Trials@uspto.gov
571-272-7822

Paper 38
Entered: January 11, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY INTERACTIVE ENTERTAINMENT LLC,
Petitioner,

v.

INTELLECTUAL PIXELS LIMITED,
Patent Owner.

IPR2020-01248
Patent 8,667,093 B2

Before JENNIFER S. BISK, JENNIFER MEYER CHAGNON, and IFTIKHAR AHMED, *Administrative Patent Judges.*

AHMED, *Administrative Patent Judge*.

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

I. INTRODUCTION

Sony Interactive Entertainment LLC ("Petitioner") requested an *inter partes* review of claims 1–9, 13, and 15–19 of U.S. Patent No. 8,667,093 B2 (Ex. 1001, "the '093 patent"). Paper 3 ("Petition" or "Pet."). Intellectual Pixels Limited ("Patent Owner") filed a Preliminary Response. Paper 9 ("Prelim. Resp."). In its Preliminary Response, Patent Owner informed us that it had disclaimed claims 5–9, 13, and 15–19. *Id.* at 1, n.1 (citing Ex. 2001 (Notice of Filing a Statutory Disclaimer of Claims in a Patent under 37 C.F.R. § 1.321(a))). Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of claims 1–4 (the "Challenged Claims") of the '093 patent. Paper 12 ("Inst. Dec.").

After institution, Patent Owner filed a Patent Owner Response (Paper 19, "PO Resp."), Petitioner filed a Reply to Patent Owner's Response (Paper 21, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 28, "PO Sur-reply"). With our authorization (Paper 28), Petitioner filed a Supplemental Reply (Paper 30, "Pet. Supp. Reply"). An oral hearing was held on October 15, 2021, and a copy of the transcript was entered in the record. Paper 37 ("Tr.").

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. Petitioner bears the burden of proving unpatentability of the Challenged Claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). Having reviewed the arguments and the supporting evidence, we determine

that Petitioner has shown, by a preponderance of the evidence, that claims 1–3 are unpatentable, but has not shown, by a preponderance of the evidence, that claim 4 of the '093 patent is unpatentable.

II. BACKGROUND

A. Related Proceedings

The '093 patent is asserted in *Intellectual Pixels Ltd. v. Sony Interactive Entertainment LLC*, No. 8:19-cv-01432 (C.D. Cal. filed July 25, 2019). Pet. 1; Paper 4, 2. That proceeding has been stayed pending resolution of this *inter partes* review. Paper 8, 2.

B. The '093 Patent (Ex. 1001)

The '093 patent, titled "Image Display System with Visual Server," was filed on November 15, 2011, and claims priority to a provisional application filed on January 24, 2001. Ex. 1001, codes (22), (54), (60), (63). The '093 patent issued on March 4, 2014. *Id.* at code (45).

The '093 patent relates to computer graphics and a graphical image display system that uses a visual server to generate and transmit images to clients. *Id.* at 1:19–21. The '093 patent explains that display of three-dimensional ("3D") images at a client requires dedicated graphics hardware not available on consumer client devices such as personal digital assistants, mobile telephones, and television set-top boxes. *Id.* at 3:9–12. The '093 patent invention seeks to display complex three-dimensional graphics, such as those used by games, on such consumer client devices by utilizing the resources of a visual server. *Id.* at 3:12–17.

Figure 1 of the ’093 patent is reproduced below.

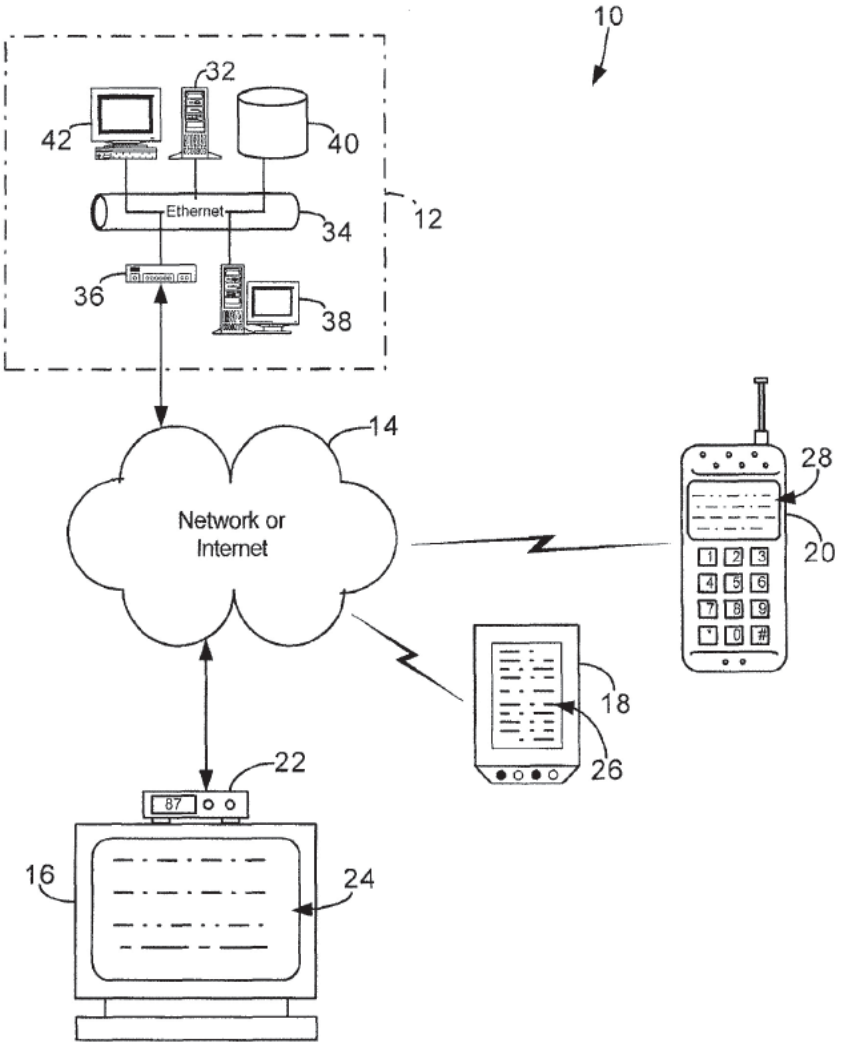


Fig. 1

Figure 1 shows image display system 10 with visual server 12 and associated components in communication with a plurality of clients (*i.e.*, television 16 with set-top box 22, PDA 18, and cellular telephone 20) across a network. *Id.* at 4:61–64; 5:13–29.

The ’093 patent explains that the visual server runs standard software, such as games, and further supports software modified to enable control of an application from a client and the delivery of a result of 3D drawing to a

client. *Id.* at 3:26–29. Visual server 12 selectively receives image-modifying data from a client (16, 18, or 20) corresponding to a generated image. *Id.* at 6:3–7. The server then generates a modified image based upon the image-modifying data, compresses the image or image data with a specific compression/decompression algorithm ("codec"), and transmits the compressed data back to the client. *Id.* at 6:7–12. The client decompresses the received image data and displays the image on a display (24, 26, or 28). *Id.* at 6:24–28. The '093 patent explains that any industry standard codecs, such as MPEG, JPEG, and H.261 may be used to compress data at the server. *Id.* at 6:28–31.

C. Challenged Claims

Petitioner challenges independent claim 1 and dependent claims 2–4. Claim 1 is reproduced below.

> 1. A method of playing interactive games on a client device having an image display, comprising:
>
> sending user input control signals to an application, running on a server, which generates 3-dimensional graphics accordingly;
>
> receiving, from said server, said 3-dimensional graphics in the form of a compressed stream of images;
>
> decompressing said compressed stream of images into at least one decompressed image at said client device, said at least one decompressed image corresponding to said graphics; and
>
> displaying said at least one decompressed image at the display of said client device, wherein said client device does not perform 3-dimensional graphics processing on said at least one decompressed image, and wherein said client device is separate from said server.

Ex. 1001, 9:23–38.

