

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VIMEO, INC. and IAC/INTERACTIVECORP,
Petitioners,

v.

BRITISH TELECOMMUNICATIONS PLC,
Patent Owner.

IPR2019-00833
Patent 7,974,200 B2

Before JESSICA C. KAISER, MONICA S. ULLAGADDI, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

RAEVSKY, *Administrative Patent Judge*.

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

I. INTRODUCTION

Vimeo, Inc. and IAC/InterActiveCorp (“Petitioners”) filed a Petition (Paper 2, “Petition” or “Pet.”) requesting an *inter partes* review of claims 1–7 and 10–12 of U.S. Patent No. 7,974,200 B2 (Ex. 1001, “the ’200 patent”). British Telecommunications plc (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). In view of those submissions, we instituted an *inter partes* review of claims 1–7 and 10–12. Paper 7 (“Decision”). Subsequent filings include a Patent Owner Response (Paper 9, “PO Resp.”), a Petitioner Reply (Paper 12, “Pet. Reply” or “Reply”), and a Patent Owner Sur-Reply (Paper 13, “Sur-Reply”). An oral hearing was held on June 4, 2020, and a copy of the transcript was entered into the record. Paper 19 (“Tr.”).

We have jurisdiction over this proceeding under 35 U.S.C. § 6(b). After considering the evidence and arguments of the parties, we determine that Petitioners have proven by a preponderance of the evidence that claims 1–3, 5–7, and 10–12 of the ’200 patent are unpatentable. *See* 35 U.S.C. § 316(e) (2018). We also determine that Petitioners have not proven by a preponderance of the evidence that claim 4 is unpatentable. We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a).

II. BACKGROUND

A. *Related Matters*

Petitioners and Patent Owner identify a related litigation involving the ’200 patent: *British Telecommunications plc v. IAC/InterActiveCorp*, No. 18-cv-00366 (D. Del.), filed March 8, 2018. Pet. 2; Paper 4, 2; Ex. 1002.

B. The '200 Patent

The '200 patent concerns a method of streaming video to a client while reducing the start-up delay associated with buffering data. Ex. 1001, 1:14–17. Figure 1 of the '200 patent is reproduced below.

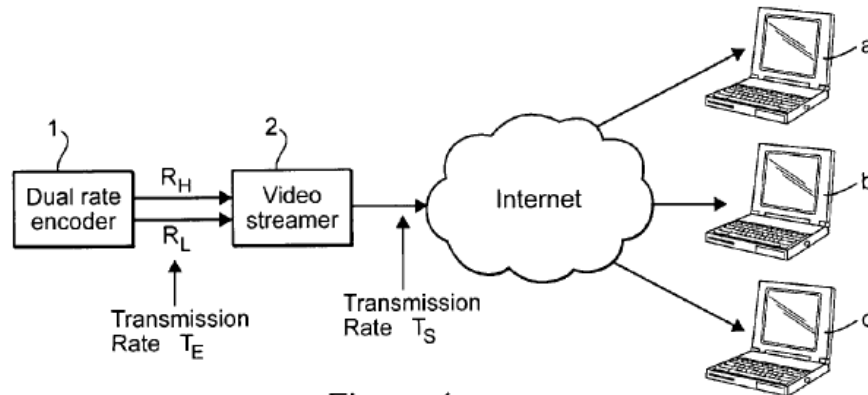


Figure 1

Figure 1 illustrates a video streaming system. *Id.* at 3:30–31, 40–41, 4:57. Dual rate encoder 1 encodes video data into two sets of data, including low bit rate data (R_L) and high bit rate data (R_H) having higher quality than the low bit rate data. *Id.* at 3:41–44, 4:1–3. Encoder 1 supplies the low bit rate data and the high bit rate data to video streamer 2, which supplies the data to client devices a, b, c over the Internet. *Id.* at 3:48–58.

Video streamer 2 reduces start-up delay by transmitting the low bit rate data at a transmission rate faster than the low bit rate. *Id.* at 5:11–26, 3:62–67, 4:10–29. Client device a, b, or c receives the low bit rate data in a client buffer and promptly reads out the data for display. *Id.* at 5:19–24. Because video streamer 2 transmits the low bit rate data faster than its bit rate, the client can display the video without first filling the buffer. *Id.* at 5:11–26. When the buffer reaches a specified level of low bit rate data, video streamer 2 switches to transmitting the high bit rate data. *Id.* at 5:27–35. The client buffer then begins to fill with the high bit rate data, placed

behind the low quality data. *Id.* at 5:36–37. The client eventually decodes the high bit rate data for display, whereupon the user will perceive an increase in picture quality. *Id.* at 5:37–40.

C. Illustrative Claims

Claims 1, 4, 5, 7, and 10 are independent. Each of claims 2, 3, 6, 11, and 12 depends from one of independent claims 1, 4, 5, 7, and 10. Claims 1 and 4 are illustrative of the challenged claims and recite:¹

1. [1.0] A method of operating a real-time communication apparatus comprising [a] a real-time data sender, [b] a real-time data display device having [c] a store, and [d] a network connecting said sender and said display device, said method comprising:

[1.1] operating said sender to transmit a plurality of first-encoding-rate data packets [a] encoded at a first encoding rate and [b] representing a first part of a real-time presentation to said display device [c] at a transmission rate higher than said first encoding rate of said first-encoding-rate data packets;

[1.2] operating said display device to:

[1.3] receive said first-encoding-rate data packets into said store;

[1.4] read-out said received first-encoding-rate data packets from said store [a] at a data rate equal to said first encoding rate of said first-encoding-rate data packets [b] for decoding [c] so as to present said first part of said real-time presentation to a user at a first level of quality;

[1.5] on said store being filled with said first-encoding-rate data to a predetermined level, sending an indication that said level has been reached to said data sender;

[1.6] operating said data sender, [a] on receipt of said indication from said display device, to send second-encoding-rate data packets [b] encoded at a second encoding rate and [c] representing subsequent parts of said real-time presentation to said display device, [d] said second encoding rate of said

¹ For convenience, we add in brackets the numbering and lettering of the claim limitations provided in the Petition. *See* Pet. 29–42, 44–57, 73–80.

second-encoding-rate data packets being higher than said first encoding rate of said first-encoding-rate data packets;

[1.7] operating said display device to:

[1.8] receive [a] the second-encoding-rate data packets [b] representing the subsequent part of real-time presentation into said store;

[1.9] read out said second-encoding-rate data packets from said store [a] at a data rate equal to said second encoding rate of said second-encoding-rate data packets [b] for decoding [c] so as to present said subsequent part of said real-time presentation to said user [d] at a second level of quality which is higher than said first level of quality.

Ex. 1001, 7:18–55.

4. [4.0] A method of operating a communication apparatus comprising [a] a data sender, [b] a data presentation device having [c] a store, and [d] a network connecting said data sender and said data presentation device, said method comprising:

[4.1] operating said data sender to transmit a first plurality of first-encoding-rate data packets [a] encoded at a first encoding rate to said data presentation device, wherein [b] said first plurality of first-encoding-rate data packets are transmitted at a first transmission rate [c] which is higher than said first encoding rate of said first-encoding-rate data packets;

[4.2] operating said data presentation device to:

[4.3] receive said first plurality of first encoding rate data packets into said store;

[4.4] read out said received first-encoding-rate data packets from said store [a] at a data rate equal to said first encoding rate of said first-encoding-rate data packets [b] for decoding [c] so as to present to a user at a first level of quality, [d] wherein the removing of said first-encoding-rate data packets from said store is initiated when said first-encoding-rate data packets first arrive at said store;

[4.5] on said store being filled with data packets to a predetermined level, sending an indication to said data sender that said predetermined level has been reached;

[4.6] operating said data sender, [a] on receipt of said indication from said data presentation device, to transmit a

second plurality of second-encoding-rate data packets
[b] encoded at a second encoding rate to said data presentation device, [c] wherein said second plurality of second-encoding-rate data packets are transmitted at a second transmission rate which is higher than said first transmission rate; and
[d] wherein said second encoding rate is higher than said first encoding rate;

[4.7] operating said data presentation device to:

[4.8] receive said second plurality of second-encoding-rate data packets into said store;

[4.9] read out said second-encoding-rate data packets from said store [a] at a data rate equal to said second encoding rate of said second-encoding-rate data packets [b] for decoding, [c] so as to present to said user at a second level of quality, wherein said second level of quality is higher than said first level of quality.

Id. at 7:64–8:39.

D. The Asserted Grounds of Unpatentability

Petitioners advance the following challenges, relying on the declaration of Dr. Clifford Reader (Ex. 1008, “Reader Decl.”):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–4, 7, 10	103(a) ²	Lippman ³ , Chou ⁴ , Muroi ⁵

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the ’200 patent was filed before the effective date of the relevant amendment, the pre-AIA version of § 103 applies.

³ “Video Coding for Multiple Audiences,” SPIE vol. 3653, pp. 780–782, pub. Jan. 1999 (Ex. 1010).

⁴ U.S. Patent No. 6,637,031 B1, iss. Oct. 21, 2003 (Ex. 1011).

⁵ JP H11-187367, pub. July 9, 1999 (Ex. 1012). Petitioners provided a certified translation of Muroi as Exhibit 1013. When referring to “Muroi,” the remainder of this Decision refers to Exhibit 1013. Patent Owner does not challenge the accuracy of the translation in Exhibit 1013. Accordingly, we treat Exhibit 1013 as an accurate translation of Muroi.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
5, 6, 11, 12	103(a)	Lippman, Chou, Muroi, Lee ⁶

III. ANALYSIS

A. Legal Standards

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence⁷, objective indicia of non-obviousness (i.e., secondary considerations). *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze the asserted obviousness grounds with the principles identified above in mind.

B. Level of Ordinary Skill in the Art

Petitioners assert that a person of ordinary skill “would have had either a bachelor’s degree in electrical engineering or computer science, or an equivalent degree, and two to three years of experience in the field of audiovisual systems design, or a graduate degree in engineering or computer science focusing on audiovisual systems design.” Pet. 9–10. Patent Owner

⁶ “An Integrated Source Coding and Congestion Control Framework for Video Streaming in the Internet,” Proc. IEEE INFOCOM, Vol. 2, pp. 747–756, pub. April 12, 2000 (Ex. 1014).

⁷ Patent Owner has not submitted any evidence of objective indicia of non-obviousness in this case.

does not address the level of ordinary skill in its Patent Owner Response. We adopt Petitioners’ assessment of the level of ordinary skill in the art because it is consistent with the prior art cited and the evidence of record.

C. Claim Construction

In an *inter partes* review filed on or after November 13, 2018, we apply the same claim construction standard used by Article III federal courts in civil actions under 35 U.S.C. § 282(b), which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018). Because the instant Petition was filed on March 22, 2019, we apply that standard here. Accordingly, we construe each challenged claim of the ’200 patent to generally have “the ordinary and customary meaning of such claim 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).

Petitioners propose a construction for the terms “first-encoding-rate data packets . . . representing a first part of a real-time presentation” and “second-encoding-rate data packets . . . representing subsequent parts of said real-time presentation.” Pet. 10–11. Petitioners assert these clauses “refer, respectively, to the onset (the ‘first part’) of a real-time presentation, and to a portion of the presentation that follows this first part (the ‘subsequent parts’).” *Id.* at 10.

Petitioners do not argue that their proffered construction is dispositive of the issue of patentability of the challenged claims, and Patent Owner does not dispute Petitioners’ construction. *See generally* Pet.; PO Resp.; Pet. Reply; Sur-reply. We determine that we need not explicitly construe these

or any other terms. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms that are in controversy, and only to the extent necessary to resolve the controversy.” (internal quotation and citation omitted)).

D. Overview of the Prior Art

Before turning to Petitioners’ asserted grounds, we provide an overview of the asserted references.

