014 ¶ 124; Ex. 2029, 2–3).

Patent Owner, however, does not explain, and we do not see, why the two uses of “maintain” in claim 1 (“fluidity, video quality and audio quality are maintained by [performing the three steps]” and “utilizing optimized decoding processes to maintain quality playback”) preclude *any* change in *any* of the characteristics. *See* Reply 20; Ex. 1085, 44:7–13 (Mr. Goldman testifying that “quality playback . . . refers to [the] fluidity, audio quality, and video quality” recited earlier in the claim). Indeed, claim 1 plainly contemplates changes to playback, as the preceding limitation 1[c.iii] recites “adjusting . . . playback.” *See* Ex. 1001, 19:35.

Moreover, the Specification of the ’849 patent indicates that maintaining quality playback “encompasses processes . . . where video quality is degraded when necessary to maintain or preserve other playback characteristics like fluidity or audio quality.” *See* Reply 21; PO Resp. 63–64 (acknowledging that “quality playback is maintained by using complexity reducing decoding processes,” and “the [S]pecification teaches that, in certain embodiments, different levels of quality may be maintained based on the processing power of the mobile device itself”); Ex. 2014 ¶ 85 (testifying to the same). The Specification describes those modified decoding processes as “shortcuts” that “decrease output quality” to various degrees, where the client decoder “dynamically adjusts how many shortcuts” are taken as needed. Ex. 1001, 4:7–16. “These short-cuts are specifically designed to drastically reduce the number of computations necessary at certain critical steps in the video decoding process at the cost [of] video output quality,” which “allows the video decoder to scale in complexity

based on the processing power of the device being used.” *Id.* at 4:16–21; *see also id.* at 12:19–29 (describing modified decoding processes “when less quality but faster processing is required”), 13:60–14:15 (describing shortcuts with “some impact on image quality” or “drastic reductions in display quality”), Fig. 13. Indeed, the Specification discloses as an example that “a faster but less accurate IDCT algorithm can be used”—just like Mattavelli, which similarly describes the IDCT as a process that can be simplified to save computational resources when needed. *Compare id.* at 12:12–15, 12:60–13:14 (faster processing time but “reduced video output quality”), *with Ex.* 1004, 2309–10.

Patent Owner’s position that the shortcuts in the ’849 patent Specification merely “streamline” the IDCT and other decoding steps “without sacrificing output quality” is contradicted by the portions cited above stating that the shortcuts can result in “reduc[ed],” “decreas[ed],” or “less[ened]” playback quality. *See* Sur-Reply 16.

Further, even if Patent Owner’s view was correct, Mattavelli’s “CGD techniques are not intended to be run all the time, but only when its algorithms determine it is necessary ‘to guarantee real-time performance in [the] presence of peaks of decoding complexity or as a way to ease the scheduling problems given by temporary fluctuations of the available processing power.’” *See* Pet. 46; Reply 22 (quoting Ex. 1004, 2312). Thus, when a video stream is being decoded that does not exhibit processor constraints, the combined system implementing Mattavelli’s decoding process would decide not to apply the CGD techniques and quality would not be reduced. The system’s decoding processes are nevertheless “optimized” because the CGD techniques are available and considered for use. *See Hewlett-Packard Co. v. Mustek Sys., Inc.*, 340 F.3d 1314, 1326

(Fed. Cir. 2003) (“Just as ‘an accused product that sometimes, but not always, embodies a claimed method nonetheless infringes,’ . . . a prior art product that sometimes, but not always, embodies a claimed method nonetheless teaches that aspect of the invention.”).

Finally, as explained above for limitation 1[c.ii], we disagree that Petitioner improperly conflates real-time playback with fluid, quality playback, as there is evidence in the record connecting the two. *See supra* Section II.D.3.c. Mattavelli does so as well, stating, for instance, that its “goal is to guarantee *real-time* video decoding with possible degradations of the image quality . . . without lo[os]ing parts of the image content,” as “abrupt interruptions” caused by skipping frames “are perceptually very annoying” to the viewer. *See* Ex. 1004, 2309–10 (emphasis added), 2312 (“Obviously, the implementation of CGD features are not proposed to be used at their maximum degradation rate but as [a] tool able to guarantee *real-time* performance in [the] presence of peaks of decoding complexity or as a way to ease the scheduling problems given by temporary fluctuations of the available processing power.” (emphasis added)).

Petitioner’s explanation regarding limitation 1[c.iv], supported by the testimony of Dr. Polish, which we credit, is persuasive. *See* Pet. 45–50; Ex. 1002 ¶¶ 199–208. Based on the full trial record, we find that Carmel and Mattavelli teach limitation 1[c.iv].

e) Conclusion

Based on all of the evidence of record, we determine that Petitioner has proven, by a preponderance of the evidence, that claim 1 would have been obvious over Carmel and Mattavelli under 35 U.S.C. § 103(a).