D. The Instituted Grounds of Unpatentability and Declaration Evidence

As against the claims remaining after Patent Owner's disclaimer, Petitioner asserts the following grounds of unpatentability, relying on the declaration testimony of Dr. Henry Fuchs (Exs. 1002, 1035). Pet. 3, 24–74; Pet. Reply 2–27.

Claims Challenged	35 U.S.C. §[1]	Reference(s)/Basis
1–3	103(a)	Schmidt[2]
1–3	103(a)	Schmidt, Keslin[3]
4	103(a)	Schmidt, IEEE 802.3 Standard[4]
4	103(a)	Schmidt, Keslin, IEEE 802.3 Standard

Patent Owner supports its arguments with a Declaration by John C. Hart, Ph.D. (Ex. 2016).

III. ANALYSIS

A. Principles of Law

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed.

[1] Because the '093 patent issued from a patent application that was filed before March 16, 2013, patentability is governed by the version of 35 U.S.C. § 103 preceding the Leahy-Smith America Invents Act ("AIA"), Pub L. No. 112–29, 125 Stat. 284 (2011).
[2] Brian K. Schmidt et al., The Interactive Performance of SLIM: a Stateless, Thin-Client Architecture, 17TH ACM SYMPOSIUM ON OPERATING SYSTEMS PRINCIPLES (SOSP '99), Dec. 12–16, 1999, at 32 (Ex. 1004, "Schmidt").
[3] U.S. Patent No. 7,274,368 B1, issued Sept. 25, 2007 (Ex. 1005, "Keslin").
[4] THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC., LOCAL AREA NETWORKS, CARRIER SENSE MULTIPLE ACCESS WITH COLLISION DETECTION, ANSI/IEEE STD. 802.3–1985, ISO/DIS 8802/3 (1985) (Ex. 1006, "IEEE 802.3 Standard").

Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). That burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware*, 800 F.3d at 1378 (discussing the burden of proof in *inter partes* review).

As set forth in 35 U.S.C. § 103(a),

> [a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.[5] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007); *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). However, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, Petitioner must articulate a reason why a person of ordinary skill in

[5] Neither party presents evidence of objective considerations of nonobviousness.

the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

We review Petitioner's asserted obviousness grounds in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner contends that a person of ordinary skill in the art would have had "at least (1) an undergraduate degree in computer science, electrical engineering, or an equivalent subject, together with two years of post-graduate experience in computer graphics; or (2) a master's degree in computer science, electrical engineering, or equivalent subject, together with one year of postgraduate experience in computer graphics." Pet. 18 (citing Ex. 1002 ¶¶ 25–27). Patent Owner agrees with Petitioner but adds that "the experience in computer graphics would include experience with multimedia systems, particularly the delivery of video display information across a network." PO Resp. 10–11 (citing Ex. 2016 ¶ 26).

We determine that Petitioner's proposed level of ordinary skill is consistent with the '093 patent and the asserted prior art, and also agree with Patent Owner's assertion regarding the relevant experience. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). Accordingly, we determine that one of ordinary skill in the art at the time of the invention would have had at least (1) an undergraduate degree in computer science, electrical engineering, or an equivalent subject, together with two years of post-graduate experience in computer graphics; or (2) a master's degree in computer science, electrical engineering, or equivalent subject, together with one year of postgraduate experience in computer

graphics. The experience in computer graphics would include experience with multimedia systems, particularly the delivery of video display information across a network.

C. Claim Construction

In this *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2019). The claim construction standard includes construing claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art at the time of the invention. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc). In construing claims in accordance with their ordinary and customary meaning, we take into account the specification and prosecution history. *Phillips*, 415 F.3d at 1315–17. Additionally, only terms that are in controversy need to be construed, and these need be construed only to the extent necessary to resolve the controversy. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy"); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

1. 3-dimensional graphics (and related terms)

The parties inform us of certain terms that were construed in pending district court litigation. *See* Pet. 17 (citing Ex. 1013, 21); PO Resp. 12–13 (citing Ex. 1013, 12–13). We determine that it is not necessary to expressly construe any of these terms for purposes of our Decision.

2. compressed stream of images

Patent Owner contends that "[t]he Board does not need to construe 'compressed stream of images' beyond the simple recognition that it does not include the color-component subsampling of Schmidt," "because at the time of the invention, color-component subsampled video was considered to be *uncompressed*." PO Resp. 13–14 (citing Ex. 2016 ¶¶ 45–52, 55–69). Petitioner responds that "neither the intrinsic nor extrinsic evidence supports Patent Owner's narrow construction of 'compressed stream of images' to exclude color component subsampling," and that "the term should be given its plain and ordinary meaning, which indisputably includes the type of image compression described in Schmidt." Pet. Reply 8 (citing Ex. 1035 ¶¶ 29–32, 34).

Because we find challenged claims 1–3 unpatentable as obvious over the combination of Schmidt and Keslin (where Petitioner relies on Keslin as teaching a compressed stream of images), we do not reach Petitioner's obviousness ground based on Schmidt alone, and therefore, we do not find it necessary to resolve the parties' claim construction dispute, which relates solely to assessing Schmidt's teaching of the compressed stream of images.

3. sending user input signals to an application

The parties also present a claim construction dispute as to the claim limitation "sending user input control signals to an application, running on a server, which generates 3-dimensional graphics accordingly," which we address below to the extent necessary to conduct our obviousness analysis. *See infra* § III.E.1.b.

D. Overview of the Asserted Prior Art

1. Schmidt (Ex. 1004)

Schmidt discloses a thin-client architecture known as SLIM (Stateless, Low-Level Interface Machine) with the goal of removing all state and computation from the desktop and using a low-level hardware and software independent protocol to connect client devices to the system's computational resources over a low-cost commodity network. Ex. 1004, 33.

Figure 1 of Schmidt is reproduced below.

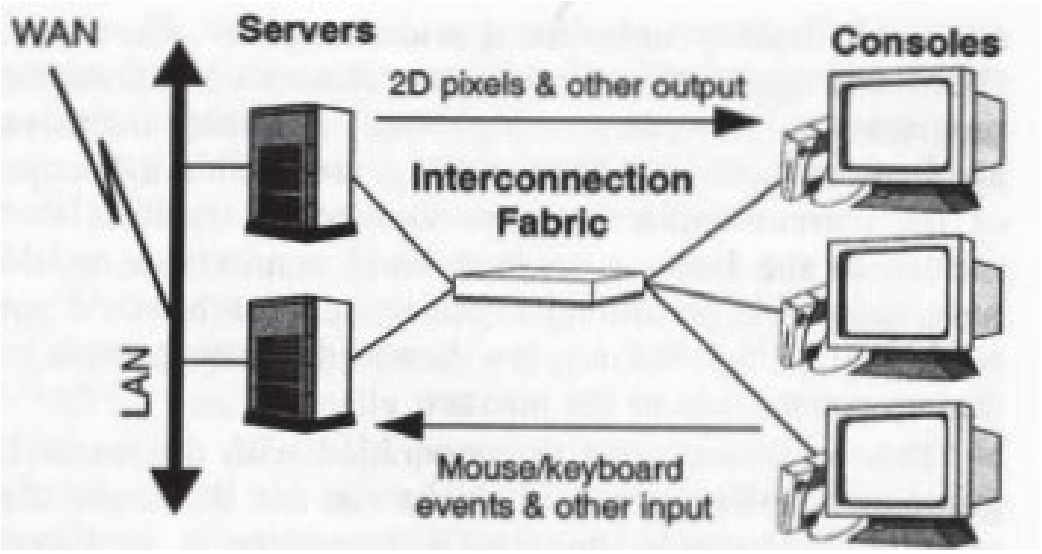


Figure 1 illustrates the main components of the SLIM architecture. *Id.* at 33. The system includes servers and consoles, where consoles transmit keyboard and mouse state events to servers via the SLIM protocol, and servers transmit audio data and display updates to consoles also via the SLIM protocol. *Id.* at 35. The servers and consoles are connected via an interconnection fabric. *Id.* at 34. For display updates, the SLIM servers send only encoded pixel updates to consoles, and each console refreshes its display from a local frame buffer using the received display update. *Id.* Schmidt also defines a set of display commands that "compress pixel data by

taking advantage of the redundancy commonly found in the pixel values generated by modern applications." *Id.* at 35. One such command, CSCS, is used to "[c]olor-space convert [a] rectangular region from YUV to RGB with optional bilinear scaling." *Id.*

Schmidt discloses that the performance of the SLIM architecture was evaluated on multimedia applications, including a 3-D game from id Software known as Quake. *Id.* at 36. Schmidt details the implementation of Quake on the SLIM architecture using "a translation layer which converts frames to a format suitable for use by the SLIM CSCS protocol command." *Id.* at 45.