1. Lippman

Lippman describes video streaming software that measures available network bandwidth and switches between separate video encodings to match channel capacity. Ex. 1010, 780. A player receiving a video stream from the software collects a minimum number of packets, termed a “pre-roll amount,” and then decodes the packets and combines the decoded results into a multimedia presentation. *Id.* Content creators using the video streaming system select which target audiences to provide content for, including those having a 28.8k modem, 56k modem, ISDN, Dual ISDN, Corporate LAN, XDSL, or Cable Modem. *Id.* at 781. There is an associated target bit rate for each target audience. *Id.* If the content creator chooses only a single target audience, the system creates three video streams—one at the target bit rate, one at approximately 75% of the target rate, and one at no more than 50% of the target rate that only contains key frames. *Id.* The 75% and 50% bit rate streams provide alternate streaming experiences for those users experiencing bad or very bad connections, respectively. *Id.* If the content creator chooses multiple target audiences, the system attempts to nest the bit rates created so that the fallback stream for one target audience is the target bit rate for another. *Id.*

2. Chou

Chou discloses a server that provides at least two different data streams, including a low resolution stream encoded below a transmission bit rate and a normal resolution stream encoded at the transmission bit rate.

Ex. 1011, 3:29–33. The server initially transmits the low resolution stream to a client, which decodes and presents the stream in real time. *Id.* at 3:33–37. The client does not need to wait for its buffer to fill before beginning to decode, thereby reducing delay due to buffering to nearly zero. *Id.* at 3:38–46. When the client buffer has grown sufficiently large, the server halts transmission of the low resolution stream and transmits the normal resolution stream. *Id.* at 3:47–51.

This process is depicted graphically in Chou’s Figure 9, reproduced below.

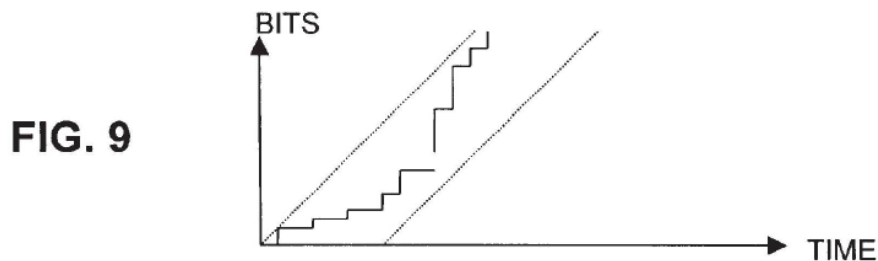


Figure 9 illustrates a graph representing a method of constructing an encoded bit stream by splicing together a low quality initial portion of content with a normal quality subsequent portion of the content. *Id.* at 10:35–39. In Figure 9, the server transmits the low bit rate encoding until its schedule intersects a full bit rate encoding schedule, and then the server transmits the full bit rate encoding. *Id.* at 11:22–24; *see also id.* at Fig. 8 (superimposing a low bit rate encoding and a full bit rate encoding); *id.* at 11:10–13 (describing Figure 8).

3. Muroi

Muroi discloses a video transmission device and receiver that operate to address decreases in video delivery speed caused by changes in traffic on the delivery path. Ex. 1013 ¶ 1. Muroi's transmission device stores video at three separate data rates. *Id.* ¶ 16. The transmission device transmits video to the receiver at an arbitrarily selected rate. *Id.* ¶ 20. The receiver stores the received video in a buffer and takes video data out from the buffer to reproduce video. *Id.* ¶¶ 20–21. Figure 2 of Muroi, reproduced below, depicts an example buffer.

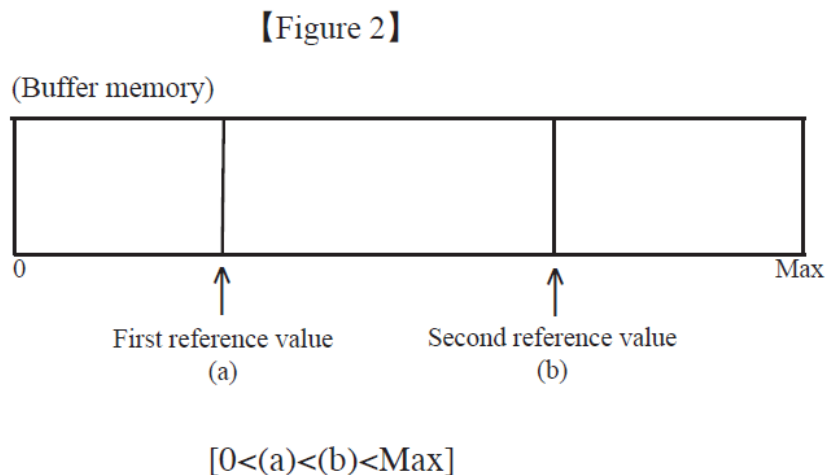


Figure 2 shows data volume in a buffer memory and reference values. *Id.* at 4–5. When the volume of data stored in the buffer falls below a first reference value (a) (see Figure 2), the receiver requests the transmitter to switch to a lower video rate. *Id.* ¶ 24. Conversely, when the volume of data stored in the buffer exceeds a second reference value (b) (see Figure 2), the receiver requests the transmitter to switch to a higher video rate. *Id.*

4. Lee

Lee discloses a transport-layer congestion control algorithm that

adjusts a video transmission rate in a TCP-friendly manner. Ex. 1014, 747, 750–51. Lee describes a typical Internet congestion control algorithm, linear increase multiplicative decrease (LIMD). *Id.* at 750. LIMD changes the sending rate of a connection by slowly increasing the transmission rate by an additive constant α upon observing no packet loss and aggressively decreasing the transmission rate by a multiplicative constant β upon observing packet losses. *Id.* Lee proposes an augmented LIMD algorithm, termed LIMD/H, which uses the history of packet losses in order to distinguish between persistent congestion and non-persistent congestion. *Id.* The LIMD/H algorithm reacts gently to non-persistent congestion and aggressively to persistent congestion. *Id.*

E. Patentability Analysis

1. Challenges Applying Lippman, Chou, and Muroi

Petitioners contend that claims 1–4, 7, and 10 are obvious over Lippman, Chou, and Muroi under 35 U.S.C. § 103(a). Pet. 25–70. For the reasons that follow, we are persuaded that Petitioners establish, by a preponderance of the evidence, that claims 1–3, 7, and 10 are unpatentable as obvious over Lippman, Chou, and Muroi. We are not, however, persuaded that Petitioners establish, by a preponderance of the evidence, that claim 4 is unpatentable as obvious over Lippman, Chou, and Muroi.

a) Independent Claim 1

For claim 1, Patent Owner does not dispute that the references disclose all the claim limitations. Instead, Patent Owner challenges Petitioners' rationale to combine the references. PO Resp. 27–54. We first address Petitioners' contentions as to the limitations of claim 1 and then address Patent Owner's arguments. We find Petitioner's contentions as to

the limitations of claim 1, as detailed below and not disputed by Patent Owner, persuasive.

(1) *“A method of operating [a] a real-time communication apparatus comprising a real-time data sender, [b] a real-time data display device having [c] a store, and [d] a network connecting said sender and said display device.”*

Petitioners contend that each of Lippman and Chou discloses the preamble of claim 1.⁸ Pet. 29–30 (citing Ex. 1008 § IX.B.1). Specifically, Petitioners contend Lippman discloses “delivery of streaming video from [a] a server to [b] a player over [d] the Internet” and “a ‘pre-roll’ amount of data, . . . which teaches use of [c] a data store at the data presentation device.” *Id.* at 29 (citing Ex. 1010, 780). Petitioners also assert that Lippman describes applications to “real-time encoding” and to “live content.” *Id.* (citing Ex. 1010, 780–81). Similarly, Petitioners assert Chou “teaches a communication system 200 comprising: [a] a data sender 204 . . . , [b] a data display device 208 . . . having [c] a store 308 . . . , and [d] a network 206 . . . connecting said sender and said display device.” *Id.* at 29–30 (citing Ex. 1011, Figs. 2, 3, 6:34–7:8, 7:60–63, 8:25). Petitioners also assert that Chou’s “data sender and data display devices are real-time devices.” *Id.* at 30 (citing Ex. 1011, 7:43–55 (referring to real-time video sources and live transmission)).

⁸ We take no position as to whether the preamble is limiting. Regardless, we find Petitioner has shown that the recitation in the preamble is satisfied by the prior art.

- (2) “operating said sender to transmit a plurality of first-encoding-rate data packets [a] encoded at a first encoding rate and [b] representing a first part of a real-time presentation to said display device [c] at a transmission rate higher than said first encoding rate of said first-encoding-rate data packets”

Petitioners contend that Chou discloses this limitation. *Id.* at 31–32 (citing Reader Decl. § IX.B.2). Petitioners assert Chou discloses:

A server provides at least two different data streams. A first data stream is a low resolution stream encoded at a bit rate below the transmission bit rate. . . . The server initially transmits the low resolution stream faster than real time, at a bit rate equal to the transmission bit rate.

Id. (citing Ex. 1011, 4:42–48, 11:6–7, Fig. 7); *see also id.* at 30 (asserting Chou discloses “real time video sources and live transmission”).

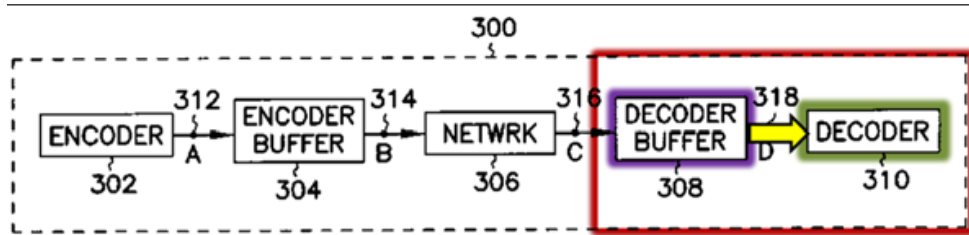
- (3) “operating said display device to: receive said first-encoding-rate data packets into said store”

Petitioners contend that each of Lippman, Chou, and Muroi discloses this limitation. *Id.* at 33 (citing Reader Decl. § IX.B.4). Petitioners contend Lippman discloses this limitation because Lippman’s “player collects a certain minimum amount of packets (specified by a pre-roll amount) and then starts to decode the packets and combine the decoded results into a multimedia presentation.” *Id.* (citing Ex. 1010, 780). Petitioners contend Chou discloses this limitation because Chou discloses “decoder buffer 308” that “receives encoded data from the network 306.” *Id.* (citing Ex. 1011, 7:60–63, 12:27–37). Petitioners also contend Muroi discloses this limitation because Muroi teaches that “buffer memory 22 temporarily stores received video data.” *Id.* (citing Ex. 1013 ¶ 20).