4. *Independent Claims 6 and 7*

Independent claim 6 is similar to claim 1, but recites a “multimedia player comprising: computer executable instructions stored on a non-transitory computer readable medium which when executed by a processor” perform three steps similar to those of claim 1, i.e., “request[ing] transmission of multimedia objects,” “receiv[ing] audio and video segments,” and “play[ing] back received multimedia objects.” Ex. 1001, 20:1–21. Independent claim 7 recites a “system comprising at least one centralized content server transmitting multimedia objects,” “said multimedia objects including segmented audio and video, and parameters and supplied host path identification,” and “at least one multimedia player configured to” perform similar steps. *Id.* at 20:22–44. Petitioner refers to its earlier arguments regarding claim 1, again relying on the components of Carmel (as modified by Mattavelli). Pet. 65–67. Patent Owner argues independent claims 1, 6, and 7 together. PO Resp. 31–47 (disputing limitations 1[c.ii], 1[c.iii], and 1[c.iv] of claim 1 and “corresponding limitations” of claims 6 and 7). We disagree with Patent Owner’s arguments for the same reasons explained above. *See supra* Section II.D.3. In view of those reasons and in light of Petitioner’s arguments and supporting evidence, we determine that Petitioner has proven, by a preponderance of the evidence, that claims 6 and 7 also would have been obvious over Carmel and Mattavelli under 35 U.S.C. § 103(a). *See* Pet. 65–67; Ex. 1002 ¶¶ 256–264.

5. *Dependent Claims 2–5, 8, and 9*

Patent Owner does not argue dependent claims 2–5, 8, and 9 separately from their parent claim 1. PO Resp. 31–47. We disagree with Patent Owner’s arguments regarding claim 1 for the same reasons explained

above. *See supra* Section II.D.3. We have reviewed Petitioner’s contentions and supporting evidence, including the testimony of Dr. Polish, and determine that Petitioner has proven, by a preponderance of the evidence, that claims 2–5, 8, and 9 would have been obvious over Carmel and Mattavelli under 35 U.S.C. § 103(a), for the reasons stated by Petitioner. *See* Pet. 55–65, 67–70; Ex. 1002 ¶¶ 223–255, 265–275.

E. Alleged Obviousness Based on Carmel and Wang

1. Wang

Wang describes “a baseline MPEG-4 AVC (Advanced Video Coding) decoder based on an optimized platform-based design methodology.” Ex. 1007, 51. According to Wang, MPEG-4 AVC “provides better image quality due to its significant improvement on the coding efficiency as compared to that of MPEG-4 visual simple profile,” but because “some of the AVC modules consume considerable power, it is challenging to realize [a] real-time AVC encoder and decoder.” *Id.* Also, AVC module performance “is seriously constrained by the low computation power and small memory for mobile devices.” *Id.* To address those constraints and “increase overall throughput,” Wang proposes “an optimized platform-based architecture with macroblock (MB) level pipelining” for a “baseline MPEG-4 AVC decoder,” where “a general-purpose processor controls the decoding processes and dedicated acceleration modules are used to speed up the computationally intensive tasks.” *Id.* Wang states that it “optimize[s] the decoder software by enhancing the frame buffer management, boundary padding, and content aware inverse transform,” and uses dedicated acceleration modules “[t]o speed up motion compensation and inverse transform.” *Id.* at 51–54, Fig. 1.

2. Claim 1

Petitioner asserts that claims 1–9 also are unpatentable over Carmel and Wang, relying on the supporting testimony of Dr. Polish.¹¹ Pet. 70–78; *see* Ex. 1002 ¶¶ 276–300. Petitioner argues that Carmel and Wang collectively teach all of the limitations of claim 1, and that it would have been obvious to combine the references’ teachings to achieve the method of claim 1. Pet. 70–73, 75–78. Patent Owner responds that Carmel and Wang do not teach certain limitations of claim 1 and a person of ordinary skill in the art would not have been motivated to combine their teachings in the manner asserted by Petitioner. PO Resp. 47–55.

a) *Undisputed Issues: Preamble and Limitations 1[a.i]–1[c.i]*

Petitioner incorporates its earlier analysis of Carmel’s teachings, and adds Wang as teaching aspects of limitations 1[a.i], 1[b.ii], and 1[c.iv] (and corresponding limitations in claims 6 and 7). Pet. 70–78; *see supra* Section II.D.3; *Voice Tech Corp. v. Unified Patents, LLC*, 110 F.4th 1331, 1337–38 (Fed. Cir. 2024) (allowing incorporation of a petition argument by cross-reference); *CRFD Research, Inc. v. Matal*, 876 F.3d 1330, 1345–46 (Fed. Cir. 2017) (agreeing with the petitioner that it “incorporated [an]

¹¹ Current Office policy requires Board panels in *inter partes* reviews to “address all grounds raised in the petition in their final written decisions” because, among other reasons, “this approach will promote compact decision making and ensure that [Board] panels will not be required to address grounds for the first time in the event of a remand from a Director Review decision or Federal Circuit appeal.” *See* Memorandum, “Final Written Decision Procedures for AIA Trial Proceedings,” dated July 29, 2025, available at <https://www.uspto.gov/sites/default/files/documents/20250729095727582.pdf>. Accordingly, we address all of Petitioner’s asserted grounds herein.

argument into other grounds of unpatentability . . . by direct citation to [the] argument in the petition”).

Limitation 1[a.i] recites “receiving audio and video segments encoded *in a digital encoding format* and with an encoding rate.” Ex. 1001, 19:20–21 (emphasis added). Petitioner argues that Carmel teaches encoding its multimedia data stream “using any suitable compression method known in the art,” and Wang teaches using the MPEG-4 AVC coding/compression format, which “would have been viewed as particularly well-suited . . . for multimedia streaming implementations involving wireless transmission to a mobile client . . . due to its high compression efficiency.” Pet. 71 (quoting Ex. 1003, 11:9–39; citing Ex. 1007, 51).