2. Keslin (Ex. 1005)

Keslin discloses a system for remote rendering of computer graphics. Ex. 1005, 1:36–38. The system includes a graphics application program, resident at a remote server that is run by a client process. *Id.* at 1:38–41.

Figure 1 of Keslin is reproduced below.

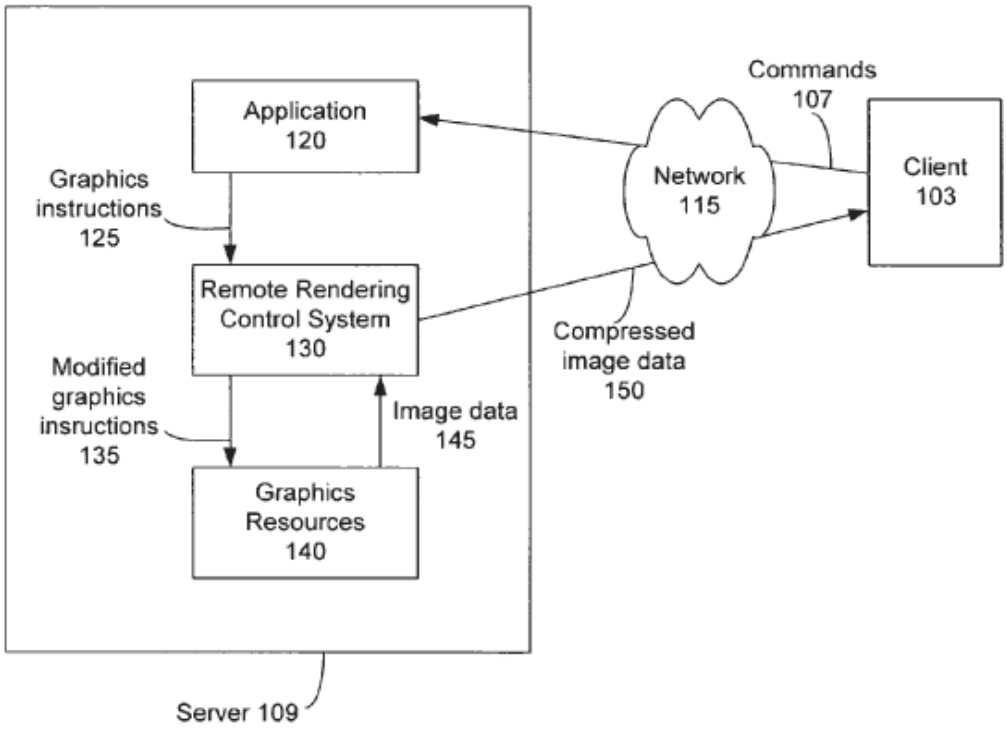


Figure 1 illustrates an overall architecture for Keslin's system. *Id.* at 3:30–31. Client 103 issues commands 107 to remotely located server 109 to perform remote rendering. *Id.* at 3:31–34. In response, application 120 generates graphics instructions 125, which are the modified by remote rendering control system 130 based on the graphics processing capabilities and graphic contexts of specific client 103. *Id.* at 3:38–51. Graphics resources 140 at the server then renders images based on the modified graphics instructions and returns image data 145. *Id.* at 3:51–53. As part of the rendering, image data 145 is compressed to form compressed image data 150 which is sent to the client. *Id.* at 3:54–57.

Figure 3 of Keslin is reproduced below.

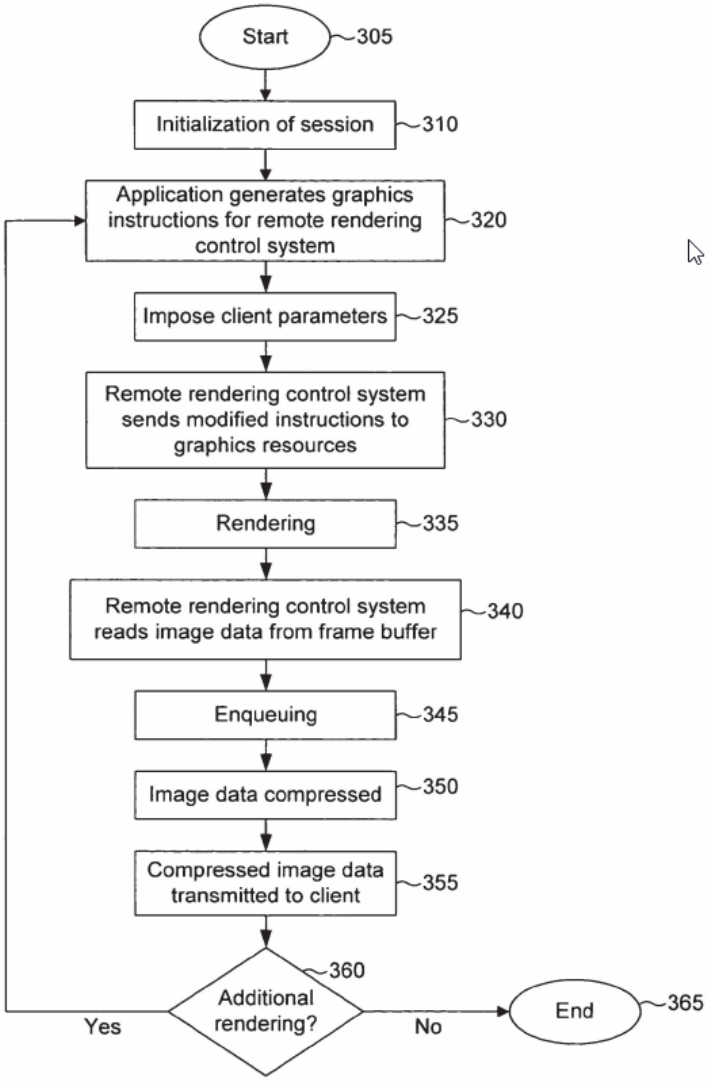


FIG. 3

Figure 3 is a flowchart that illustrates the method of remote rendering of computer graphics in Keslin. *Id.* at 2:15–16. As part of the method of remote rendering, at 350, image data is compressed into compressed image data. *Id.* at 5:5–6. At 355, the compressed image data is transmitted to the client. *Id.* at 5:6–7.

Figure 11 of Keslin is reproduced below.

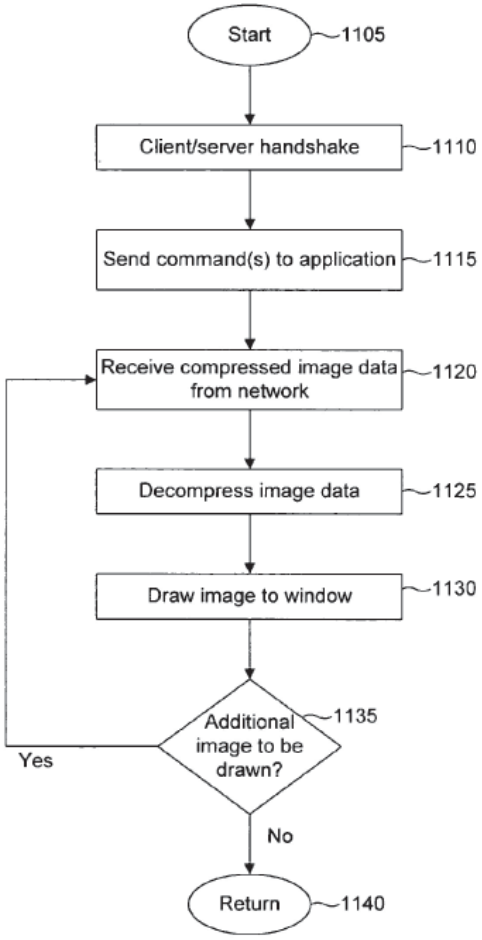


FIG. 11

Figure 11 is a flowchart illustrating the remote rendering process from the perspective of the client. *Id.* at 2:36–38. As part of the method of remote rendering, at 1125, image data is decompressed at the client. *Id.* at 7:55–56. At 1130, the appropriate image is drawn to a window at the client. *Id.* at 7:56–57.