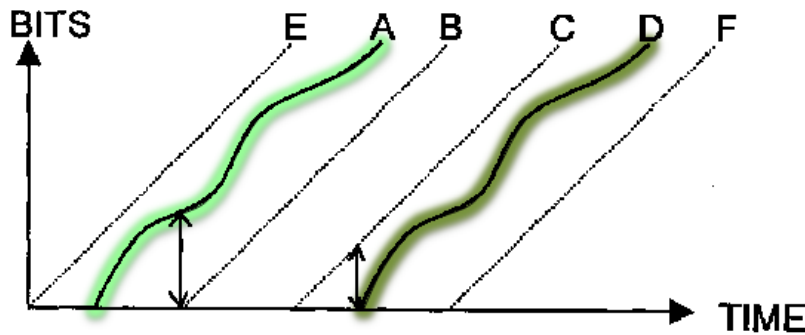
- (4) “operating said display device to: . . . read-out said received first-encoding-rate data packets from said store

[a] at a data rate equal to said first encoding rate of said first-encoding-rate data packets [b] for decoding [c] so as to present said first part of said real-time presentation to a user at a first level of quality”

Petitioners contend that Chou discloses this limitation based on Figures 3 and 4D of Chou, reproduced below with annotations added by Petitioners:



Chou, Fig. 3 (annotations added by Petitioners)

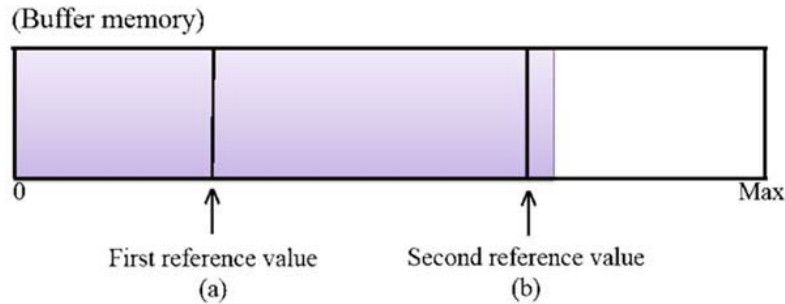


Chou, Fig. 4D (annotations added by Petitioners)

Id. at 34–35 (citing Reader Decl. § IX.B.5). Figure 3 depicts points A, B, C, and D in a streaming media system, and Figure 4D depicts data flow schedules corresponding to points A and D in Figure 3. Ex. 1011, 7:41, 7:66–8:8, 8:41–47. Petitioners assert Chou discloses that “schedule A is encoding rate and schedule D is read out rate.” Pet. 35 (citing Ex. 1011, 7:66–8:5). Petitioners contend that schedule A and schedule D represent equal rates. *See id.* at 34–35; Ex. 1008 ¶ 215.

- (5) *“on said store being filled with said first-encoding-rate data to a predetermined level, sending an indication that said level has been reached to said data sender”*

Petitioners contend that Muroi discloses this limitation. Pet. 35–36 (citing Ex. 1008 § IX.B.6). Specifically, Petitioners reproduce Figure 2 of Muroi as annotated below:

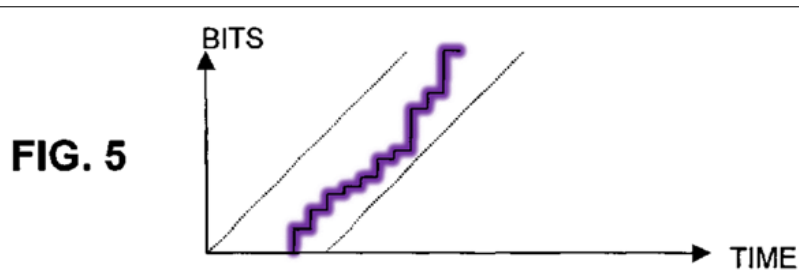


Id. at 36 (annotations in Petition). Figure 2 depicts Muroi’s buffer at the video receiver device. Ex. 1013 ¶¶ 18, 20. Petitioners contend Muroi discloses that “when a buffer is filled with first-encoding-rate data to threshold (b), a display device 2 sends a rate switch request . . . to the data sender 1 . . . , which indicates that the threshold has been reached.” Pet. 36 (citing Ex. 1013 ¶¶ 6, 7, 24).

- (6) *“operating said data sender, [a] on receipt of said indication from said display device, to send second-encoding-rate data packets [b] encoded at a second encoding rate and [c] representing subsequent parts of said real-time presentation to said display device, [d] said second encoding rate of said second-encoding-rate data packets being higher than said first encoding rate of said first-encoding-rate data packets”*

Petitioners contend that Chou discloses this limitation. *Id.* at 36–38 (citing Ex. 1008 § IX.B.7). As to parts [a]–[c] of this limitation, Petitioners contend Chou discloses those parts because Chou teaches: “When the client buffer has grown sufficiently large to guard against future underflow by the normal resolution stream, the server stops transmission of the low resolution

stream and begins transmission of the normal resolution stream.” *Id.* at 37 (citing Ex. 1011, 4:51–55). As to parts [b] and [d] of this limitation, Petitioners point to an annotated version of Figure 5 of Chou as depicted below:



Id. Figure 5 illustrates a decoding schedule for multimedia content pre-encoded at a full bit rate. Ex. 1011, 4:7–8. According to Petitioners, Figure 5 depicts a “decoding schedule for full bit rate content,” which “teaches that the second-encoding-rate data packets are [b] encoded at a second encoding rate, [d] wherein said second encoding rate is higher than said first encoding rate.” Pet. 37–38 (citing Ex. 1011, 10:64–65).

(7) “operating said display device to: receive [a] the second-encoding-rate data packets [b] representing the subsequent part of real-time presentation into said store”

Petitioners contend that each of Lippman, Chou, and Muroi discloses this limitation. *Id.* at 38–39 (citing Ex. 1008 § IX.B.9). Petitioners contend Lippman discloses these features because Lippman’s “player stores packets into a pre-roll buffer even after stream switching occurs.” *Id.* at 38 (citing Ex. 1010, 781). Petitioners contend Chou’s “decoder buffer 308 receives encoded data from the network,” including a “second plurality of second-encoding-rate data packets.” *Id.* at 39 (citing Ex. 1011, 7:60–63, 12:27–37). In addition, Petitioners contend Muroi’s “buffer memory 22 temporarily stores received video data.” *Id.* (citing Ex. 1013 ¶ 20).

(8) “operating said display device to: . . . read out said second-encoding-rate data packets from said store [a] at a data rate equal to said second encoding rate of said second-encoding-rate data packets [b] for decoding [c] so as to present said subsequent part of said real-time presentation to said user [d] at a second level of quality which is higher than said first level of quality”

Petitioners contend that Chou discloses this limitation, relying on similar arguments as for similar limitations in element [1.4], discussed above. *Id.* at 39–42 (citing Ex. 1008 § IX.B.10). In addition, Petitioners point to Chou’s disclosure that “the second data stream is sent to improve the quality as soon as the playback buffer can handle it.” *Id.* at 41 (citing Ex. 1011, 12:32–37).

(9) *Summary*

As we noted above, Patent Owner does not dispute that the references disclose all the claim limitations. We are persuaded by Petitioners’ arguments and cited evidence, as described above, and accordingly, we find that the combination of Lippman, Chou, and Muroi discloses each and every limitation of claim 1.

(10) *Rationale to Combine*

Petitioners assert that a person of ordinary skill in the art would have modified the operation of Lippman “to perform fast start-up operations as taught by Chou and to switch streams according to buffer status indications as taught by Muroi.” *Id.* at 25 (citing Ex. 1008 § IX.A).

With respect to fast start-up, Petitioners point to Lippman’s player collecting “pre-roll” packets, which result in pre-roll times of 1.7 to 5.8 seconds. *Id.* at 26 (citing Ex. 1010, 780, 782). Petitioners then point to Chou’s disclosure that describes “start-up delays of 2–10 seconds” as “annoying” and “intolerable.” *Id.* (citing Ex. 1011, 3:8–19). According to

Petitioners, Chou “proposes solutions to avoid such delays” and also “identifies RealNetworks’ RealAudio and RealVideo players,” which Petitioners assert are the subject of Lippman. *Id.* Petitioners assert, therefore, that a person of ordinary skill in the art would have applied Chou’s techniques in Lippman’s architecture to avoid these “annoying” delays. *Id.* Specifically, Petitioners assert that “a skilled worker would cause Lippman’s system to fall back to a lower-rate coding, for example a ‘28.8 Modem’ coding when starting streaming to a ‘56K Modem’ target audience member.” *Id.* at 26–27.

With respect to stream switching, Petitioners assert, “both Lippman and Muroi prepare multiple codings of video at different coding rates and switch among them to match changing bandwidth.” *Id.* at 27. Petitioners assert that “Lippman does not explain how bandwidth is measured in his system” but that “Muroi explains that switches between different data-rate encodings can be accomplished by measuring a volume of data stored in the receiver’s storage buffer.” *Id.* Petitioners, therefore, assert that a “skilled worker would recognize readily that Muroi’s switching technique finds application with a system such as Lippman’s.” *Id.* at 27–28 (citing *KSR*, 550 U.S. at 418 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond that person’s skill.”)); *see also* Ex. 1008 ¶¶ 148–150 (“Lippman . . . does not explain how such measurements are to be performed” but “Muroi also discloses techniques for switching between redundant codings of video in response to changing bandwidth conditions of a network.”).

Patent Owner makes several arguments attacking the Lippman, Chou, Muroi combination, supported by the testimony of Dr. Nathaniel Polish, which we address in detail below. PO Resp. 28–53; Ex. 2001 (“Polish Decl.”), Ex. 2002 (“2nd Polish Decl.”).

(a) Modifying Lippman with Muroi

Patent Owner first contends it would not have been obvious to modify Lippman to implement Muroi’s technique for determining when to switch between different versions of video. PO Resp. 27–28. Specifically, Patent Owner contends that one of ordinary skill in the art would not have modified Lippman with Muroi “for the purposes of solving a problem that is already solved by” Lippman. *Id.* at 28 (citing *Ex parte Rinkevich*, 2007 WL 1552288 (BPAI May 29, 2007) (nonprecedential)).

Patent Owner contends that in *Rinkevich*, the primary reference identified a commercially-available product that solved a user authentication problem and identified where to find that product online, without providing specific details of how to solve the problem. *Id.* at 30. According to Patent Owner, the secondary reference in *Rinkevich* disclosed specific details of how to solve the problem. *Id.* at 29. In *Rinkevich*, Patent Owner asserts, the Board determined there was no motivation to combine the references because “the problem [to be solved by the secondary reference] is already solved by [the primary reference].” *Id.* at 30 (quoting *Rinkevich*, 2007 WL 1552288, at *4). Patent Owner asserts that like the primary reference in *Rinkevich*, Lippman identifies a commercially-available product (“RealSystem’s SureStream”) for switching video versions and where to find the product online without specifying how the product switches video versions. *Id.* (citing Ex. 1010, 780). Patent Owner contends Muroi is like the secondary reference in *Rinkevich* that disclosed specific details for

solving a user authentication problem because Muroi discloses specific details for determining how to switch video versions. *Id.* at 30–31.

Accordingly, Patent Owner contends that “a [person of ordinary skill in the art] having common sense at the time of the invention would not have reasonably looked to [Muroi] to solve a problem already solved by [Lippman].” *Id.* at 31 (quoting *Rinkevich*, 2007 WL 1552288, at *4).

In the Reply, Petitioners contend that the present facts differ from those in *Rinkevich* and instead resemble those in *Unwired Planet, LLC v. Google Inc.*, “where a primary reference (Brohoff) provided search results that grouped service providers by location within a geographic zone, but did not explain how service providers are prioritized within those zones.” Pet. Reply 10 (citing *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1003–1004 (Fed. Cir. 2016)). According to Petitioners, the “Federal Circuit affirmed the Board’s holding [in *Unwired Planet*] that it would have been obvious to apply teachings of a secondary reference (Galitz), which taught different ordering techniques and the benefits of using them to the Brohoff system.” *Id.* Petitioners contend the facts here are analogous to *Unwired Planet* because Lippman’s system measures available bandwidth without explaining how to do so and because Muroi teaches how to measure bandwidth. *Id.* at 11. Accordingly, Petitioners contend that it would have been obvious to combine the two references. *Id.*

Patent Owner’s Sur-Reply argues *Unwired Planet* is inapposite because it refers to prior art references that disclosed “different, complementary features.” Sur-Reply 8 (emphasis omitted). In contrast, Patent Owner contends, the facts here correspond more closely with *Rinkevich* because “Lippman and Muroi disclose the same feature”—video stream switching. *Id.* at 8–9 (citing Ex. 1010, 780; Ex. 1013 ¶¶ 23–24).