Limitation 1[b.ii] recites that “said multimedia objects are located using http and received by said multimedia player from servers *using a wireless connection*.” Ex. 1001, 19:26–28 (emphasis added). Petitioner argues that Wang, like Carmel, teaches “a multimedia player/decoder receiving compressed multimedia data via a wireless connection.” Pet. 71–72 (citing Ex. 1007, 51).

Patent Owner in its Response does not dispute that Carmel and Wang teach the preamble and limitations 1[a.i]–1[c.i]. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *Dynamic Drinkware*, 800 F.3d at 1378. Having reviewed Carmel and Wang, on the complete trial record, we agree with Petitioner’s analysis, as supported by the testimony of Dr. Polish, which we credit. *See* Pet. 70–72; Ex. 1002 ¶¶ 277–278.

b) Disputed Limitations 1[c.ii] and 1[c.iii]

Patent Owner relies on its earlier arguments that Carmel does not teach limitations 1[c.ii] and 1[c.iii]. PO Resp. 47–48; Sur-Reply 20.

We disagree with those arguments for the reasons explained above. *See supra* Sections II.D.3.b–c.

c) Disputed Limitation 1[c.iv]

Limitation 1[c.iv] recites “utilizing optimized decoding processes to maintain quality playback.” Ex. 1001, 19:38–39. Petitioner argues that Wang’s decoder “optimizes the decoding hardware and software so that resource-constrained mobile devices can decode MPEG-4 AVC encoded data fast enough to utilize this compression standard and benefit from the higher image quality it can provide.” Pet. 72. To support its position, Petitioner cites Wang’s disclosure that its “platform[-]based design method [is used] to increase overall throughput” to address constraints due to “the low computation power and small memory for mobile devices.” *Id.* (quoting Ex. 1007, 51). Petitioner further contends that Wang repeatedly states that its decoder “optimize[s]” the decoding process to achieve the “goal of increased throughput/decoding speed of the AVC codec.” *Id.* at 72–73 (citing Ex. 1007, 51 (“optimized platform-based design methodology,” “optimize the decoder software”), 52 (“optimized AVC decoder”), 53–54 (“Software Optimization”)). Lastly, Petitioner argues that, if limitation 1[c.iv] requires both video and audio optimization, Wang further suggests using optimized audio decoding processes as well, particularly on a “computationally-constrained mobile device.” *Id.* at 73 (citing Ex. 1002 ¶ 283).

Patent Owner responds that “Wang’s decoder is intended to improve throughput, not maintain quality playback,” as recited in limitation 1[c.iv]. PO Resp. 48–51 (citing Ex. 1007, 51, 53–54; Ex. 2014 ¶¶ 132–135). They are not the same, according to Patent Owner, because “[w]hile improving

throughput or decoding speed can help maintain quality playback, it does not automatically correlate to maintaining quality playback. Other factors, like processing power, multimedia player configuration, and decoding efficiency would also contribute.” *Id.* at 50. Patent Owner also points out that Wang only mentions “quality” in relation to MPEG-4 AVC, not in connection with its decoder. *Id.* at 51 (citing Ex. 1007, 51). Finally, Patent Owner contends that, even if Wang teaches limitation 1[c.iv], that limitation is the third step recited in claim 1 by which “fluidity, video quality and audio quality are maintained,” and Wang does not maintain video quality (because it just “attempts to improve throughput and decoding speed”) or audio quality, or discuss fluidity. *Id.* at 51–52.

We disagree with Patent Owner. First, Patent Owner acknowledges that improving throughput or decoding speed can “help” maintain quality playback. PO Resp. 50. Thus, it is unclear why using Wang’s optimized AVC decoder would not constitute “utilizing optimized decoding processes *to maintain quality playback.*” Patent Owner does not quantify how much improved throughput or decoding speed would have to contribute to the quality of playback to meet limitation 1[c.iv]. Instead, Patent Owner only states that other factors contribute as well, but does not explain why they would all need to be considered to determine whether quality playback is maintained or quantify how much they would each need to contribute. *See id.*

Second, similar to our analysis of the combination of Carmel and Mattavelli, *see supra* Section II.D.3.d, we determine that Patent Owner’s arguments are inconsistent with how the Specification of the ’849 patent describes the use of optimized decoding processes. The Specification describes using “shortcuts/decoding optimizations that

decrease decoding complexity and video quality in order to *increase* decoding speed.” See Reply 24–25; Ex. 1001, 4:7–19 (describing exemplary optimized decoding processes that “decrease output quality the most but have the most impact on *decoding speed*” (emphasis added)), 12:19–29 (describing exemplary optimized decoding processes that “use[] faster motion compensation without bilinear interpolation when less quality but *faster processing* is required” (emphasis added)), 12:60–13:14 (describing optimized IDCT processing that “ignore[s] certain input values of insufficient energy to make a very noticeable impact on the output image and further *decrease processing time*” (emphasis added)), 13:51–59 (describing methods for “*improving the speed* of computation at the expense of output quality” (emphasis added)). Wang’s optimized AVC decoding that increases decoding speed, therefore, maintains quality playback in a manner similar to the exemplary processes disclosed in the Specification of the ’849 patent.