3. IEEE 802.3 Standard (Ex. 1006)

The IEEE 802.3 Standard discloses a standard published in 1983 by the Institute of Electrical and Electronics Engineers relating to the Carrier Sense Multiple Access with Collision Detection ("CSMA/CD") media

access method by which two or more stations share a common bus transmission medium. Ex. 1006, 13. The IEEE 802.3 Standard discloses that "[w]henever the medium is busy, the CSMA/CD MAC sublayer defers to the passing frame by delaying any pending transmission of its own." *Id.* at 38. That delay is referred to by the IEEE 802.3 Standard as interFrameSpacing. *Id.* at 38–39.

E. Obviousness over Schmidt and Keslin

Petitioner contends that claims 1–3 are unpatentable under 35 U.S.C. § 103 as obvious over Schmidt and Keslin. Pet. 59–68. To support its contentions, Petitioner provides, among other things, explanations as to how the prior art teaches each claim limitation. *Id*. Petitioner also relies upon Dr. Fuchs's testimony (Exs. 1002, 1035) to support its positions. *Id.*

Patent Owner argues that Petitioner's proposed obviousness combination fails to address Schmidt's teaching away from adding further computation to Schmidt's client and the fundamental differences in the Schmidt and Keslin systems. PO Resp. 45–49. On the complete record, we are persuaded by Petitioner's explanations and evidence in support of the obviousness ground for claims 1–3 over Schmidt and Keslin. We address below the evidence, analysis, and arguments presented by the parties.

1. Independent Claim 1

a) "A method of playing interactive games on a client device having an image display, comprising:"

Petitioner contends Schmidt discloses a method of playing interactive games on a client device having an image display. Pet. 24–25 (citing Ex. 1002 ¶ 55). Petitioner argues that Schmidt discloses the SLIM client-server system comprising both servers and consoles. *Id.* at 25–26 (citing Ex. 1004, 33, Fig. 1; Ex. 1002 ¶ 56). Petitioner further contends that the

consoles disclosed in Schmidt are thin clients, which are simple desktop machines with an image display, that access a shared pool of computational resources over a dedicated interconnection fabric. *Id.* at 26 (citing Ex. 1004, Abstract, 35, Fig. 1).

Petitioner contends that Schmidt further discloses a method of playing Quake, an interactive 3D game, on the SLIM console. Pet. 27 (citing Ex. 1004, Abstract, 36, 44, 45, 46; Ex. 1002 ¶ 58). Petitioner further contends Quake is an interactive game where the player interacts with the game by controlling the character within a 3D world. *Id.* at 27–28 (citing Ex. 1009, 39; Ex. 1002 ¶ 59).

Patent Owner does not specifically respond to these arguments. *See generally* PO Resp. On the complete record, we find that Petitioner provides sufficient evidence that Schmidt teaches the preamble of claim 1.[6]

b) "sending user input control signals to an application, running on a server, which generates 3-dimensional graphics accordingly;"

Petitioner contends Schmidt teaches or suggests sending user input control signals to an application, running on a server, which generates 3-dimensional graphics accordingly. Pet. 28 (citing Ex. 1002 ¶ 61). Petitioner contends Schmidt discloses that the SLIM console (*i.e.*, the client device) sends user input control signals in the form of mouse and keyboard inputs to the SLIM server. *Id.* at 28–29 (citing Ex. 1004, 33, Fig. 1; Ex. 1002 ¶ 62). Petitioner further contends that the "mouse/keyboard events & other input" shown in Schmidt's Figure 1 are types of user input control

[6] Although we need not decide whether the preamble of claim 1 is limiting, Petitioner has shown that the recitation in the preamble is satisfied by the prior art.

signals because Schmidt refers to those signals as "input" and "input events." *Id.* at 29 (citing Ex. 1004, 33, 37, 38; Ex. 1002 ¶ 63). According to Petitioner, Schmidt discloses that the SLIM consoles operate by "passing keyboard and mouse state" to the servers, which respond by updating the display. *Id.* at 29–30 (citing Ex. 1004, 35, 37, 38).

Next, Petitioner argues that Schmidt explains that its "user input control signals" are sent to an application running on the SLIM server, which, according to Petitioner, is "an application, running on a server," as claim 1 requires. Pet. 30 (citing Ex. 1004, 33, 35). Petitioner points to Table 2 of Schmidt as showing various applications that run on the SLIM servers, including applications that generate 3-dimensional graphics, such as the 3D Quake game. *Id.* at 30–32 (citing Ex. 1004, 36 (Table 2), 44; Ex. 1002 ¶¶ 65–66).

Petitioner argues that Schmidt discloses that when using SLIM architecture to play Quake on a SLIM client, the client sends keyboard and mouse input control signals to the SLIM server running the Quake application, which in response, generates 3D graphics for display on the SLIM client, thus "generat[ing] 3-dimensional graphics" based on the user input control signals. Pet. 32 (citing Ex. 1004, 35, 44, 45). Petitioner argues that in Quake, the 3D graphics are changed as the player moves around in the game, and a person of ordinary skill in the art would understand from Schmidt's disclosure that mouse and keyboard inputs are sent from the SLIM console to the SLIM server, where they cause the Quake game application running on the server to generate 3D graphics based on the inputs. *Id.* at 33 (citing Ex. 1009, 39; Ex. 1002 ¶ 67).

Patent Owner responds that claim 1 requires that the server *itself*, as opposed to an application running on the server, generates 3-dimensional

graphics. PO Resp. 51. Specifically, Patent Owner argues that the first limitation of claim 1 recites three requirements, with the third requirement, "the server generat[ing] 3-dimensional graphics," being separate from the first two. *Id.* For support, Patent Owner points to the very next limitation of claim 1 as confirming that "it is the server (not the application) generating the graphics, as it specifies 'receiving, *from said server*, said 3-dimensional graphics . . . .'" *Id.* at 51–52 (citing Ex. 1001, 9:28). Patent Owner also cites various portions of the '093 patent specification to argue that it is the server, not the application, that generates a modified image. *Id.* at 52 (citing Ex. 1001, 1:18–21, 3:22–37, 5:43–48, 6:3–20, 6:63–67, 7:38–41).

Patent Owner's annotated version of Figure 3 of the '093 patent is reproduced below.