Turning to our analysis, we first note that Patent Owner’s exclusive reliance on *Rinkevich* is misplaced. The Board’s decision in *Rinkevich* is nonprecedential and, therefore, not binding. See PTAB Standard Operating Procedure (SOP) 2 (Rev.10), available at <http://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/resources>. *Rinkevich* also differs from this case in at least two significant respects—in burden of proof and level of detail. First, *Rinkevich* is an *ex parte* appeal decision, which involves a different *prima facie* burden than Petitioners’ preponderance of the evidence burden here. See, e.g., Manual of Patent Examining Procedure (“MPEP”) § 2142 (describing the burden-shifting framework of the *prima facie* case in examination); 35 U.S.C. § 316(e) (“In an inter partes review instituted under this chapter, the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.”). Second, in *Rinkevich*, the Examiner’s rationale to combine was terse, but here, Petitioners supply detailed arguments with expert testimony to support Petitioners’ reasoning. Compare *Rinkevich*, 2007 WL 1552288, at *4 (“The Examiner asserts that the *nature of the problem to be solved* would have led an artisan, having knowledge of Savill, to look to Wu to solve the purported deficiencies of Savill.”) (emphasis omitted), with Pet. 25–29; Ex. 1008 ¶¶ 137–160. Consequently, we view *Rinkevich* as having limited applicability to the facts of this case.

Far more pertinent to our decision are the principles of obviousness articulated by our reviewing courts, including the Supreme Court’s *KSR* decision. There, the Supreme Court explained that a rationale to combine may arise from various sources, including the “interrelated teachings of multiple patents.” *KSR*, 550 U.S. at 418. The Court also stated, “if a technique has been used to improve one device, and a person of ordinary

skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *Id.* at 417.

We also consider the Federal Circuit’s guidance in *Unwired Planet*, stating that “[f]or [a] technique’s use to be obvious, the skilled artisan need only be able to recognize, based on her background knowledge, its potential to improve the device and be able to apply the technique.” 841 F.3d at 1003. The primary reference in *Unwired Planet* (Brohoff) described a system that allowed users to search for information and provide results based on their location, but it did not explain how those search results were ordered. *Id.* The secondary reference (Galitz) described various ordering techniques and their benefits. *Id.* The court concluded these were techniques “that a person of ordinary skill in the art would recognize could be used to improve [Brohoff’s] information display.” *Id.* Expert testimony supported this conclusion. *Id.* The patentee also “d[id] not dispute that a person of ordinary skill in the art would have been able to apply the teachings of Galitz to make the improvement it suggests.” *Id.*

We agree with Petitioners that this case is similar to *Unwired Planet*. Like the primary reference in *Unwired Planet*, Lippman does not describe certain details, such as how to switch streams based on measuring bandwidth. *See* Ex. 1010, 780–781. Like the secondary reference in *Unwired Planet*, Muroi offers a detailed solution, namely how to determine when to switch video streams. *See* Ex. 1013 ¶¶ 23, 24. Also like the secondary reference in *Unwired Planet*, Muroi describes the benefit of its approach, including “realiz[ing] video reproduction with the *highest picture quality possible* by changing the video rate dynamically according to the state of the network at a given point in time.” *Id.* ¶ 30 (emphasis added).

We agree with Petitioners that one of ordinary skill in the art would have looked to Muroi's detailed disclosure to fill in details absent from Lippman's disclosure. *See* Pet. 27–28; Reply 10–11. We also find Muroi's "highest picture quality" benefit would have led one of ordinary skill to combine Muroi's teachings with Lippman because Lippman likewise expresses a desire to "maximize[] the quality of a streaming multimedia experience regardless of the vagaries of a user[']s Internet connection." *See* Ex. 1013 ¶ 30; Ex. 1010, 782.

Petitioner's contention is supported by the testimony of Dr. Reader, which we credit. He testifies that "Lippman teaches that a switch between redundant codings of video may be performed based on measurements of available bandwidth, even though he does not explain how such measurements are to be performed." Ex. 1008 ¶ 148. Dr. Reader further testifies that "Muroi also discloses techniques for switching between redundant codings of video in response to changing bandwidth conditions of a network" and "discloses how measurements are to be performed." *Id.* ¶¶ 149–150. Dr. Reader also testifies about the benefits of Muroi's approach, which "enables a data sender to switch between streams in response to fluctuating network delivery speeds." *Id.* ¶ 151. Patent Owner does not cite Dr. Polish's testimony to support its arguments, nor does Patent Owner dispute that one of ordinary skill in the art would have been able to apply the teachings of Muroi to make the improvement it suggests. *See generally* PO Resp.; *Unwired Planet*, 841 F.3d at 1003 ("For [a] technique's use to be obvious, the skilled artisan need only be able to recognize, based on her background knowledge, its potential to improve the device and be able to apply the technique."); *KSR*, 550 U.S. at 417 ("using the technique is obvious unless its actual application is beyond that person's skill.").

Accordingly, Petitioners persuade us that one of ordinary skill in the art would have looked to Muroi to solve the problem of missing details in Lippman's stream switching solution.

Contrary to Patent Owner's assertion, the fact that Lippman provides a link to download its player would not have led one of ordinary skill in the art away from combining with Muroi. *See* PO Resp. 30 (arguing against the combination because "Lippman identifies a commercially-available product that determines when to switch between different versions of video"). Lippman merely states, "[f]or those interested in experimenting further we encourage the download of our freely available RealProducer and RealPlayer™ available at www.real.com." Ex. 1010, 781. Nothing in Lippman or in any other evidence of record suggests that this download link is for anything more than downloading a functioning player. Significantly, Lippman does not state that the download link includes any additional details on how to implement stream switching. We find the mere mention of Lippman's download link would not have discouraged one of ordinary skill in the art from combining Lippman's teachings with Muroi's disclosure.

Based on the preponderance of the evidence of record, we agree with Petitioner that the skilled artisan would have combined Lippman and Muroi as proposed. For the reasons explained above, Patent Owner's arguments to the contrary above are unavailing. We address Patent Owner's additional arguments against combining Muroi with Lippman in the following section.

(b) Modifying Lippman with Chou and Muroi

Patent Owner next contends that modifying Lippman with Chou and Muroi would have changed Lippman's principle of operation. PO Resp. 32–44. Patent Owner raises three main arguments: (1) "modifying Lippman to transmit low quality video at startup as taught in Chou would change

Lippman’s principle of operation,” (2) “modifying Lippman to transmit low quality video at startup as taught in Chou would frustrate a main goal of Lippman,” and (3) “modifying Lippman to use Muroi’s client-side control technique would further change the principle of operation of Lippman.” *Id.* at 36 (citing Ex. 2001 ¶¶ 173–187; Ex. 2002 ¶¶ 6–78), 32 (citing *In re Ratti*, 270 F.2d 810 (C.C.P.A. 1959); *Ex parte Böger*, Appeal 2017-001586 (PTAB Aug. 31, 2017); *Ex parte Salinas*, Appeal 2013-00433 (PTAB Jan. 22, 2016); *Ex parte Mandrusov*, Appeal 2008-0114 (BPAI, July 23, 2008); *Plas-Pak Indus., Inc. v. Sulzer Mixpac AG*, Appeal 2013–007786 (PTAB Jan. 17, 2014) (appeal from *inter partes* reexamination), *aff’d*, 600 Fed. Appx. 755, 759–60 (Fed. Cir. 2015) (nonprecedential)). The next section addresses Patent Owner’s first two arguments, and the following section addresses Patent Owner’s third argument.

(i) Whether Chou changes the principle of operation and frustrates a main goal of Lippman

We begin by summarizing Patent Owner’s first two arguments. First, Patent Owner contends that modifying Lippman with Chou would change Lippman’s principle of operation. PO Resp. 36–37. Specifically, Patent Owner contends that Chou would change Lippman’s operation from “an optimistic assumption of network conditions by initially transmitting the highest quality video . . . that [a] client’s Internet connection will support” to “a pessimistic assumption of network conditions by initially transmitting lower-quality video to the client.” *Id.* at 36–37 (citing Ex. 2001 ¶¶ 177–180). Patent Owner also contends that Chou’s “principle of operation at startup (sacrificing video quality for faster startup) is the opposite of Lippman’s principle of operation at startup (sacrificing faster startup for higher video quality).” *Id.* at 37 (citing Ex. 2002 ¶ 49).

Second, Patent Owner contends that Chou would “frustrate Lippman’s main goal of maximiz[ing] the quality of a streaming multimedia experience regardless of the vagaries of a [user’s] Internet connection.” *Id.* at 38 (citing Ex. 1010, 782). By transmitting low quality video at startup, Patent Owner contends, “Chou would reduce rather than maximize the quality of the streaming multimedia experience.” *Id.* (citing Ex. 2002 ¶¶ 56–62). Patent Owner contends that although Chou seeks to avoid start-up delays, Lippman’s pre-roll buffer is a “primary *feature*” rather than a shortcoming “because buffering pre-roll is critical to Lippman’s stated goal” of maximizing streaming quality. *Id.* (citing Ex. 1010, 782; Ex. 2001 ¶¶ 92–93; Ex. 2002 ¶ 40). Thus, Patent Owner contends, “transmitting lower-quality video at startup to avoid buffering pre-roll reduces the quality of the user’s video experience rather than maximizes the quality of the user’s video experience, especially when the user’s Internet connection would support a higher-quality video stream.” *Id.* at 38–39 (citing Ex. 1010, 780–82; Ex. 2002 ¶ 49).

Petitioners in their Reply contend motivation is not lacking to modify Lippman because neither Lippman nor Chou “describes any ‘assumptions’ of network conditions.” Reply 6. Rather, Petitioners contend, Lippman is not “optimistic” but merely “*measures available bandwidth* and switches between separate (non-layered) video encodings to match the channel capacity.” *Id.* at 12 (quoting Ex. 1010, 780). Chou, Petitioners contend, “does not make ‘pessimistic assumptions’ regarding network conditions and, instead, it estimates the state of playback buffers at client devices.” *Id.* (citing Ex. 1011, Abstract, 3:47–51, 10:52–11:29). Petitioners further contend, “[a]lthough applying Chou’s technique would change Lippman’s system—as all obvious combinations do—a skilled worker would recognize

that it would change Lippman's system for the better." *Id.* Specifically, Petitioners contend that "[a] skilled worker would be motivated to apply Chou's technique to Lippman's system . . . to avoid the annoying latencies represented by Lippman's prolonged buffer times." *Id.* at 13.

Petitioners also contend that Chou would not frustrate Lippman's goals, asserting "Lippman never states that the quality of video at initial playback must be maintained at the highest quality, or that he sacrifices faster startup for higher video quality, as [Patent Owner] suggests." *Id.* at 14. Rather, Petitioners contend, "Lippman focuses on maintaining the quality of streaming experience overall." *Id.* (citing Ex. 1010, 780). Petitioners also contend that Patent Owner "impl[ies] incorrectly that Lippman requires buffered video be coded at the highest possible coding rate at startup." *Id.* Petitioners assert, "Lippman teaches to apply pre-roll at a variety of coding rates, not just the highest coding rate possible" because Lippman's pre-roll buffer merely collects "a certain minimum amount of packets" and permits a presentation to "continue seamlessly until the player is stopped or the content finishes." *Id.* at 14–15 (citing Ex. 1010, 780–81; Ex. 1011, 2:32–34). Moreover, Petitioners contend, "Lippman invites others to find new ways to improve streaming experiences" by stating that "[o]ur goal is to present one approach to this problem . . . in the hopes of encouraging progress in the development of the best possible video streaming experience over the Internet." *Id.* at 15 (quoting Ex. 1010, 780). Petitioners conclude, "[a] skilled worker . . . would recognize that Chou's fast startup technique represents further progress in streaming experiences by avoiding . . . 'intolerable' startup delays" and therefore "promote[s] Lippman's goals, rather than frustrate[s] them." *Id.* (citing Ex. 1011, Abstract, 3:8–18, 3:29–46, 12:27–36).

In its Sur-Reply, Patent Owner responds that “Dr. Polish never opined that the systems in Lippman or Chou affirmatively ‘make’ any assumption as Petitioners contend”; rather, according to Patent Owner, Dr. Polish explained that Lippman’s and Chou’s protocols are “***based on***” optimistic and pessimistic assumptions, respectively. Sur-Reply 4–5 (citing Reply 6–7; Ex. 2001 ¶¶ 102, 175, 180). Patent Owner also disputes that Chou’s approach would change Lippman for the better, as “[t]he issue is not whether Chou would improve Lippman as Petitioners’ allege, but whether modifying Lippman with the teachings of Chou would change Lippman’s principle of operation.” *Id.* at 10.