Third, to the extent Patent Owner contends that Wang’s optimized AVC decoding alone does not teach maintaining “fluidity, video quality and audio quality” (introduced in limitation 1[c.ii]), we again note that Petitioner relies on the combination of Carmel and Wang for the full set of three steps recited in claim 1 by which fluidity, video quality, and audio quality are maintained. See Pet. 35–45, 72–73, 75–78; *Palo Alto Networks*, 122 F.4th at 1386; *Mouttet*, 686 F.3d at 1333.

Petitioner’s explanation regarding limitation 1[c.iv], supported by the testimony of Dr. Polish, which we credit, is persuasive. See Pet. 72–73; Ex. 1002 ¶¶ 279–281. Based on the full trial record, we find that Carmel and Wang teach limitation 1[c.iv].

d) Disputed Issue: Motivation to Combine

Petitioner explains in detail, with supporting testimony from Dr. Polish, why and how a person of ordinary skill in the art would have had reason to combine the teachings of Carmel and Wang, with a reasonable expectation of success. *See* Pet. 75–78; Ex. 1002 ¶¶ 292–300. Specifically, an ordinarily skilled artisan would have modified Carmel’s system to use “Wang’s optimized AVC decoder to play back high-quality AVC-encoded multimedia data,” which would have been “an improvement over alternative AVC decoders running on the same types of processors.” Pet. 75–76. Petitioner contends that Carmel and Wang are both directed to processing multimedia data playback “for the appreciation of a user,” while providing the highest perceived audio and video output quality possible in view of system constraints to ensure playback continuity. *Id.* at 76 (citing Ex. 1003, 7:25–26, 7:35–49, 10:48–54, 11:9–18, 11:24–52, Figs. 3D, 6B; Ex. 1007, 51–55). Petitioner argues that Wang’s “AVC format/standard would have been viewed as particularly well-suited for multimedia streaming implementations involving wireless transmission to a mobile client due to its high compression efficiency.” *Id.* at 76–77 (citing Ex. 1007, 51).

Petitioner further asserts that a person of ordinary skill in the art would have appreciated that Carmel and Wang “complement[]” each other because Carmel addresses constraints on available network bandwidth, and Wang addresses limits on available processing resources at the client/multimedia player. Pet. 77 (citing Ex. 1003, 7:36–41, 9:6–9, 9:13–17, 10:64–11:22, 11:40–12:17, Fig. 6B; Ex. 1007, 51–55). According to Petitioner, an ordinarily skilled artisan would have been motivated to combine the complementary teachings in Carmel and Wang to create a more robust streaming system that addresses both “potential bottlenecks”—from

bandwidth constraints and client processing limits—to provide the best possible playback experience. *Id.* (citing Ex. 1002 ¶¶ 295–298). And, as with the combination of Carmel and Mattavelli, Carmel’s statement that multimedia playback should be achieved “preferably with only a minimal necessary transmission and decoding delay” is an express disclosure that would have motivated a person of ordinary skill in the art to combine the references’ teachings. *See id.* (citing Ex. 1002 ¶ 299); Ex. 1003, 10:50–54. Finally, Petitioner argues that incorporating Wang’s decoder optimization techniques into Carmel’s system would have been

an obvious combination of known methods to address a known set of related issues (i.e., constraints on both network and decoding processing bandwidth) to yield predictable results—*i.e.*, a system where a mobile client multimedia player/decoder advantageously optimizes both the available network bandwidth (using the highly-efficient AVC standard) and the available decoding resources to facilitate/enable the decoding/playing/outputting AVC-encoded multimedia data on a mobile wireless device.

Pet. 78 (citing Ex. 1002 ¶ 300).

Patent Owner responds that a person of ordinary skill in the art would not have been motivated to combine the teachings of Carmel and Wang because “Carmel seeks to implement media streaming over *existing* client hardware and software,” whereas Wang proposes a new “‘prototype decoder’ that relies on improved hardware and software.” PO Resp. 52–53 (emphasis added) (citing Ex. 1003, 1:11–13, 1:43–47, 1:51–54, 6:38–40; Ex. 1007, 51, 52, Fig. 2; Ex. 2014 ¶¶ 138–139). Patent Owner further argues that the asserted combination is “fundamentally incompatible with the teachings and goals of Carmel,” as “incorporating Wang’s hardware-dependent decoder into Carmel’s system would defeat one of the

primary purposes of Carmel—namely, enabling seamless streaming to diverse client devices (i.e., ‘*conventional* personal computers or workstations’).” *Id.* at 53–54 (citing Ex. 2014 ¶ 140); Sur-Reply 20–21.

In Patent Owner’s view, modifying Carmel’s system would require all of its clients “to obtain and install Wang’s specific platform-based prototype decoder in order to receive streamed multimedia.” PO Resp. 54–55 (citing Ex. 2014 ¶ 141). Patent Owner argues that “every customer of Carmel’s Internet service provider would have to buy new hardware with Wang’s prototype decoder architecture.” *Id.*

We disagree that Carmel’s intended purpose is as narrow as Patent Owner contends. Carmel states that its system can use a “common, existing server and network infrastructure,” and “conventional personal computers or workstations” as client machines, but the *software* (Java applet or plug-in) used by the client is designed specifically to implement the disclosed processes. *See* Reply 27–28; Sur-Reply 20; Ex. 1003, 1:23–58 (describing a goal of avoiding the need for a “dedicated encoder and broadcast server”), 6:38–44, 7:12–17 (“[C]lients 30 will typically need only [to] add a Java applet or plug-in to their existing Web browsers, as described [in Carmel], in order to receive and play back the broadcast.”), 10:28–34 (“The operation of client [30] is controlled by a Java applet, which may be downloaded from server 36, and includes facilities for carrying out the steps shown in [Figures 6A and 6B].”). Thus, Carmel contemplates some customization of the client device. Although Wang is both a hardware and software solution, we do not see why that would make it incompatible with, or defeat the intended purposes of, Carmel’s system, which customizes the software at the client. *See* Ex. 1007, 51 (disclosing a methodology that “jointly optimize[s]

the software and hardware design of the decoder”), 53–54 (disclosing the partition of tasks between hardware and software).