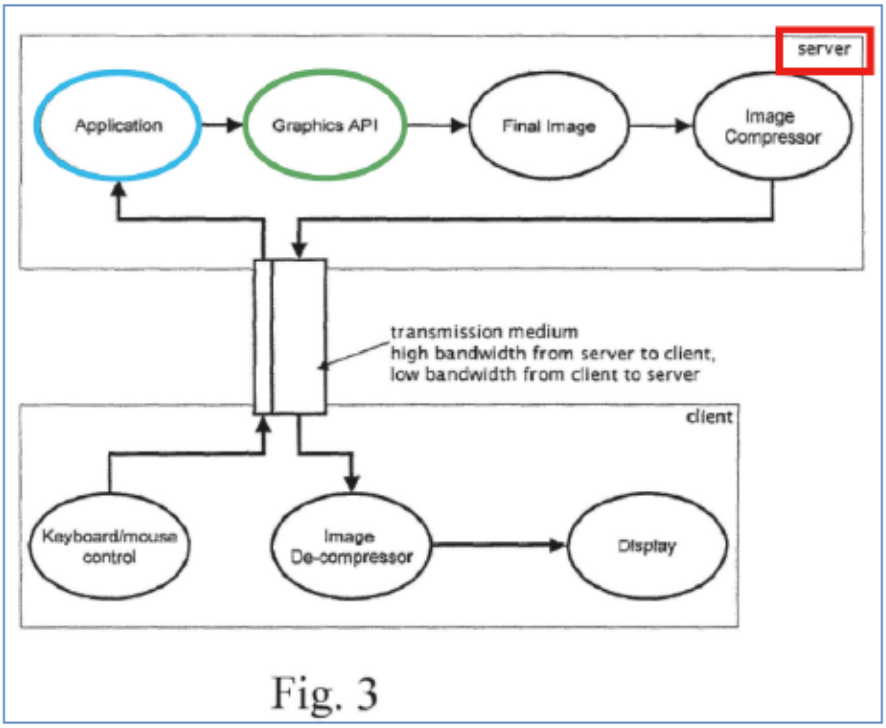


Fig. 3

Patent Owner's annotations to Figure 3, above, show the "Application" component of server highlighted in blue and "Graphics API" component of the server highlighted in green. PO Resp. 53. Patent Owner argues that the

application component sends drawing commands to the graphics application programming interfaces ("API"), which can be one of the industry standard APIs, such as Direct3D or OpenGL, and the server uses its 3D graphics processing capabilities to generate the "Final Image." *Id.* at 53 (citing Ex. 1001, 5:43–48, 8:54–62, Fig. 3). Patent Owner argues that because the application merely sends commands to the Graphics API, it is the server that generates the 3D graphics. *Id.* at 53–54.

In our Institution Decision, we rejected Patent Owner's arguments as unsupported in view of the plain language of claim 1 and the disclosure of the '093 patent. Inst. Dec. 20–21. We noted that the claim recites "an application, running on a server, which generates 3-dimensional graphics accordingly." *Id.* at 20. Rather than Patent Owner's narrow reading of this limitation, requiring the server to generate 3-dimensional graphics independently from the claimed application, we determined that a more reasonable construction of this limitation is that the server *in its entirety*, including the application running on the server, generates the 3-dimensional graphics. *Id.* In other words, the phrase "which generates 3-dimensional graphics accordingly" cannot be read separately from the first two phrases of the limitation in the manner that Patent Owner proposes. *Id.*

Patent Owner argues that our preliminary construction was improper because it "read[s] out the term 'application' by lumping together the 'application' and the 'server,'" "effectively re-writ[ing] the limitation 'sending user input control signals to an application, running on a server, which generates 3-dimensional graphics accordingly . . . .' as 'sending user input control signals to a server, which generates 3-dimensional graphics accordingly . . . .'" PO Resp. 54; *see also* PO Sur-reply 20. We disagree. Claim 1 plainly requires "sending user input control signals *to an*

application," and requires that that application run on a server. The claim language, however, does not clearly distinguish between the two components for the purposes of generating the 3-dimensional graphics, and we therefore, gave the limitation its more reasonable interpretation in light of the specification, i.e., not limiting the claim to either the application or the server *alone* as generating the 3-dimensional graphics.[7]

Patent Owner's interpretation on the other hand would limit the application from having any role in generating the 3-dimensional graphics. Patent Owner acknowledges that the claimed application at least sends "drawing commands" for the 3-dimensional graphics to the Graphics API (*see* Ex. 1001, 8:59–61, Fig. 3), but argues that that functionality is "no more a part of generating 3-dimensional graphics than placing a pizza delivery order is a part of making the pizza." PO Resp. 45 (citing Ex. 2016 ¶ 98). So long as the specification *requires* the application to play *some* part in generating 3-dimensional graphics, we are not persuaded to limit the claim in the manner proposed by Patent Owner, which excludes any participation by the application. *See* Ex. 1035 ¶ 71 (testifying that a person of ordinary skill in the art "would have understood that an 'application, running on a server' generates the 3D graphics by instructing the server to do so," either by calling an API like OpenGL or implementing other instructions for the server's CPU to process); Pet. Reply 20–21.

[7] As we explained in our Institution Decision, the Specification uses the term "server" broadly to refer to the entire server component shown in Figure 3, not just select components of the server as Patent Owner proposes. *See* Inst. Dec. 21 (citing Ex. 1001, 3:33–34, 5:32–34, 7:14–8:33, Figs. 2, 3). As illustrated in Figure 3 of the '093 patent, the application is illustrated as being a part of the server.

In view of our interpretation of the claim limitation, Patent Owner's argument that Schmidt fails to teach this limitation because the Quake application in Schmidt does not use the server's graphics API or graphics processing capability is not persuasive. PO Resp. 55–57 (citing Ex. 1004, 4, 44–45; Ex. 2016 ¶¶ 96–99). Schmidt discloses that Quake is a 3D game application that renders 3D graphics (Ex. 1004, 44–45), and as Petitioner points out, Schmidt further discloses that that "3-D graphics performance is directly related to the speed of the *server processor*," teaching that Quake's 3D graphics rendering depends directly on the server processor as well. Pet. Reply 21 (citing Ex. 1004, 44; Ex. 1042, 124:18–125:5; Ex. 1035 ¶ 72). Schmidt therefore teaches "an application, running on a server, which generates 3-dimensional graphics accordingly." Based on the entirety of the record, we find that Petitioner has shown by a preponderance of the evidence that the asserted prior art teaches this limitation.

c) "receiving, from said server, said 3-dimensional graphics in the form of a compressed stream of images;"

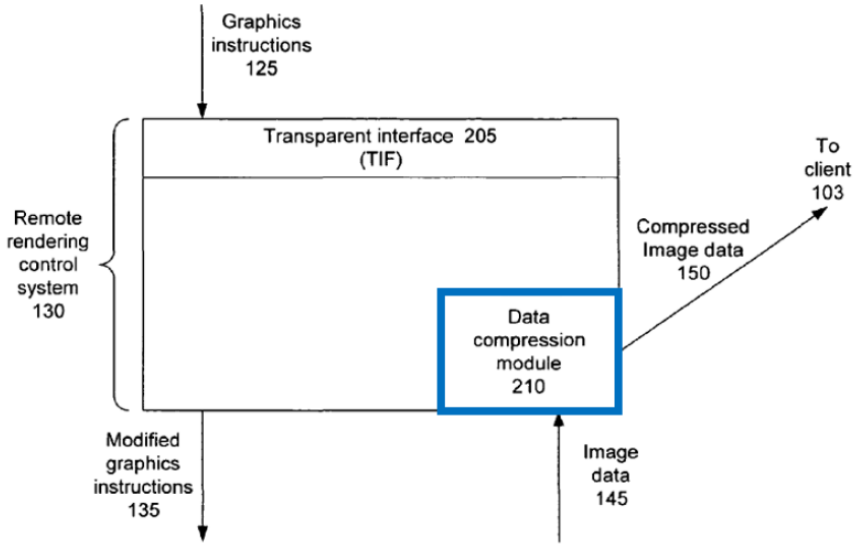
Petitioner argues that the combination of Schmidt and Keslin teaches or suggests this limitation. Pet. 33, 59 (citing Ex. 1002 ¶¶ 70, 155).

Petitioner contends that Schmidt's client receives compressed frames as a "compressed stream of images." Pet. 35. Petitioner asserts that a person of ordinary skill in the art would have understood receiving a "stream of images" to refer to receiving a sequence of image data, such as a sequence of image frames. *Id.* (citing Ex. 1002 ¶ 74). Petitioner further asserts that a person of ordinary skill in the art would also have understood that the image frames in Quake are streamed because Schmidt equates Quake with "streaming video." *Id.* at 35–36 (citing Ex. 1004, Abstract, 34, 46; Ex. 1002 ¶ 75). Petitioner argues that Schmidt discloses that Quake images are

streamed one frame at a time to client devices when it describes how the server renders each frame. *Id.* at 36 (citing Ex. 1004, 45; Ex. 1007, 21; Ex. 1002 ¶ 76).