Further, Patent Owner disagrees that “Lippman never states that the quality of video at initial playback must be maintained at the highest quality” because Lippman “maximiz[es] bandwidth usage,” and “[t]ransmitting the highest quality of video *that the client’s Internet connection will support* (including at startup) maximizes the bandwidth usage.” *Id.* at 11–12 (citing Reply 13–14; Ex. 1010, 780) (emphasis omitted). Patent Owner also contends that “Lippman’s principle of operation at startup (sacrificing faster startup for higher video quality) is the exact opposite of Chou’s principle of operation at startup (sacrificing video quality for faster startup).” *Id.* at 12 (citing Ex. 2002 ¶ 49). Finally, Patent Owner contends that “buffering pre-roll is a primary ***feature*** of Lippman—not a shortcoming.” *Id.* at 13 (citing PO Resp. 38–39; Ex. 2001 ¶¶ 92–93; Ex. 2002 ¶ 40).

Turning to our analysis, “[w]e start from the self-evident proposition that mankind, in particular, inventors, strive to improve that which already exists.” *Pro-Mold and Tool Co., Inc. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573 (Fed. Cir. 1996). “Under the correct analysis, any 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.” *KSR*, 550 U.S. at 420. Moreover, “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *Id.* at 421. With respect to combining Chou with Lippman, Petitioners provide evidence to show that a person of ordinary skill in the art would have been motivated to apply Chou to solve a problem with Lippman’s approach. Specifically, we credit Dr. Reader’s testimony that Chou recognizes start-up delays, such as Lippman’s delay due to pre-roll buffering, are “annoying” and “intolerable,” and that a person of ordinary skill would have “appl[ied] Chou’s techniques to . . . Lippman’s to avoid such delays.” Ex. 1008 ¶ 147. We find Patent Owner’s arguments and evidence to the contrary unavailing.

Patent Owner relies on *In re Ratti* and several of the Board’s nonprecedential decisions in *ex parte* appeals to support Patent Owner’s argument that if a secondary reference changes the principle of operation or frustrates a main goal of the primary reference, the secondary reference cannot provide a motivation to combine. PO Resp. 32 (citing *Ratti*, 270 F.2d at 810; *Ex parte Böger*, Appeal 2017-001586; *Ex parte Salinas*, Appeal 2013-00433; *Ex parte Mandrusov*, Appeal 2008-0114; *Plas-Pak*, Appeal 2013–007786). These cases more accurately support that the issue is whether the combination would impermissibly change the principle of operation of the references or impermissibly frustrate a primary purpose of them. For example, a skilled artisan has no reason to combine references in a way that renders a device inoperable. *Cf. In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (one of ordinary skill in the art would not be motivated to modify a reference by making it “inoperable for its intended purpose”); *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir.

2001) (noting that producing a “seemingly inoperative device” is a type of teaching away from a combination). Even if the proposed combination would diminish the primary reference’s performance, but not make it inoperable, the diminished performance would merely be one of several competing considerations in the obviousness analysis. *See Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) (“The fact that the motivating benefit comes at the expense of another benefit . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.”).⁹

Patent Owner contends that Chou would “change Lippman’s principle of operation” or “frustrate a main goal of Lippman.” *See, e.g.*, PO Resp. 36. But Patent Owner’s arguments amount to asserting that Chou would merely diminish Lippman’s performance. Even if it were true that modifying Lippman with Chou would change Lippman’s operation from “an optimistic assumption of network conditions” to “a pessimistic assumption of network conditions,” Patent Owner does not argue that such a change would render Lippman inoperable or even that such a change would not be counterbalanced by motivating benefits. *See* PO Resp. 36–37 (citing Ex. 2001 ¶¶ 177–180). Likewise, Patent Owner contends that Lippman maximizes streaming quality and that Chou’s fast startup would merely reduce that quality. PO Resp. 38 (citing Ex. 1010, 782). And although Patent Owner contends that “buffering pre-roll is critical to Lippman’s main goal regarding maximizing streaming quality,” Patent Owner does not

⁹ We also note that the cases upon which Patent Owner relies involve mechanical and electrical inventions that are not directly analogous to the facts of this case.

contend that eliminating this pre-roll would sufficiently outweigh the advantages that Petitioners identify based on the combination with Chou, to undermine Petitioner's obviousness analysis. *See* PO Resp. 38.

We find that the alleged different “assumptions,” “opposite principles of operation,” reduction in quality, and eliminating buffering pre-roll are merely competing considerations against Chou's teaching that its fast startup technique would avoid the “‘particularly annoying,’ ‘intolerable’ startup delays” that may be present in systems such as Lippman's. *See* Ex. 1008 ¶¶ 144–147 (citing, e.g., Ex. 1011, 2:59–3:16). Weighing all these competing considerations together, we are persuaded one of ordinary skill in the art would have been motivated to use Chou's fast startup technique in Lippman's system to avoid those intolerable delays, even at the possible expense of some quality at start-up. We emphasize that any reduction in streaming quality from the combination is merely a possibility, as it appears to us that Chou's fast playback would represent *higher* quality than no playback at all during Lippman's buffering period. Thus, we agree with Petitioners that “[a]lthough applying Chou's technique would change Lippman's system—as all obvious combinations do—a skilled worker would recognize that it would change Lippman's system for the better.” Reply 12.

In summary, we find that replacing Lippman's pre-roll buffering with Chou's fast startup would have been the very kind of change one of ordinary skill in the art would have found obvious to make based on the evidence of record before us, including the testimony of Dr. Reader which we find more persuasive than the testimony of Dr. Polish. We, therefore, determine that Petitioners have persuasively articulated a rationale to combine Chou with Lippman, supported by the testimony of Dr. Reader.

(ii) Whether Muroi changes Lippman's principle of operation

Turning to Patent Owner's third argument, Patent Owner contends that modifying Lippman with Muroi would change Lippman from a "centralized, server-controlled scheme" to a "distributed, client-controlled scheme" for stream switching. PO Resp. 40 (citing Ex. 2001 ¶¶ 181–186).

Patent Owner first addresses a remark we made in our Institution Decision. *Id.* There, we discussed Patent Owner's Preliminary Response argument that "Muroi's stream switching feature would require an even further fundamental change in Lippman's principle of operation." Decision 25 (quoting Prelim. Resp 43). At that stage, we disagreed with Patent Owner that Lippman and Muroi were incompatible, in part, because "Dr. Reader testifies that one of ordinary skill in the art would have recognized that Lippman's server would have become overloaded if it diagnosed bandwidth individually for every client." *Id.* at 26 (citing Ex. 1008 ¶¶ 105–107). Patent Owner disputes Dr. Reader's assertion. PO Resp. 40 (citing Decision 26; Ex. 2001 ¶¶ 105–107). Patent Owner argues that Dr. Reader addresses "a server becoming overloaded when **encoding** video," not when implementing Lippman's switching scheme. *Id.* at 41 (citing Ex. 2002 ¶ 9). Patent Owner cites another reference, Lu (Ex. 1029), as describing Lippman's server-controlled scheme as "effective and requir[ing] only a little server involvement." *Id.* (citing Ex. 1029 § 3.2.1; *id.* n. 22 (Lippman)). In light of Lippman's "little server involvement" and Lu's teachings, Patent Owner contends that one of ordinary skill in the art would not have been motivated to modify Lippman with Muroi's teachings "for the purpose of reducing the risk of video server overload caused by 'increased processing and I/O demands.'" *Id.* at 42 (citing Ex. 2002 ¶ 14; Ex. 1029 § 3.2.1).

Patent Owner also asserts that one of ordinary skill in the art would not have “replac[ed] Lippman’s centralized, server-controlled scheme with Muroi’s distributed, client-controlled scheme” because “a client-controlled approach is not a guaranteed improvement over a server-controlled approach.” *Id.* at 43. Instead, Patent Owner contends, in the client-controlled approach, “a minority of ‘greedy’ clients can monopolize bandwidth . . . and starve other clients of network bandwidth.” *Id.* at 43 (citing Ex. 2002 ¶¶ 19–24). Patent Owner asserts that “a video provider would prefer an outcome where most clients receive ‘good’ quality video rather than . . . where a few ‘greedy’ clients receive the ‘best’ quality video while the rest of the clients receive ‘poor’ quality video (or perhaps no video at all).” *Id.* at 43–44 (citing Ex. 2002 ¶¶ 25–29).

In the Reply, Petitioners contend that “Dr. Polish . . . contradicts express disclosure from the prior art” when stating that Lippman’s video server determines whether to switch streams. Reply 4 (citing Ex. 2001 ¶ 79, 185; Ex. 2002 ¶¶ 32, 38). Petitioners contend that Lippman actually “explains that his *player* . . . controls the stream-switching process: ‘[T]he player will switch to a lower or higher bandwidth stream when conditions are appropriate.’” *Id.* (citing Ex. 1010, 781). Thus, Petitioners contend, “Lippman expressly discloses that his *player* switches between streams, just as Muroi’s player does, demonstrating that Dr. Polish’s opinions about the basic facts are wrong.” *Id.* “In this regard,” Petitioners contend, “Lippman and Muroi are alike because they both employ *client-controlled* stream-switching techniques.” *Id.* at 16 (citing Ex. 1013 ¶¶ 23–24). Petitioners further argue that Patent Owner’s “argument regarding the purported location of switching ‘control’ is a red herring” because the “proper question is whether it would have been obvious for a client to send ‘an indication that

[a predetermined level of fullness] has been reached to said data sender.” *Id.* (quoting Ex. 1001, claim 1).

Petitioners also contend that even if Lippman performed server-controlled stream switching, “it would have been obvious for a server to switch streams in response to a client’s buffer-fullness messages that represent network bandwidth.” *Id.* (citing Ex. 1010, 780; Decision 26). Petitioners contend that it is undisputed that Lippman does not explain how to measure bandwidth, and Muroi and other references (including Lu) “suggest having clients measure bandwidth.” *Id.* at 16–17 (citing Ex. 1029, 8; Ex. 1034, 33:22–24:9, 69:24–70:10; Ex. 1013 ¶¶ 21, 23–24). Petitioners cite Lu as teaching that “[d]ynamic stream switching relies on ‘estimated available bandwidth **reported by a client.**’” *Id.* at 17 (citing Ex. 1029, 8). Petitioners also assert that “people of skill recognized that it is preferable to have systems operate using information of actual device state rather than predictive models.” *Id.* (citing Ex. 1008 ¶ 113). Thus, according to Petitioners, even if Lippman uses a server to control stream switching, “applying Muroi’s measurement techniques to Lippman’s system merely reflects application of well-known features operating according to their established functions.” *Id.* (citing *KSR*, 550 U.S. at 417–418).

Petitioners further dispute that “concerns over server loading would dissuade a skilled worker from applying Muroi’s technique to Lippman’s system.” *Id.* (citing PO Resp. 42). Petitioners contend that Patent Owner’s “greedy client” argument is based on speculative expert testimony and should be ignored, as “Dr. Polish cites nothing that corroborates his explanation of a ‘greedy client’ phenomenon.” *Id.* at 17, 18, 7. Petitioners also contend that Dr. Polish also fails to address Dr. Reader’s testimony on

“prevailing Internet techniques that limit client transmission rates over the Internet.” *Id.* at 7 (citing Ex. 1008 ¶¶ 86–87; Ex. 2002).