Also, Carmel broadly states that its server compresses video and audio data “using *any* suitable compression method known in the art,” which the client then decodes. *See* Ex. 1003, 10:45–48, 11:7–8, 11:27–39 (emphasis added). This provides an additional reason why a person of ordinary skill in the art would have found the references compatible and looked to a reference like Wang, which discloses the MPEG-4 AVC compression method.

In addition, Wang uses a common hardware platform and describes its decoder as an improvement over existing AVC decoders of the time. *See* Ex. 1007, 51 (“For comparison, the proposed prototype decoder and MPEG-4 AVC reference decoder are evaluated on an [Advanced RISC Machine (ARM)] platform, which is one of [the] most popular portable devices. Our experiments show that the throughput of the MPEG-4 reference decoder can be improved by 6 to 7 times. . . . With the dedicated accelerators, the overall throughput is increased by about 30% . . .”), 52 (“[T]he ARM platform is one of the most typical portable devices and takes almost 75% of the market for . . . mobile devices.”). We agree with Petitioner and Dr. Polish that an ordinarily skilled artisan would have recognized that incorporating Wang’s optimized AVC decoder into Carmel’s system would be an improvement; would have understood Carmel and Wang to be directed to the same goal of “providing the highest practicable streaming quality audio and video in view of device and/or system constraints”; and “would have been motivated to use the MPEG-4 AVC format/standard taught by Wang (along with Wang’s optimized AVC decoder) in the systems and methods taught by Carmel, in particular for

wireless/mobile clients, because of its high compression efficiency which permits higher image quality with less data transfer.” *See* Pet. 76–77; Ex. 1002 ¶ 292–294; Ex. 1003, 7:36–49, 10:48–54, 11:9–18; Ex. 1007, 51–52.

With respect to Patent Owner’s assertion that all “customer[s]” would need to “buy” new hardware with Wang’s decoder, whether a motivation to combine exists does not depend on whether a viable commercial product can be created. *See* PO Resp. 54–55. Indeed, claim 1 requires only a single “multimedia player” requesting and receiving multimedia objects. Obviousness “does not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention.” *Honeywell Int’l Inc. v. 3G Licensing, S.A.*, 124 F.4th 1345, 1355 (Fed. Cir. 2025). “Rather, ‘the question is whether there is something in the prior art as a whole to suggest the *desirability*, and thus the obviousness,’ of the claimed invention.” *Id.* (emphasis added). Further, “[t]he motivation-to-combine analysis is a flexible one. ‘[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.’” *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1379 (Fed. Cir. 2023) (quoting *KSR*, 550 U.S. at 420).

We find particularly persuasive in this regard Petitioner’s contention that, like the asserted combination of Carmel and Mattavelli, a person of ordinary skill in the art would have found Carmel and Wang to have “complementary” teachings. *See* Pet. 52, 77. Specifically, Carmel addresses constraints due to limited available network bandwidth, and Wang addresses constraints due to limited processing resources at the client. *See, e.g.,*

Ex. 1003, 7:36–42 (clients 30 “monitor the time codes as the file is received, in order to ensure that the transmission or reception is ‘keeping up’ with the input of the data to the computer” and, “[i]n the event that a lag is detected, steps are taken to increase the data transmission or reception rate”), 10:64–11:22, 11:40–12:17; Ex. 1007, 51 (“To address such constraints with limited resource[s], we adopt [a] platform[-]based design method to increase overall throughput.”); Ex. 1002 ¶¶ 296–298. Dr. Polish explains the combination of complementary teachings as follows:

A person of ordinary skill in the art would have been motivated to combine the complementary methods and techniques taught by Carmel and Wang to form a streaming system that is more robust and better able to handle multiple potential bottlenecks or constraints in the progress of a multimedia bitstream from its source to the end user across a network in a way that provides the best possible playback experience. A person of ordinary skill in the art would have recognized that a multimedia streaming system would potentially be subject to constraints on (i) available network bandwidth, (ii) multimedia player processing resources, or (iii) both at the same time, and would have been motivated to use MPEG-4 AVC encoding for its compression efficiency (allowing one to transmit higher quality video using less bandwidth) and apply Wang’s teachings regarding an optimized AVC decoder to the multimedia player/decoder on a (processing power-constrained) mobile client 30 taught and rendered obvious by Carmel and Wang to allow such a decoder to decode this AVC-encoded data.

Ex. 1002 ¶ 298. We credit Dr. Polish’s testimony regarding a motivation to combine Carmel and Wang, as it is explained in sufficient detail and supported by specific disclosures in the references, for the reasons explained above. *See id.* ¶¶ 292–300.