Next, Petitioner relies on Keslin as teaching a "compressed stream of images" because Keslin discloses an application residing on a server that renders graphics and compresses the rendered image data before sending the image data to a client. Pet. 60–61 (citing Ex. 1005, 3:17–19).

Petitioner's annotated version of Figure 2 of Keslin is reproduced below.



Petitioner's annotations to Figure 2, above, show "data compression module 210" of remote rendering control system 130 in Keslin's server highlighted in blue. Pet. 62. According to Petitioner, Keslin explains that various methods of data compression were known to persons of ordinary skill in the art, and discloses a data compression module that is capable of performing those data compression methods. *Id.* at 61–62 (citing Ex. 1005, 4:6–22, Fig. 2; Ex. 1002 ¶ 157). Specifically, Keslin discloses that

> in an embodiment of the invention, image data 145 undergoes compression before transmission to client 103. Compression of

> the data is performed by a data compression module 210, which produces compressed image data 150. Various methods of data compression are known to persons of ordinary skill in the art. In an embodiment of the invention, color cell compression is used. In alternative embodiments of the invention, data compression module 210 can perform alternative compression algorithms, such as the process described in U.S. patent application Ser. No. 09/458,011, "Image Data Compression and Decompression," incorporated herein by reference in its entirety. In an embodiment of the invention, data compression module 210 is capable of performing any of a plurality of data compression algorithms.

Ex. 1005, 4:6–22.

Petitioner contends that the flow chart of Keslin's method also confirms that image data is compressed at the server before it is transmitted to the client. Pet. 62–63 (citing Ex. 1005, 5:3–6, Fig. 3 (*reproduced supra* § III.D.2); Ex. 1002 ¶ 158).

Patent Owner argues a person of ordinary skill in the art would not have been motivated to add Keslin's compression and decompression to the SLIM client disclosed in Schmidt in light of Schmidt's express teaching to remove all state and computation from the SLIM client. PO Resp. 45–49. Patent Owner's arguments are directed to Petitioner's proposed motivation to combine the two references, and are addressed below. *See infra* § III.E.1.f. Patent Owner does not otherwise respond to Petitioner's arguments as to this limitation. *See* PO Resp. 45–49 (arguing only that Petitioner's Ground II combination of Schmidt with Keslin does not cure Schmidt's deficiencies regarding "compressed stream of images"). Based on the entirety of the record, we find that Petitioner has shown by a preponderance of the evidence that the asserted prior art teaches this limitation.

d) "decompressing said compressed stream of images into at least one decompressed image at said client device, said at least one decompressed image corresponding to said graphics; and"

Petitioner contends Keslin discloses that, when the client receives the compressed image, the client will decompress the image data. Pet. 63–65 (citing Ex. 1005, 4:6–22, 7:45–60, Fig. 11 (*reproduced supra* § III.D.2); Ex. 1002 ¶ 159). Aside from its arguments directed to the reasons to combine the two references (addressed *infra* § III.E.1.f.), Patent Owner does not present arguments as to this limitation. *See* PO Resp. 45–49. Based on the entirety of the record, we determine that Petitioner has proved by a preponderance of the evidence that the asserted prior art teaches this claim limitation.

e) "displaying said at least one decompressed image at the display of said client device, wherein said client device does not perform 3-dimensional graphics processing on said at least one decompressed image, and wherein said client device is separate from said server"

Petitioner argues Schmidt discloses this limitation. Pet. 43 (citing Ex. 1002 ¶ 93). Petitioner contends that Schmidt discloses that the decompressed image is displayed on the client device's display. *Id.* (citing Ex. 1004, 34, 45; Ex. 1002 ¶ 94). Petitioner further contends that Schmidt discloses that the client device "does not perform 3-dimensional graphics processing on said at least one decompressed image" because "Schmidt further explains that the Sun Ray 1 console used in the SLIM system does not have 3-D graphics rendering capabilities, and that the 3-D operations 'directly' depend on the server processor, which performs the 3-D rendering." *Id.* at 43–46 (citing Ex. 1004, 33, 35, 44–45; Ex. 1002 ¶¶ 95–

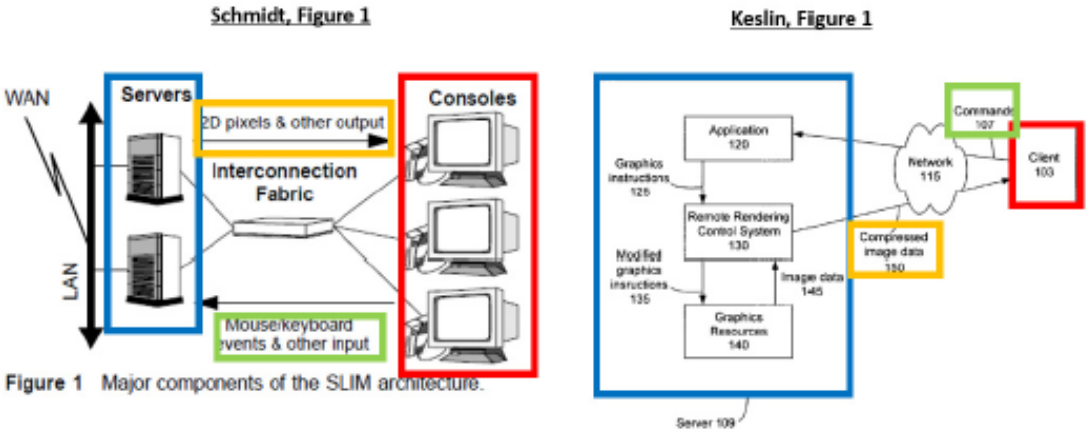
100). Petitioner also contends that Schmidt's clients are separate from its servers. *Id.* at 46 (citing Ex. 1004, Fig. 1).

Patent Owner does not present arguments as to this limitation. *See generally* PO Resp. Based on the entirety of the record, we determine that Petitioner has proved by a preponderance of the evidence that the asserted prior art teaches this claim limitation.

f) Motivation to Combine Schmidt and Keslin

Petitioner contends that a person of ordinary skill in the art would have been motivated to apply Keslin's teachings of image compression and decompression techniques in a client-server system as taught by Schmidt. Pet. 65 (citing Ex. 1002 ¶ 161).

Petitioner's comparison of annotated versions of Figure 1 of Schmidt and Figure 1 of Keslin is reproduced below.



Petitioner's annotations to the two figures, above, show the servers in each system, highlighted in blue, clients or consoles highlighted in red, user commands transmitted from the client to server highlighted in green, and image data transmitted from the server to clients highlighted in yellow. Pet. 66. Petitioner argues both Schmidt and Keslin describe similar remote rendering systems with similar architectures, where both Schmidt and Keslin

utilize servers to perform rendering of graphics, where both references utilize clients that transmit input control signals to the server, and where the server transmits graphics to the client. *Id.* at 65–66 (citing Ex. 1004, Fig. 1; Ex. 1005, Fig. 1; Ex. 1002 ¶ 162). Petitioner argues that a person of ordinary skill in the art would have been motivated to look at Keslin's rendering system for improving Schmidt, and would have understood that Keslin's compression teachings could be applied to improve the system of Schmidt because it would reduce bandwidth requirements through compression and decompression. *Id.* at 66 (citing Ex. 1002 ¶ 163). Petitioner argues Schmidt explicitly recognizes that "some form of compression is possible" to reduce bandwidth requirements, and, thus, Schmidt contains an express suggestion to look at similar references that utilize image compression, such as Keslin. *Id.* at 66–67 (citing Ex. 1004, 45; Ex. 1002 ¶ 164).

Petitioner argues that applying Keslin's compression teachings is a simple application of known technique (i.e., image compression and decompression) to improve a similar client-server system, as disclosed in Schmidt, in the same way (i.e., reducing the size of graphics transmission to reduce bandwidth and improve the overall performance of the SLIM system). Pet. 67 (citing Ex. 1004, 38; Ex. 1002 ¶ 165).