In the Sur-Reply, Patent Owner contends that Petitioners “cherry-pick[] ambiguous passages from Lippman and ignore[] other disclosures,” arguing that Lippman’s statement about the player switching “does not address *which* end decides/determines whether to switch, only that the switch is made.” Sur-Reply 3. Patent Owner relies on Lu to support its argument that Lippman discloses server-controlled stream switching, as Lu states “[t]he idea [in Lippman] is that the server can switch among multiple streams” and it is “the server’s decision on whether it will respond.” *Id.* at 3–4, 14 (citing Ex. 1029 § 3.2.1). Patent Owner also disputes that Dr. Polish did not cite anything to support his explanation of a “greedy client” phenomenon, as Dr. Polish cited three references in support. *Id.* at 5–6 (citing Exs. 2006, 2007, 2008; Ex. 2002 ¶¶ 24–29; Ex. 1034, 99:9–100:21).

Although the parties expend significant effort disputing whether Lippman discloses server-centric or player-centric switching, we find it unnecessary to resolve whether Lippman’s server or player controls stream switching. Indeed, contradictory statements in the record make it difficult to determine the extent to which Lippman’s server and player are involved with stream switching.¹⁰ What *is* clear is that Lippman’s player provides at least some input to the server for stream switching. Lippman states that “the player will switch” streams “when conditions are appropriate,” and Lu

¹⁰ Lippman states that its “player will switch to a lower or higher bandwidth stream,” which appears to describe a client-centric approach, but Lu states that Lippman’s “server can switch among multiple streams.” Ex. 1010, 781; Ex. 1029 § 3.2.1.

confirms¹¹ that “the switching is dynamic, depending on the estimated available bandwidth reported by a client,” that is, Lippman’s player. *See* Ex. 1010, 781; Ex. 1029 § 3.2.1. Muroi’s client likewise provides input to the server for stream switching. *See* Ex. 1013 ¶¶ 23–24. Muroi’s client makes a rate switching request to the server “according to the state of the network,” i.e., based on fluctuating network bandwidth. *See* Ex. 1013 ¶¶ 30, 21; Ex. 1008 ¶ 151. As both Lippman’s and Muroi’s players provide at least some input to a server for stream switching, Patent Owner’s argument that modifying Lippman with Muroi would change Lippman’s principle of operation on this basis is unpersuasive. *See* PO Resp. 36, 40–44.

In any event, we agree with Petitioners that “even if” Lippman performs server-controlled stream switching, “it would have been obvious for a server to switch streams in response to a client’s buffer-fullness messages that represent network bandwidth.” *See* Reply 16 (citing Ex. 1010, 780). Patent Owner contends that changing from a service-centric approach to a client-centric approach would starve some clients’ bandwidth based on a few “greedy” clients. *See* PO Resp. 43–44; Sur-Reply 5–7; Ex. 2002 ¶ 20 (testifying that Muroi’s “client-controlled architecture . . . may result in other clients either (i) receiving very low quality video streams or (ii) being unable to receive a video stream at all”). However, we find this problem to be illusory because, according to Patent Owner, “[t]he idea [in Lippman] is that the server can switch among multiple streams” and it is “the server’s decision on whether it will respond.” Sur-Reply 3–4, 14 (citing Ex. 1029 § 3.2.1). As we understand it, Petitioners’ proposed

¹¹ Neither party challenges Lu as mischaracterizing Lippman; to the contrary, both parties rely on Lu. *See, e.g.*, Pet. 14; PO Resp. 41; Reply 17; Sur-Reply 4.

combination is not to bodily incorporate Muroi's client-based control by completely replacing whatever server control Lippman has; rather, it is to incorporate Muroi's "indication that [a predetermined level of fullness] has been reached to [the] data sender" in Lippman. *See* Reply 16; Pet. 25–29, 35–36; *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art."). Thus, even if Lippman's player using Muroi's technique greedily requested too much bandwidth, in the proposed combination Lippman's server would still retain the decision whether to switch streams. Because Lippman's server would retain this control, we find that Lippman's server could avoid problems due to potentially greedy clients.

Thus, we also find unpersuasive Patent Owner's argument that Muroi would change Lippman's principle of operation on this basis.

(c) Chou and Muroi Rendering Lippman Unsatisfactory for its Intended Purpose

Patent Owner additionally argues that "modifying Lippman with the teachings of Chou and Muroi as Petitioners propose would make Lippman's system unsatisfactory for its intended purpose." PO Resp. 45 (citing Ex. 2002 ¶¶ 30–78). This argument is largely redundant with Patent Owner's previous arguments.

Patent Owner contends modifying Lippman with Chou and Muroi would reduce Lippman's streaming quality as follows:

Modifying Lippman's system with both Chou and Muroi as proposed would render Lippman's system unsatisfactory for its intended purpose because the modified system would not

transmit the best-quality version of the video for a target audience (e.g., a version encoded at the full bitrate for the target audience) to a client device in that target audience even during optimal network conditions.

....

Even at startup, transmitting lower quality video to a user in a target audience when the user's Internet connection would support a better quality version of the video is contrary to Lippman's intended purpose of "maximiz[ing] the quality of a streaming multimedia experience regardless of the vagaries of a [user's] Internet connection."

Id. at 48 (citing Ex. 2002 ¶¶ 56–58), 49 (citing Ex. 2002 ¶ 62).

Patent Owner further contends that Chou and Muroi would reduce Lippman's streaming quality for additional reasons:

Because Petitioners' proposed system moves the function of determining when to switch between video versions from the server (as taught in Lippman) to the client (as taught in Muroi), the video server would respond to the client's rate switching request by switching to a lower quality version of the video. . . . And because the modified system implements Chou's approach of transmitting the lower quality video at the full transmission rate at startup to fill the client buffer, the server would transmit the third "keyframe only" version to the client at the transmission rate for the normal-quality encoding of the video, too.

....

Immediately switching from the second "75% rate" version at startup to the third "keyframe only" version of the video (or from the "28.8 Modem" version to the "28.8 Modem Duress" version, depending on the implementation) even further diminishes the quality of the user's experience, thereby further frustrating Lippman's intended purpose of "maximiz[ing] the quality of a streaming multimedia experience regardless of the vagaries of a [user's] Internet connection."

Id. at 50 (citing Ex. 1013 ¶ 27; Ex. 2002 ¶¶ 65, 66), 51 (citing Ex. 2002 ¶ 68). Finally, Patent Owner proposes additional scenarios (PO Resp. 51–53) where a “user does not receive the best quality version of the video that his or her Internet connection would otherwise support.” *Id.* at 53 (citing Ex. 2002 ¶ 77). Patent Owner also contends that “[t]his sub-optimal outcome is contrary to Lippman’s intended purpose of ‘maximiz[ing] the quality of a streaming multimedia experience.’” *Id.* (citing Ex. 1010, 780–782; Ex. 2002 ¶ 78).

Each of these arguments echoes Patent Owner’s argument above that Chou would change Lippman’s principle of operation or frustrate Lippman’s purpose by reducing Lippman’s quality in some way. None of Patent Owner’s arguments in this section show any disadvantages purportedly resulting from the combination that sufficiently undermines Petitioner’s obviousness analysis, including the reasons why a person of ordinary skill would have found the combination obvious (e.g., from advantages of the combination). We, therefore, reject these arguments for reasons similar to those stated above, as they also do not undermine Petitioner’s persuasive showing.

(d) Summary

For the foregoing reasons, and based on our review of the complete record, we are persuaded that Petitioners have established by a preponderance of the evidence that claim 1 is rendered obvious by Lippman, Chou, and Muroi.

b) Independent Claim 4

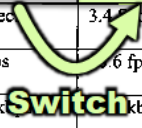
Independent claim 4 is similar to claim 1 in many respects, and Petitioners provide similar arguments for similar portions of claims 4 and 1. Pet. 44–57. However, claim 4 also recites “wherein said second plurality of

second-encoding-rate data packets are transmitted at a second transmission rate which is higher than said first transmission rate,” which is not recited in claim 1. Patent Owner contends that Petitioners have not shown this limitation is taught or suggested by the asserted prior art. PO Resp. 54–57. We agree with Patent Owner.

(1) The parties’ arguments

The Petition sets forth two theories for how the asserted prior art discloses this limitation. Pet. 52–53. First, Petitioners contend Lippman discloses this limitation based on Lippman’s video statistics table, reproduced below with annotations added by Petitioners:

Target Audience	28.8 Modem High Duress	28.8 Modem Duress	28.8 Modem	56k Modem	Single ISDN	Dual ISDN
Target Total Bitrates	12 kbps	15 kbps	20 kbps	34 kbps	45 kbps	80 kbps
Target Video Bitrates	7 kbps	10 kbps	15 kbps	29 kbps	36.5 kbps	71.5 kbps
Video Bitrates – Foreman	10.4 kbps	10.6 kbps	15 kbps	32.7 kbps	39.7 kbps	72.5 kbps
Buffer Time – Foreman	5.6 Secs	4.3 Secs	3.8 Secs	3.4 Secs	2.6 secs	1.7 Secs
Average fps – Foreman	.2 fps	2.7 fps	4.2 fps	16.6 fps	12.5 fps	14.6 fps
Video Bitrates – Grandma	7.5 kbps	10.5 kbps	15.9 kbps	29 kbps	37.9 kbps	74.5 kbps
Buffer Time – Grandma	5.8 Secs	4.8 Secs	4.9 Secs	3.3 Secs	2.9 secs	2.7 Secs
Average frames per second – Grandma	.1 fps	10.5 fps	14 fps	15 fps	15 fps	15 fps



Id. (citing Reader Decl. § IX.E.7). Lippman describes the above table as presenting aggregated statistics for two MPEG video clips. Ex. 1010, 781. The Petition contends Lippman teaches that “playback should be seamless, robust to missing packets and changing bandwidth conditions” and that “stream switching [is] accomplished by ‘key frames.’” *Id.* at 53 (citing Ex. 1010, 780–781).

The Petition’s second theory is that “[w]hen Chou’s teachings are applied, it would cause a skilled worker to use Lippman’s server to switch to a higher rate coding and transmit it at increasingly higher transmission rates according to the probe-lose-throttle principle.” Pet. 53 (citing Ex. 1008

§ VII.A.1). The Petition describes the probe-lose-throttle principle in its section entitled “Background Knowledge of a Skilled Worker.” *Id.* at 12 (“When packet loss is discovered, . . . source devices on the Internet reduce their transmission rates for a time, then gradually increase their transmission rates in an effort to determine if higher rate transmission can be supported. . . . [This is] called the ‘probe-lose-throttle’ principle.”) (citing Ex. 1001, 2:55–67; Ex. 1014 (Lee), 747). The Petition also contends that “a skilled worker would recognize that, over the course of the streaming session, transmission rates would rise from an initial, relatively-slow transmission rate to a higher steady-state transmission rate.” *Id.* at 27.

In our Institution Decision, we determined preliminarily that Petitioners’ arguments for this limitation were not persuasive. Decision 30. We asked the parties to address the following two issues at trial:

First, the parties should address whether the “Target Total Bitrates” in Lippman’s table are transmission rates, as Lippman does not appear to describe the “Target Total Bitrates” as transmission rates.

Second, the parties should address whether the asserted second-encoding rate data packets in Lippman are transmitted at a second transmission rate that is higher than the first transmission rate.

Id. at 30–31. We also determined preliminarily that “the Petition cites over four pages of Dr. Reader’s declaration for the proposition that Lippman and Chou would transmit at increasingly higher rates according to the probe-lose-throttle principle, but Petitioners do not explain in the Petition how this would occur.” *Id.* at 31 (citing Pet. 53).

Patent Owner contends that the combination of Lippman, Chou, and Muroi fails to teach or suggest “transmit[ting] a second plurality of second-encoding-rate data packets encoded at a second encoding rate to said data

presentation device . . . at a second transmission rate which is higher than said first transmission rate.” PO Resp. 54. Patent Owner contends that “the ‘Target Total Bitrates’ in Lippman’s table correspond to encoding rates—not transmission rates.” *Id.* at 55 (citing Ex. 2002 ¶ 82). Patent Owner addresses Petitioners’ “probe-lose-throttle” argument by contending that “the addition of Chou fails to overcome the deficiencies of Lippman.” PO Resp. 55–56 (citing Ex. 2002 ¶ 87). Patent Owner further contends, “both Lippman and Chou are silent as to any purported ‘probe-loss-throttle principle.’” *Id.* at 57.