Based on the full trial record, we conclude that Petitioner has shown sufficiently that a person of ordinary skill in the art would have been

motivated to modify Carmel's method to use Wang's optimized AVC decoder and would have had a reasonable expectation of success in doing so. An ordinarily skilled artisan would have been motivated to look to a reference like Wang to find an advantageous compression method to use, recognized that Wang's AVC decoder would have been an improvement, and found the teachings of Carmel and Wang complementary, as they address different sets of constraints in a multimedia streaming system. *See* Pet. 75–78. Incorporating Wang's teachings into Carmel would have provided various benefits, such as creating a more robust, adaptable, and efficient multimedia streaming system. *See id.*

e) Conclusion

Based on all of the evidence of record, we determine that Petitioner has proven, by a preponderance of the evidence, that claim 1 would have been obvious over Carmel and Wang under 35 U.S.C. § 103(a).

3. Claims 2–9

As explained above, independent claims 6 and 7 recite limitations similar to those of claim 1, and the parties argue the independent claims together. *See* Pet. 70–73, 75–78; PO Resp. 47–55. Petitioner relies on Wang as additionally teaching certain aspects of dependent claims 3, 4, 5, 8, and 9. Pet. 73–75. Patent Owner does not make any additional arguments with respect to the dependent claims. We have reviewed Petitioner's contentions and supporting evidence, including the testimony of Dr. Polish, and determine that Petitioner has proven, by a preponderance of the evidence, that claims 2–9 would have been obvious over Carmel and Wang

under 35 U.S.C. § 103(a), for the reasons stated by Petitioner. *See* Pet. 70–78; Ex. 1002 ¶¶ 276–300.

F. Alleged Obviousness Based on Carmel, Wang, and Wolters

Petitioner asserts that claims 1–9 also are unpatentable over Carmel, Wang, and Wolters, relying on the supporting testimony of Dr. Polish. Pet. 78–80; *see* Ex. 1002 ¶¶ 301–304. Petitioner incorporates its earlier analysis of Carmel and Wang, and adds Walters as additionally teaching “optimized decoding processes” as recited in limitation 1[c.iv] (and corresponding limitations 6[c.iv] and 7[c.iv]). Pet. 78–80; *see supra* Section II.E; *Voice Tech*, 110 F.4th at 1337–38; *CRFD Research*, 876 F.3d at 1345–46.

Petitioner argues that “to the extent” the phrase “optimized decoding processes” requires “both optimized video *and audio* decoding processes,” Wolters teaches the High-Efficiency MPEG Advanced Audio Coding (HE AAC) audio compression standard, which ““extend[ed] the reach of high quality MPEG-4 Audio to much lower bitrates’ enabling higher quality compressed audio with less data.” Pet. 78–79 (quoting Ex. 1041, 1; citing Ex. 1041, 12 (stating that MPEG-4 HE AAC “optimized source code for both encoders and decoders is available for license” and “[o]ptimized binary implementations . . . are presently available”)). Petitioner explains in detail, with supporting testimony from Dr. Polish, why and how a person of ordinary skill in the art would have had reason to combine the teachings of Wolters with those of Carmel and Wang, with a reasonable expectation of success. *See id.* at 78–80; Ex. 1002 ¶¶ 302–304. Petitioner contends that a person of ordinary skill in the art would have been motivated to incorporate “optimized processes for decoding HE AAC data,” as taught by

Wolters, into the combined system of Carmel and Wang “for the same reasons a [person of ordinary skill in the art] would be motivated to use AVC video coding—*e.g.*, because it provides high compression efficiency allowing transmission of high-quality audio using less data.” Pet. 79–80 (citing Ex. 1002 ¶ 304; Ex. 1041, 13). Petitioner asserts that Wolters explicitly suggests such a combination because it discloses that “[b]y coupling HE AAC with MPEG-4 Video, more bits can be allocated to the video signal without degrading the quality of the audio signal” and, “[c]ombined with the new [AVC standard], even more significant gains in quality are possible.” *Id.* (quoting Ex. 1041, 13). According to Petitioner, incorporating Wolters’s HE AAC techniques “would maximize the available decoding processing resources to enable use of this standard and deliver the highest quality possible/practicable.” *Id.* at 80.

Patent Owner responds that Wolters teaches two variants of HE AAC: Low-Power (LP), which “results in a reduced audio quality but . . . requires less computational resources for both memory and complexity,” and High-Quality (HQ), which “offers better audio quality at the cost of greater computational complexity.” PO Resp 55–56 (quoting Ex. 1041, 13). As to HE AAC LP, Patent Owner argues that it “reduces audio quality” rather than “maintain[ing]” audio quality. *Id.* (citing Ex. 2014 ¶¶ 144–145). As to HE AAC HQ, Patent Owner contends that a person of ordinary skill in the art “would not have implemented” it “in the mobile context” because HE AAC HQ requires “greater computational complexity” to achieve higher audio quality, which conflicts with “the ’849 [p]atent’s core premise and repeated disclosures concerning the severe processing constraints of mobile devices.” *Id.* at 56–58 (citing Ex. 1001, 1:51–52, 2:13–15, 4:50–54, 10:26–28; Ex. 1041, 6, 13; Ex. 2014 ¶¶ 146–148).

Patent Owner’s arguments are unavailing. Regarding HE AAC LP, for similar reasons to those explained above, we disagree that the word “maintain[ing]” precludes any change to audio quality at all. *See supra* Section II.D.3.d. Also, HE AAC LP only has reduced audio quality as compared to the other variant HE AAC HQ—not, for example, as compared to any other standard used by Carmel or Wang. *See* Ex. 1041, 13 (“[T]he computational complexity of the Low power decoder does not exceed the requirements of a plain AAC decoder.”).