Petitioner further argues that a person of ordinary skill in the art would have had a reasonable expectation of success in applying image compression and decompression to Schmidt because Schmidt explains that "some form of compression is possible" in the SLIM system. Pet. 67–68 (citing Ex. 1004, 45, Fig. 1; Ex. 1005, Fig. 1; Ex. 1002 ¶ 166). Given the similarities between the architectures of Schmidt's and Keslin's systems, Petitioner argues, a person of ordinary skill in the art would have expected

the image compression described in Keslin to be successful when applied to the system in Schmidt. *Id.* at 68.

Patent Owner responds that "Petitioner's proposed obviousness combination fails to address Schmidt's teaching away from adding application software and burdensome computation to the client . . . as well as the fundamental differences in the Schmidt and Keslin systems." PO Resp. 45 (citing Ex. 2016 ¶¶ 101–09). Patent Owner contends that a person of ordinary skill in the art reviewing Schmidt would not have had a reason to add computation and complexity to the SLIM client in contravention of Schmidt's express teachings. *Id.* Patent Owner contends that Schmidt discloses MPEG and JPEG compression, but teaches that decompression should occur at the server, not the client, and thus, an ordinarily skilled artisan would not be motivated to move that decompression operation to the SLIM client, which Patent Owner contends is "simply a dumb frame buffer" that ran "neither an operating system nor any applications." *Id.* at 46 (citing Ex. 1004, 35; PO Resp. §§ V.A.3.a, V.A.3.b); PO Sur-reply 17. According to Patent Owner, "extremely burdensome computation that was performance-limiting on the *server* could not have been successfully moved to the 'dumb frame buffer' client with a reasonable expectation of success," given that Schmidt's stated purpose for the SLIM client is to remove "all state and computation." PO Resp. 46 (citing Ex. 1004, 33, 44; Ex. 2016 ¶ 85). According to Patent Owner, an ordinarily skilled artisan would have understood the SLIM client is "likely to be far more burdened performing that decompression than the server, causing a lag in presenting images at the client." *Id.* Quake, Patent Owner notes, already "represent[s] the worst-case scenario for a SLIM system." *Id.* (citing Ex. 1004, 44). Patent Owner asserts that Petitioner's proffered bandwidth reduction benefit for the

combination ignores Schmidt's express teachings about the cost of processing for compression and decompression as well as the desire to remove all state and computation from the SLIM client. *Id.* at 47 (citing Pet. 66); PO Sur-reply 18–19. Accordingly, Patent Owner argues, Petitioner has failed to carry its burden of showing obviousness in the face of those contrary teachings by Schmidt. PO Resp. 48.

Petitioner responds that Schmidt does not teach away from decompression at the SLIM client because Schmidt invites the reader to explore other forms of compression, even if there is an additional processing cost. Pet. Reply 15 (citing Ex. 1004, 45, 53). Patent Owner's reliance on Schmidt's statement about removing all state and computation from the client ignores Schmidt's broader disclosure about decompression as well as the statement that "client-side decompression processing is 'worthwhile despite . . . high processing overhead' because it yields 'a significant reduction in bandwidth.'" *Id.* at 16 (citing Ex. 1004, 38; Ex. 1035 ¶ 54; Ex. 1042, 172:10–25, 87:18–88:8). Petitioner further contends that Schmidt's statement about minimizing processing at the client is in context of comparing SLIM to the X-protocol, and thus, instead of teaching away, encourages investigation into alternatives. *Id.* (citing Ex. 1004, 45; Ex. 1035, 55). Petitioner also argues that Schmidt's characterization of Quake as a "worst-case scenario" was due in part to its high demand on bandwidth, and if anything that description of Quake would have motivated an ordinarily skilled artisan to find additional ways to reduce bandwidth when running applications like Quake on a server such as by using compression at the server and decompression at the client. *Id.* at 17 (citing Ex. 1004, 38; Ex. 1035 ¶ 56). Lastly, Petitioner responds that Schmidt's problems with MPEG and JPEG for video playback applications on the

server would not have discouraged investigation into using MPEG or JPEG to compress an image stream because academics recognized as early as 1985 that it would be straightforward to do so. *Id.* at 17–18 (citing Ex. 1007; Ex. 1042, 27:3–12; Ex. 1035 ¶¶ 57–58).

We agree with Petitioner's reasons as to why one of ordinary skill in the art would have been motivated to combine the teachings of Schmidt and Keslin as proposed, and are not persuaded that Schmidt teaches away from the combination. A reference teaches away "when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Mouttet*, 686 F.3d 1322, 1333–34 (Fed. Cir. 2012). A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not "criticize, discredit, or otherwise discourage" investigation into the invention claimed. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006) ("We will not read into a reference a teaching away from a process where no such language exists.").

Schmidt does not suggest that the use of compression at the server and decompression at the client would be unworkable, nor does it criticize, discredit, or discourage the technological efficacy of the use of such compression. On the contrary, Schmidt teaches reducing image data to be transmitted at the server through the use of the CSCS command. *See, e.g.*, Ex. 1004, 38 ("The color space convert and scale (CSCS) command . . . provides a significant reduction in bandwidth"), 44 ("[We] used the CSCS command with 6 bits/pixel compression"), 45 ("Using the CSCS command, . . . compression up to 5 bits per pixel (an 88% bandwidth reduction) is

possible"). Although we agree with Patent Owner that one of Schmidt's goals is to reduce processing costs at the client, that is just *one* of its goals; Schmidt acknowledges that client processing costs incurred in reducing bandwidth—another one of Schmidt's goals—can be worthwhile. *See, e.g.*, Ex. 1004, 38 (noting that CSCS "provides a significant reduction in bandwidth, making it worthwhile despite the high processing overhead"), 40 (noting that operations such as decoding protocol commands for display incurs processing overhead), 45 (stating that "SLIM provides substantial savings on higher bandwidth operations"); Pet. 66–67; Ex. 1035 ¶ 54. Schmidt repeatedly emphasizes the value in reducing bandwidth by reducing pixel data, explaining that "typically, some form of compression is possible," and that "[i]f the SLIM CSCS command is not being used, there is still opportunity for finding redundancy among pixels which can reduce bandwidth somewhat." Ex. 1004, 45. Given Schmidt's emphasis on reducing bandwidth and that use of compression was fairly straightforward and well known in the art, we are not persuaded that Schmidt's teachings would have discouraged an ordinarily skilled artisan from Petitioner's proposed combination. As Petitioner points out, Levoy[8], an academic reference from 1995, states that:

> Recent advances in real time image compression and decompression hardware make it possible for the high-performance machine to operate as a rendering server for the *low-end machines*. This can be accomplished *straightforwardly*

[8] Marc Levoy, Polygon-Assisted JPEG and MPEG Compression of Synthetic Images, PROCEEDINGS OF THE 22ND ANNUAL CONFERENCE ON COMPUTER GRAPHICS AND INTERACTIVE TECHNIQUES, 21–28 (1995) (Ex. 1007, "Levoy"); *see also* Ex. 1003 ¶¶ 74–80.

> by rendering on the server, then *compressing* and transmitting an image stream to the client.

Ex. 1007, 21 (emphasis added). We therefore find that an ordinarily skilled artisan would not have found Schmidt to discourage adding compression, and thus decompression, at the cost of additional computation at the SLIM client, but instead would have found Schmidt's mixed teachings as merely highlighting the cost-benefit balance that comes with such compression and the resulting processing overhead.

We are also unpersuaded by Patent Owner's arguments that Schmidt statements about "removing all state and computation from the desktop" and characterization of the SLIM client was a "dumb frame buffer" client suggest that an ordinarily skilled artisan would have found implementing decompression on the SLIM client to be extremely computationally burdensome. Dr. Fuchs testifies that a person of ordinary skill in the art would not have understood "removing all state and computation from the desktop" to mean there can be no decompression on the client, but instead that Schmidt was "referring to the use of the server for application-level state and computation, allowing the user to move from one client to another without loss of application state." Ex. 1035 ¶ 54 (citing Ex. 1004, 33). Dr. Fuchs quotes Schmidt stating that

> the servers maintain the true state at all times. Thus, the user is isolated from desktop failures and may move freely between terminals. In our implementation, users can simply present a smart identification card at any desktop, and the screen is returned to the exact state at which it was left.