In the Reply, Petitioners concede that Lippman does not disclose the disputed limitation and instead rely exclusively on their probe-lose-throttle theory. Reply 24. Petitioners state, “although Lippman does not disclose that packets are transmitted at a second transmission rate that is higher than the first transmission rate, the Petition explains that this feature is rendered obvious by ‘probe-lose-throttle’ rate control techniques that are . . . part of the background knowledge of the ordinarily skilled worker.” *Id.* Petitioners contend that Patent Owner does not dispute “that the probe-lose-throttle technique is familiar to the ordinarily skilled worker or that it would have been obvious to consider the teachings of Lippman, Chou, and Muroi with this background knowledge.” *Id.* at 25. Petitioners also contend that Dr. Polish failed to challenge Dr. Reader’s findings on the probe-lose-throttle principle. *Id.* at 26.

Petitioners’ Reply further contends that a reference introduced in Dr. Polish’s second declaration, Rejaie (Ex. 2006), “further corroborates Dr. Reader’s explanation of probe-lose-throttle techniques.” *Id.* According to Petitioner, “Rejaie describes application of the probe-lose-throttle technique to video-streaming systems that switch among layered codings.”

Id. at 27 (citing Ex. 2006 § 2). Petitioners contend that at low bandwidth levels, Rejaie’s server sends fewer coded video layers to a player device than at higher bandwidth levels. *Id.* (citing Ex. 2006 § 1.3). Petitioners further assert, “[a]ll the while, Rejaie’s server probes for additional bandwidth by increasing its transmission rate . . . until it determines that a packet is lost, and it throttles its transmission rate to a lower level.” *Id.* (citing Ex. 2006 § 2). The Reply also cites Lee (Ex. 1014) as supporting Petitioners’ probe-lose-throttle argument. *Id.* at 24–25.

In its Sur-Reply, Patent Owner disagrees with the Reply’s assertion that Patent Owner did not dispute that claim 4 is obvious in view of Lippman, Chou, Muroi, and the probe-lose-throttle technique because its Patent Owner Response “addressed the probe-lose-throttle technique . . . in as much detail as Petitioners addressed the technique in the Petition.” Sur-Reply 23. Patent Owner also contends that Petitioners’ probe-lose-throttle argument in the Reply is untimely because it “advances new arguments based on citations to additional prior art references.” *Id.* at 20–21. Specifically, Patent Owner contends that the Petition merely makes “passing mention of probe-lose-throttle” and that the Reply’s “over four new pages of argument” and “extensive citations to new prior art references” is improper. *Id.* at 23 (citing *Intelligent Bio-Sys., Inc. v. Illumina Cambridge, Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016)).

On the merits, Patent Owner’s Sur-Reply contends that although probe-lose-throttle is a congestion control mechanism used in Transport Control Protocol (TCP), “as Petitioners acknowledge, Lippman employs User Datagram Protocol (UDP) rather than TCP to transmit video.” *Id.* at 24 (citing Reply 23; Ex. 1010, 780). According to Patent Owner, “UDP does not implement TCP’s probe-lose-throttle mechanism or any other type of

congestion control.” *Id.* (citing Pet. 12; Ex. 1018 (RFC 1122), 82). Patent Owner also contends that “Petitioners provide no explanation of how a [person of ordinary skill in the art] might further modify the proposed Lippman-Chou-Muroi combination to implement TCP’s probe-lose-throttle mechanism.” *Id.* at 25. Finally, Patent Owner contends that other references teach away from using TCP for multimedia applications. *Id.* at 25–26 (citing Ex. 1021 (Padhye), Abstract (“Using TCP for multimedia applications is not practical . . . but inappropriate”); Ex. 1014 (Lee), 747 (TCP’s probe-lose-throttle “is inappropriate for video packet flows.”)).

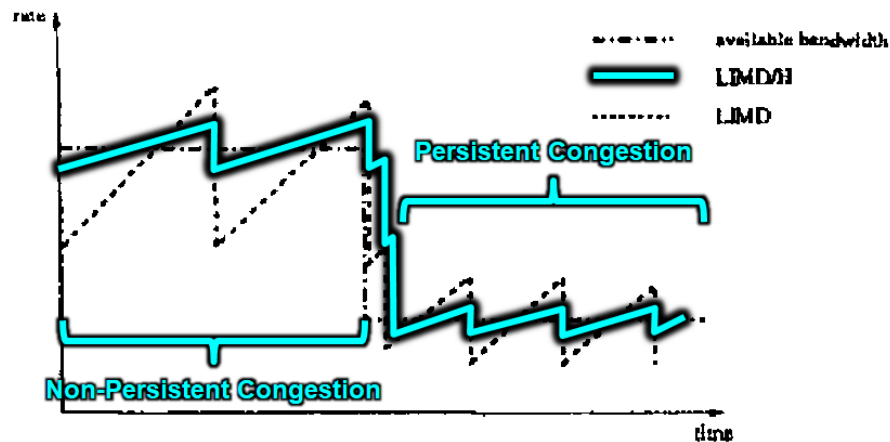
(2) *Analysis*

The Petition’s probe-lose-throttle argument is short on details and specific citations. The Petition does not cite to any supporting evidence for its proposition that “a skilled worker would recognize that, over the course of the streaming session, transmission rates would rise from an initial, relatively-slow transmission rate to a higher steady-state transmission rate.” Pet. 27. As we noted at institution, the Petition tersely contends that “[w]hen Chou’s teachings are applied, it would cause a skilled worker to use Lippman’s server to switch to a higher rate coding and transmit it at increasingly higher transmission rates according to the probe-lose-throttle principle.” Decision 30 (citing Pet. 53 (citing Ex. 1008 § VII.A.1)). But neither the Petition nor the four pages of Dr. Reader’s declaration that it cites explains how transmission rates rising “over the course of the streaming session” would suggest to one of ordinary skill in the art that second encoding rate packets would be sent at a higher transmission rate than first encoding rate packets in the cited references. “A skeletal argument, really nothing more than an assertion, does not preserve a claim.” *SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1320 (Fed.

Cir. 2006) (internal quotation omitted). In short, the Petition fails to persuade us that the probe-lose-throttle theory plugs the gap in its now-conceded failure of Lippman to teach the disputed limitation. *See* Reply 24.

Our decision does not rest on the brevity of the Petition alone. Rather, we determine that Petitioners' cited evidence for the probe-lose-throttle principle also fails to support the Petition's argument. The Petition cites to Lee (Ex. 1014 of Ground 2), other references (Exs. 1020–1024), the '200 patent itself (Ex. 1001, 2:55–67), and Dr. Reader's declaration to establish the background knowledge regarding probe-lose-throttle. Pet. 12, 27. Lee is the reference the Petition and Dr. Reader discuss in the most detail with respect to this principle. *See* Pet. 21–23, 79–80 (discussing claim 5). In contrast, the Petition does not discuss the other references in any detail (Exs. 1020–1024), and Dr. Reader's declaration merely refers to them in passing. *See* Pet. 12; Ex. 1008 ¶ 89 (citing Exs. 1020–1024 with short parenthetical descriptions). The Petition similarly does nothing more than cite a portion of the '200 patent without explanation. *See* Pet. 12 (citing Ex. 1001, 2:55–57). We, therefore, focus our review on Lee and Dr. Reader's testimony.

Petitioners reproduce Figure 6 of Lee in a background section of the Petition:



Pet. 22 (citing Ex. 1014, 751). Figure 6 of Lee provides a congestion control example when available bandwidth has suddenly decreased. Ex. 1014, 751. The Petition explains that Lee's congestion control algorithm "reacts gently to non-persistent congestion in order to keep the sending rate variation to a minimum in steady state." Pet. 22 (citing Ex. 1014, 750). The Petition further explains that Lee's algorithm "reacts aggressively, however, to persistent congestion," characterizing this response as "TCP-friendly." *Id.* at 23 (citing Ex. 1014, 747). Dr. Reader also testifies that "Lee characterizes the TCP transmission rate control technique as operating according to a 'probe-lose-throttle' principle." Ex. 1008 ¶ 90 (citing Ex. 1014, 747).

The problem with Petitioners' reliance on Lee to establish background knowledge is that although Petitioners state that "a skilled worker would recognize that, over the course of the streaming session, transmission rates would rise," Lee's figure depicts probe-lose-throttle at a high level without any particular time scale. *See* Pet. 27; Ex. 1014, 751. Lee's vague figure does not sufficiently illustrate *how* to compare the timing of Lee's increasing transmission rates with the teachings of Lippman, Chou, and Muroi; nor does the Petition do so. *See* Pet. 27. Further, Petitioners do not explain how one of ordinary skill in the art would know when Lee's transmission rate would reach its higher steady-state in the combination. Petitioners merely assert that "[w]hen Chou's teachings are applied, it would cause a skilled worker to use Lippman's server to switch to a higher rate coding and transmit it at increasingly higher transmission rates according to the probe-lose-throttle principle." *Id.* at 53. From Lee's Figure 6, it is unclear whether Lee's steady-state transmission rate would be reached during Lippman/Chou's transmission of lower-encoding rate packets or whether it would be reached, as Petitioners claim, during Lippman/Chou's transmission

of higher-encoding rate packets. In fact, as time goes on and congestion rises, Lee Figure 6 shows a *drop* in transmission rate, which Petitioners do not account for in their explanation. *See* Ex. 1014, 751. Thus, we find that Lee does not adequately support Petitioners' argument.

We next consider Dr. Reader's testimony in greater detail. Dr. Reader provides additional detail missing from the Petition, but his declaration cannot make up for the Petition's brevity when Petitioners cite indiscriminately to four pages of his declaration in support of a single proposition. *See* Pet. 53 (citing Ex. 1008 § VII.A.1). It is the Petition, not the expert declaration, that must make Petitioners' case. *See Liberty Mutual Ins. Co. v. Progressive Casualty Ins. Co.*, CBM2012-00003, Paper 8 at 10, 14 (PTAB Oct. 25, 2012) (the Board "will address only the basis, rationale, and reasoning put forth by the Petitioner in the petition, and resolve all vagueness and ambiguity in Petitioner's arguments against the Petitioner"); *cf.* 37 C.F.R. § 42.6(a)(3) ("Arguments must not be incorporated by reference from one document into another document."); *Cisco Systems, Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 at 9 (PTAB Aug. 29, 2014) ("This practice of citing the Declaration to support conclusory statements that are not otherwise supported in the Petition also amounts to incorporation by reference.").

In any event, Dr. Reader's declaration does not adequately support or clarify the Petition's argument. Initially, Dr. Reader discusses the probe-loose-throttle principle in the context of Lippman's pre-roll period. Ex. 1008 ¶ 158. Dr. Reader testifies that "a skilled worker would understand the transmission rate *during [Lippman's] pre-roll period* would be less than the full 34 kbps transmission rate ascribed to the '56K Modem' case." *Id.* (emphasis added). Dr. Reader further testifies that "[w]hen the start-up

phase is complete, . . . the streaming server may switch to the 34 kbps coding The server *may* continue to increase its transmission rate beyond the 34 kbps coding protocol, consistent with the TCP-friendly rate control techniques.” *Id.* ¶ 159 (citing *id.* ¶¶ 86, 89) (emphasis added). In other words, Dr. Reader testifies that Lippman would initiate a moderate transmission rate during the pre-roll buffering phase but may continue increasing transmission rate after switching to a higher encoding rate.

There are several problems with this testimony. First, Dr. Reader relies only on a citation to his prior general discussion of probe-lose-throttle techniques to support his opinion that the transmission rate may continue to increase after Lippman’s coding rate switch. *See id.* ¶ 159 (citing *id.* ¶¶ 86, 89); *see also id.* ¶ 86 (citing Ex. 1001, 2:55–58), *id.* ¶ 89 (citing Exs. 1014, 1020–1024 without detailed discussion)). Dr. Reader does not explain why transmission rates may continue to increase *after* Lippman’s coding rate switch. In other words, Dr. Reader’s testimony on this point amounts to unsupported expert opinion. *See* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”); *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”).