Regarding HE AAC HQ, we do not see why additional complexity would have dissuaded a person of ordinary skill in the art from using Wolters’s audio decoding techniques. Wolters expressly states that HE AAC HQ “should be used in situations where audio quality is more important,” indicating that one of skill would choose which variant to use based on the relative importance of audio quality. *See* Ex. 1041, 13. Further, like Wang’s disclosure of improved functionality, Wolters describes the use of HE AAC in general as an improvement over existing standards of the time. *See supra* Section II.E.2.c; Ex. 1041, 1 (disclosing that HE AAC “extend[ed] the reach of high-quality MPEG-4 Audio to much lower bitrates,” i.e., higher quality compressed audio could be obtained with less data). And Wolters explicitly suggests combining HE AAC for audio with MPEG-4 for video. *See* Ex. 1041, 13 (“The unique capability of HE AAC to achieve high quality at very low bitrates not only enhances existing markets but also enables new markets for digital audio. . . . By coupling HE AAC with MPEG-4 Video, more bits can be allocated to the video signal without degrading the quality of the audio signal. . . . Combined with the new [AVC standard], even more significant gains in quality are possible.”).

Regardless of which of the two variants is used, we are persuaded that a person of ordinary skill in the art would have been motivated to use HE AAC audio coding, and optimized decoding processes using that standard, in the combined system of Carmel and Wang because doing so would “provide[] high compression efficiency allowing transmission of high-quality audio using less data” and “maximize the available resources to . . . deliver the highest quality video and audio playback experience possible/practicable.” *See* Pet. 79–80; Ex. 1002 ¶ 304. We credit Dr. Polish’s testimony regarding a motivation to combine with Wolters, as it is explained in sufficient detail and supported by specific disclosures in the reference. *See* Ex. 1002 ¶¶ 302–304.

Finally, Patent Owner asserts that Petitioner does not identify anything in Wolters that maintains “fluidity” and “video quality” (introduced in limitation 1[c.ii]). PO Resp. 56. Again, Petitioner relies on a combination of Carmel, Wang, and Wolters, not Wolters alone, for the full set of three steps recited in claim 1 by which fluidity, video quality, and audio quality are maintained. *See* Pet. 35–45, 72–73, 75–80; *Palo Alto Networks*, 122 F.4th at 1386; *Mouttet*, 686 F.3d at 1333.

We have reviewed Petitioner’s contentions and supporting evidence, including the testimony of Dr. Polish, and determine that Petitioner has proven, by a preponderance of the evidence, that claims 1–9 would have been obvious over Carmel, Wang, and Wolters under 35 U.S.C. § 103(a). *See* Pet. 78–80; Ex. 1002 ¶¶ 301–304.

G. Additional Obviousness Grounds

Petitioner asserts that claims 1–9 also are unpatentable over (1) the combination of Carmel, Wang, Wolters, Guo, Yu, and Forecast, and (2) the

combination of Carmel, Mattavelli, Guo, Yu, and Forecast, relying on the supporting testimony of Dr. Polish. Pet. 80–86; *see* Ex. 1002 ¶¶ 305–315. Petitioner incorporates its earlier analysis of the underlying combinations of Carmel, Wang, and Wolters, and Carmel and Mattavelli, and relies on additional teachings in Guo, Yu, and Forecast. Pet. 80–86; *see supra* Sections II.D–F; *Voice Tech*, 110 F.4th at 1337–38; *CRFD Research*, 876 F.3d at 1345–46.

First, Petitioner argues that “to the extent” limitation 1[b.ii] (“wherein said multimedia objects are located using http and received by said multimedia player from servers using a wireless connection”) and similar limitations 6[b.ii] and 7[b.ii] require that multimedia objects be received from “a plurality of servers,” Guo teaches the use of multiple helper servers. Pet. 80–82. Petitioner contends that Guo teaches “a multimedia stream . . . divided into smaller chunks/segments and that copies of these chunks are stored/cached on multiple helper servers that work together to transmit the full data stream to a client upon request.” *Id.* (citing Ex. 1051, code (57), 2:54–3:8, 6:24–26, 7:11–16, Figs. 2, 5a–5b). A person of ordinary skill in the art would have been motivated to use multiple host servers in Carmel’s system, according to Petitioner, to achieve a “faster, more robust, [and] adaptable” system that is “better able to ensure that sufficient bandwidth/download rates are maintained and that the series of multimedia objects are received by a client 30/media player in the proper sequence” with minimal delay. *Id.* at 82–83 (citing Ex. 1002 ¶¶ 307–309; Ex. 1051, 2:34–50, 3:1–8, 5:11–16, 11:24–27).

Second, claims 3 and 8 recite additional limitations pertaining to transcoding a live multimedia stream. Claim 3 recites that

the multimedia objects are created from a live multimedia stream that is transcoded into an optimal digital format at an optimal encoding rate reflecting available network bandwidth and converting the input multimedia stream into audio and video segments by splitting the encoded stream into intervals for access by wireless clients.

Ex. 1001, 19:43–49. Claim 8 recites a similar limitation. *Id.* at 20:45–50.

Petitioner argues that “to the extent” the term “transcoded” in claims 3 and 8 requires “first decoding a compressed data source and then re-encoding the data in a desired format,” Yu teaches source multimedia data that was “previously compressed using an older or different codec/compression standard, . . . where such data is first decompressed before it is re-encoded in a desired/optimal format for streaming.” Pet. 83–84 (citing Ex. 1061, code (57), 1:26–39, 1:59–62, 2:16–20, 2:44–49, Fig. 1). Petitioner contends that a person of ordinary skill in the art would have been motivated to incorporate such processing in Carmel’s system because, for example, source multimedia data “often would be compressed in some manner” and Yu’s transcoder “can beneficially extract statistics when decoding the source data that are helpful when re-encoding the data with a desired (typically more sophisticated or efficient) codec, making dual-pass encoding more efficient/less costly.” *Id.* at 84 (citing Ex. 1002 ¶ 312; Ex. 1061, 1:6–52, 1:56–2:23, 3:23–26, 9:7–19).

Third, claims 4 and 5 recite limitations pertaining to the I-frames of a MPEG-4 multimedia stream. Claim 4 recites that “a multimedia file is scanned for an I-frame, and a multimedia segment is split at the I-frame to create the video segment, together with a separate audio segment,” and claim 5 recites that “multimedia objects are split from multiple [MPEG-4] composite layer streams by scanning time intervals and splitting the

multimedia objects into video multimedia objects at next I-frames.”

Ex. 1001, 19:50–57. Petitioner argues that to the extent Carmel’s “teachings regarding splitting a media stream into slices” do not teach or suggest splitting at I-frames, Forecast teaches “that when splitting MPEG encoded audio and video streams (e.g., for purposes of splicing), the start of a new sequence (e.g., a clip that is being spliced in) is scanned and split such that it begins with an I-frame.” Pet. 84–85 (citing Ex. 1016, 2:11–16, 2:33–50, 12:7–14, 14:41–45, 22:53–65). Petitioner contends that a person of ordinary skill in the art would have been motivated to split multimedia objects/segments at I-frames in Carmel’s system to avoid “decoding problems and errors resulting from missing reference frames that would arise when a new spliced-in segment started with predicted frames” rather than an I-frame. *Id.* at 85–86 (citing Ex. 1002 ¶ 314; Ex. 1016, 2:11–16).

Patent Owner responds that Petitioner’s additional grounds fail because Petitioner only provides a rationale for incorporating the teachings of each of Guo, Yu, and Forecast into the underlying Carmel system, not the combined Carmel-Mattavelli system or Carmel-Wang-Wolters system asserted for the previous grounds. PO Resp. 58–60 (citing *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 887 (Fed. Cir. 2024) (“there must exist a motivation to combine various prior art references in order for a skilled artisan to make the claimed invention”)).

As explained above, Patent Owner does not dispute, and we find, that Carmel teaches or suggests limitations 1[b.ii], 6[b.ii], and 7[b.ii], and the additional limitations of claims 3–5 and 8. *See supra* Sections II.D.3.a, II.D.5. Regardless, for the additional asserted grounds, Petitioner provides a sufficient explanation for why a person of ordinary skill in the art would have been motivated to incorporate the teachings of Guo, Yu, and Forecast.

Each proposed modification—using multiple helper servers (based on Guo), transcoding a multimedia stream (based on Yu), and splitting multimedia objects/segments at I-frames (based on Forecast)—pertains to what occurs at the *server* that transmits the multimedia objects (for which Petitioner relies on Carmel). *See* Pet. 13–18, 22–23, 29–30, 80–86. Mattavelli, Wang, and Wolters, by contrast, pertain to processing at the *client* that receives and plays back the multimedia objects.¹² *See id.* at 44–50, 72–76, 78–80. Thus, we see no error in Petitioner premising its motivation to combine analysis on making changes to Carmel’s server.

We have reviewed Petitioner’s contentions and supporting evidence, including the testimony of Dr. Polish, and determine that Petitioner has proven, by a preponderance of the evidence, that claims 1–9 would have been obvious over Carmel, Wang, Wolters, Guo, Yu, and Forecast, and Carmel, Mattavelli, Guo, Yu, and Forecast, under 35 U.S.C. § 103(a). *See* Pet. 80–86; Ex. 1002 ¶¶ 305–315.

¹² Patent Owner argues that Petitioner relies on both Carmel and Wang for limitation 1[b.ii] but “provides no explanation for why a [person of ordinary skill in the art] would think to add a third reference [Guo], or how the addition of Guo would impact Wang’s additions.” PO Resp. 59–60. Petitioner, however, does not rely on Wang and Guo for the same portion of limitation 1[b.ii]. Petitioner argues that Wang teaches receiving multimedia objects “using a wireless connection,” but argues that Guo teaches receiving from multiple “servers.” Pet. 71–72, 80–82. Thus, there is no redundancy between Wang and Guo.

III. CONCLUSION

Petitioner has demonstrated, by a preponderance of the evidence, that claims 1–9 of the '849 patent are unpatentable on the bases set forth in the following table. In summary:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–9	103(a)	Carmel, Mattavelli	1–9	
1–9	103(a)	Carmel, Wang	1–9	
1–9	103(a)	Carmel, Wang, Wolters	1–9	
1–9	103(a)	Carmel, Wang, Wolters, Guo, Yu, Forecast	1–9	
1–9	103(a)	Carmel, Mattavelli, Guo, Yu, Forecast	1–9	
Overall Outcome			1–9	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–9 of the '849 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2025-00775
Patent 10,771,849 B2

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