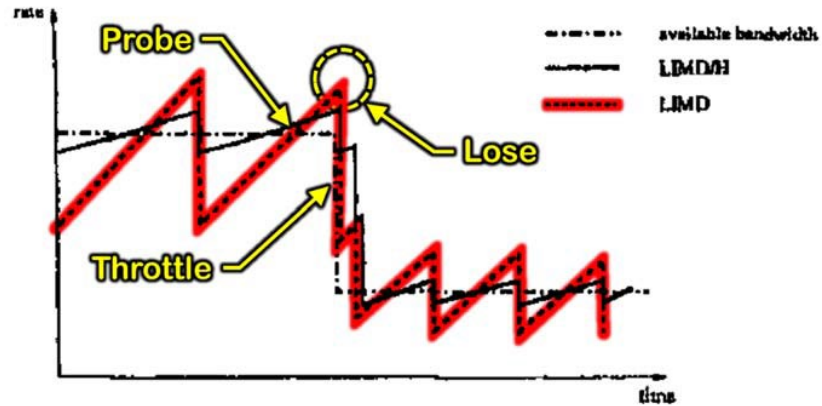
Second, Dr. Reader’s assertion that the transmission rate “*may* continue to increase” after a coding rate switch is insufficient to show that a skilled artisan would have understood the transmission rate *would* increase. *See* Ex. 1008 ¶ 159 (emphasis added); *cf. Personal Web Techs. LLC v. Apple, Inc.*, 848 F.3d 987, 993 (Fed. Cir. 2017) (it is not enough to state that “a skilled artisan, once presented with the two references, would have

understood that they *could* be combined”) (emphasis added); *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (“[Defendant’s] expert also succumbed to hindsight bias in her obviousness analysis. [Her] testimony primarily consisted of conclusory references to her belief that one of ordinary skill in the art *could* combine these references, not that they *would* have been motivated to do so.”).

Finally, Dr. Reader’s testimony is unpersuasive because it relies on Lippman’s pre-roll period to establish transmission rate timing, but Petitioners propose *eliminating* Lippman’s pre-roll period in the combination with Chou. *Compare* Ex. 1008 ¶ 158 (“[A] skilled worker would understand the transmission rate *during [Lippman’s] pre-roll period* would be less than the full 34 kbps transmission rate ascribed to the ‘56K Modem’ case.”) (emphasis added) *with* Pet. 26–27 (“Lippman explains that players collect a minimum amount of ‘pre-roll’ packets, then start playing”; “Chou describes that start-up delays of 2–10 seconds are ‘annoying’ and ‘intolerable’”; “A skilled worker would be motivated to apply Chou’s techniques in Lippman’s architecture to *avoid* these ‘annoying’ delays”; and “playback [would] begin immediately.”) (emphasis added). Dr. Reader does not explain how probe-lose-throttle timing would work once Lippman’s pre-roll period is eliminated in the modification with Chou.

Accordingly, we give little weight to Dr. Reader’s testimony that one of ordinary skill in the art would have understood that Lippman, Chou, and Muroi in view of the probe-lose-throttle principle would have taught or suggested the disputed limitation of claim 4. *See* 37 C.F.R. § 42.65(a).

In the Reply, Petitioners present additional arguments supporting their probe-lose-throttle theory. *See* Reply 24–28. Petitioners expound on Lee’s Figure 6, supplying the following new annotations:



Id. at 24–25. Figure 6 is annotated to show alleged probe, lose, and throttle portions of a transmission. *See id.* Petitioners assert, “[i]n this technique, a server transmits packets at ever-increasing transmission rates (the ‘probe’) until a packet is lost (‘lose’), at which time the server drops the transmission rate to a lower level (‘throttle’), and the process repeats.” *Id.* at 24. We find that Petitioners’ newly annotated Figure 6 does not clarify how one of ordinary skill in the art would have understood the timing of probe-lose-throttle to apply to the combination of Lippman, Chou, and Muroi for the reasons we describe above, including that the annotated Figure 6 still does not include a time scale.

Petitioners also provide detailed discussion of the probe-lose-throttle principle in the context of a new reference, Rejaie (Ex. 2006), cited in Dr. Polish’s second declaration. *Id.* at 26–27; Ex. 2002 ¶ 27. Patent Owner’s Sur-Reply objects to the Reply’s reliance on Rejaie and Lee as presenting untimely arguments. Sur-Reply 21 (“Petitioners’ new probe-lose-throttle discussion set forth for the first time in their Reply advances new arguments based on citations to additional prior art references.”). We agree with Patent Owner that Petitioners’ argument based on Rejaie is untimely for reasons we explain below.

Our reviewing court has instructed that “[u]nlike district court litigation—where parties have greater freedom to revise and develop their arguments over time and in response to newly discovered material—the expedited nature of IPRs bring with it an obligation for petitioners to make their case in their petition.” *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016). Accordingly, “[i]t is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” *Id.* (quoting 35 U.S.C. § 312(a)(3)). In *Illumina*, a petitioner included a new theory of invalidity in its reply brief, relying on new references not submitted with its petition. *Id.* In those circumstances, the Federal Circuit held that the Board did not err in refusing the reply brief as improper. *Id.* at 1370. Similarly here, Petitioners improperly include a new theory of invalidity in the Reply based on a new reference, Rejaie, not in the Petition.

The fact that Dr. Polish introduced Rejaie in his second declaration for one purpose does not permit Petitioners to use Rejaie for another, unrelated purpose. *See* Ex. 2002 ¶ 27. Dr. Polish did not introduce Rejaie for the purpose of addressing the probe-lose-throttle principle. Rather, Dr. Polish introduced Rejaie to support his opinion that “a distributed, client-controlled architecture like the one described in Muroi is not a guaranteed improvement over a centralized, server-controlled architecture like the one described in Lippman.” *Id.* ¶ 15. While Dr. Polish references Rejaie’s “congestion control mechanisms,” Dr. Polish does so without discussing probe-lose-throttle techniques and only to support his server-centric point. *See id.* ¶ 27 (“Because ‘congestion control mechanisms for streaming video playback are critical’ . . . , Rejaie suggests to persons of skill in the art that decisions about

controlling the amount of traffic to insert into the network . . . are better left to the server rather than the client.”). Dr. Polish’s discussion of Rejaie in the context of server-centric architecture did not open the door for Petitioners to use Rejaie to bolster an unrelated argument about probe-lose-throttle. *See* 37 C.F.R. § 42.23(b). While we asked the parties in our Institution Decision to address in more detail whether Lippman teaches or suggests the disputed limitation, we agree with Patent Owner that our Decision “did not invite Petitioners to cite new evidence” for its probe-lose-throttle theory. *See* Decision 30–31; Sur-Reply 21–22.

Thus, although we are mindful not to parse reply arguments with “too fine of a filter,”¹² we determine that Petitioners’ reliance on Rejaie constitutes untimely new argument, not responsive to the Patent Owner Response. Accordingly, we decline to consider it.¹³ As we determine the Petitioners failed to meet their burden to show the unpatentability of claim 4, we need not address the Sur-Reply’s claim 4 arguments on the merits. *See* Sur-Reply 23–26.

¹² *See Ericsson Inc. v. Intellectual Ventures I LLC*, 901 F.3d 1374, 1380 (Fed. Cir. 2018). There, the Board improperly excluded petitioner’s reply argument, but it was “[u]ndoubtedly . . . a special case in which Petitioner, Patent Owner, and the Board all initially applied the broadest reasonable interpretation claim construction standard, and only after institution applied *Phillips* instead.” *Id.* This case differs from *Ericsson* because no such special claim construction issue exists and because unlike *Ericsson*, Petitioners here rely on a new Reply reference. *See id.*

¹³ We consider any potential prejudice to Petitioners from declining to consider Rejaie to be minimal. Counsel for Petitioners admitted during oral argument that “I don’t think that Rejaie is critical in any way. . . . So, it’s not so much that Rejaie is needed. It’s that Rejaie is just sort of icing on the cake because they found a reference that corroborates our argument.” Tr. 43:19–45:1.

For the foregoing reasons, and based on our review of the complete record, we are not persuaded that Petitioners have established by a preponderance of the evidence that claim 4 is rendered obvious by Lippman, Chou, and Muroi, or those references in view of the background knowledge of a person of ordinary skill in the art.

c) Independent Claims 7 and 10

Petitioners assert that independent claims 7 and 10 have nearly all of the same features as claim 1 and identify any pertinent differences on pages 57–70 of the Petition. Petitioners’ detailed analysis explaining where the combination of Lippman, Chou, and Muroi teaches the limitations in these claims is essentially identical to the analysis discussed above with respect to claim 1. Pet. 29–42. Patent Owner relies on the same arguments for claims 7 and 10 as it does for claim 1. PO Resp. 27–54.

For the reasons discussed above, and based on our review of the complete record, we are persuaded that Petitioners have established by a preponderance of the evidence that claims 7 and 10 are rendered obvious by Lippman, Chou, and Muroi.

d) Dependent Claims 2 and 3

Petitioners provide a detailed analysis explaining where Lippman, Chou, and Muroi disclose the limitations in dependent claims 2 and 3. Pet. 42–44. Patent Owner does not offer separate arguments for these claims or contest Petitioners’ analysis. For the reasons discussed above, and the argument and evidence in the Petition (*id.*), we are persuaded that Petitioners have established by a preponderance of the evidence that claims 2 and 3 are rendered obvious by Lippman, Chou, and Muroi.

2. *Challenges Applying Lippman, Chou, Muroi, and Lee*

Petitioners contend that claims 5, 6, 11, and 12 are obvious over Lippman, Chou, Muroi, and Lee under 35 U.S.C. § 103(a). Pet. 70–85. Patent Owner does not challenge Petitioners’ arguments for these claims.¹⁴

Petitioners provide a detailed analysis explaining where Lippman, Chou, Muroi, and Lee disclose the limitations in dependent claims 5, 6, 11, and 12, which we find persuasive. Pet. 80–85. Petitioners also articulate a detailed rationale to combine Lee with Lippman, Chou, and Muroi, which we also find persuasive. *Id.* at 70–73. Based on our review of the complete record, we are persuaded that Petitioners have established by a preponderance of the evidence that claims 5, 6, 11, and 12 are rendered obvious by Lippman, Chou, Muroi, and Lee.

¹⁴ Although the Preliminary Response challenged Petitioner’s arguments on claim 5 (Prelim. Resp. 56–62), the Patent Owner’s failure to renew these challenges in its Patent Owner Response constitutes waiver. *See* Paper 8, 7 (“Patent Owner is cautioned that any arguments for patentability not raised in the response may be deemed waived.”).

IV. CONCLUSION¹⁵

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–4, 7, 10	103(a)	Lippman, Chou, Muroi	1–3, 7, 10	4
5, 6, 11, 12	103(a)	Lippman, Chou, Muroi, Lee	5, 6, 11, 12	
Overall Outcome			1–3, 5–7, 10– 12	4

V. ORDERS

In consideration of the foregoing, it is hereby:

ORDERED that Petitioners have shown by a preponderance of the evidence that claims 1–3, 5–7, and 10–12 of the '200 patent are unpatentable;

FURTHER ORDERED that Petitioners have not shown by a preponderance of the evidence that claim 4 is 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.

¹⁵ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

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For PETITIONER:

Robert Hails
T Cy Walker
BAKER HOSTETLER LLC
rhails@bakerlaw.com
cwalker@bakerlaw.com

For PATENT OWNER:

Daniel Boehnen
Grantland Drutchas
Jeffrey Armstrong
George Lyons
MCDONNELL BOEHNEN HULBERT & BERGHOFF, LLP
boehnen@mbhb.com
drutchas@mbhb.com
armstrong@mbhb.com
lyons@mbhb.com