Ex. 1004, 33. Dr. Fuchs further testifies a person of ordinary skill in the art would not have understood Schmidt's statements about removing state to mean that the client cannot perform *any* processing whatsoever because the client in Schmidt *does* perform processing, such as CSCS commands.

Ex. 1035 ¶ 54 (citing Ex. 1004, 37–38 (Table 5 listing computation costs at the client for processing the SLIM commands), 33 (Figure 1 showing the client generates "[m]ouse/keyboard events & other input"), 35 (the "SLIM consoles" include a "100MHz microSPARC-IIep processor")). We credit Dr. Fuchs's testimony because it is consistent with our findings of Schmidt's teachings. Aside from the CSCS command, Schmidt discloses other computational tasks that the SLIM client could handle. For example, Schmidt explains, in comparing its protocol to the X protocol, that if video is scaled to a higher resolution, the X server must perform the operation prior to sending the image to the X client, whereas the Sun Ray 1 console, i.e., Schmidt's SLIM client, "can do it locally at substantial savings in bandwidth." Ex. 1004, 45; *see also id*. at 35 (listing the hardware components of the Sun Ray 1 SLIM client). The record therefore fails to support that a person of ordinary skill in the art would have found the SLIM client to be as computationally underpowered as Patent Owner makes it out to be.

And, although we agree with Patent Owner that Schmidt discloses that its testing with the MPEG-II video player application and the JPEG-compressed NTSC video application showed that decompression by those applications was processor intensive when implemented on the SLIM server (*see* PO Resp. 40–42 (citing Ex. 1004, 44)), we are not persuaded that that disclosure would have discouraged a person of ordinary skill the art from Petitioner's proposed combination based on Keslin. Keslin, after all, allows "[v]arious methods of data compression are known to persons of ordinary skill in the art," such as color cell compression, and teaches a data compression module capable of performing any of a plurality of data compression algorithms. Pet. 61 (citing Ex. 1005, 4:6–22, Fig. 2).

Schmidt's experience with specific decompression implementations of two specific applications on the SLIM server is therefore insufficient to cast doubt on use of any and all known compression methods with Schmidt's system, especially when others in the field considered it to be straightforward. *See* Ex. 1004, 44 (listing the specific applications and decompression methods employed by Schmidt); *see also* Pet. Reply 17–18 (citing Ex. 1007; Ex. 1042, 27:3–12).

Because we do not agree with Patent Owner's characterization of Schmidt's system, we also disagree with Patent Owner that Petitioner's proposed combination fundamentally alters Schmidt's principle of operation or renders it inoperative for its intended purpose. PO Resp. 44.

Accordingly, we determine Petitioner provides an adequate reason why an ordinarily skilled artisan would have combined Keslin's compression/decompression functionality with Schmidt's SLIM system in the manner asserted by Petitioner. *See KSR*, 550 U.S. at 420 ("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").

2. Dependent Claims 2 and 3

Petitioner argues that claim 2 also would have been obvious in view of Schmidt and Keslin. Pet. 47–48, 59, 68. Claim 2 depends on claim 1 and additionally recites "wherein said sending and said receiving are performed across at least one of an Internet, a WAN, a LAN, an Ethernet, or wireless communication." Ex. 1001, 9:39–41. Petitioner contends that Schmidt teaches this additional limitation because Schmidt discloses that the SLIM system uses an interconnection fabric. Pet. 47 (citing Ex. 1004, 33; Ex. 1002 ¶ 106). Petitioner further contends that the interconnection fabric

is implemented as a dedicated private network using the Ethernet protocol. *Id.* at 47–48 (citing Ex. 1004, 33–34; Ex. 1002 ¶ 107).

Next, Petitioner argues that claim 3 would have been obvious in view of Schmidt and Keslin. Pet. 48–50, 59, 68. Claim 3 depends on claim 1 and additionally recites "wherein said user input control signals are generated by a game input device." Ex. 1001, 9:42–43. Petitioner contends that Schmidt teaches this additional limitation because Schmidt discloses a keyboard and a mouse, and an ordinarily skilled artisan would have understood that a keyboard and a mouse are types of "game input devices." Pet. 48–49 (citing Ex. 1002 ¶¶ 110–111; Ex. 1011, 217, Fig. 9.4; Ex. 1001, Fig. 3). Petitioner contends that Schmidt further discloses sending keyboard and mouse data from the client to the server as part of the 3D interactive gameplay in Quake. *Id.* at 49 (citing Ex. 1002 ¶ 112).

Patent Owner does not raise any additional arguments (aside from the arguments directed to claim 1) specific to these dependent claims. *See* PO Resp. 23–57 (arguing claim 1 limitations as to Petitioner's Grounds I and II). We have reviewed Petitioner's arguments and evidence with respect to claims 2 and 3 and the reasons as to why one of ordinary skill in the art would have been motivated to combine the teachings of Schmidt and Keslin as proposed, and we find them sufficiently supported on the record before us. Therefore, we affirmatively adopt Petitioner's analysis as our own. Pet. 47–50.

3. Weighing the Graham Factors

"Once all relevant facts are found, the ultimate legal determination [of obviousness] involves the weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan." *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1361

(Fed. Cir. 2017). On balance, considering the record before us, Petitioner has shown, by a preponderance of the evidence, that the subject matter of claims 1–3 would have been obvious to one of ordinary skill in the art at the time of the invention.

F. Obviousness over Schmidt, Keslin, and the IEEE 802.3 Standard

Petitioner contends that claim 4 would have been obvious in view of Schmidt, Keslin, and the IEEE 802.3 Standard. Pet. 72–74. Claim 4 depends from claim 1 and additionally recites "wherein said sent user input control signals are sent after a specified elapsed time." Ex. 1001, 9:44–45. Petitioner contends that the combination of Schmidt and the IEEE 802.3 Standard teaches this additional limitation because "[i]n the CSMA/CD protocol described in the IEEE 802.3 Standard, Ethernet devices wait 'a specified elapsed time' (called 'interFrameSpacing') prior to transmission." Pet. 69–70 (citing Ex. 1006, 38–39; Ex. 1002 ¶ 172); *id.* at 72 (incorporating arguments from the Schmidt/IEEE 802.3 Standard ground into the discussion for the Schmidt/Keslin/IEEE 802.3 Standard ground). Petitioner further contends that interframe spacing is the "minimum interframe spacing" for the protocol and is defined as a time period of 9.6 microseconds. *Id.* at 70 (citing Ex. 1006, 56; Ex. 1002 ¶ 172).

Petitioner contends that Schmidt's "SLIM system uses the Ethernet protocol, and therefore uses Ethernet's CSMA/CD procedure of waiting a specified time period prior to transmission." Pet. 70–71 (citing Ex. 1004, 33–34; Ex. 1002 ¶ 174), 73 (arguing that Schmidt teaches that the "SLIM system operates according to the Ethernet protocol"). Thus, according to Petitioner, an ordinarily skilled artisan reading Schmidt would have understood that transmission from the SLIM client to the SLIM server would

be sent in accordance with the Ethernet protocol described by the IEEE 802.3 Standard, where input control signals sent by the SLIM client will wait if there is a pending transmission on the network, and then transmit after a specified elapsed time period (i.e., the interframe spacing period). *Id.* at 71 (citing Ex. 1002 ¶ 175).

Petitioner argues a person of ordinary skill in the art would have been motivated to combine the teachings of Schmidt and the IEEE 802.3 Standard because Schmidt's SLIM system uses the Ethernet protocol and a person of ordinary skill in the art would have understood that "the SLIM client devices send user input control signals after a specified elapsed time period (the interframe spacing) according to the Ethernet protocol." Pet. 71–72 (citing Ex. 1004, 34; Ex. 1006, 38; Ex. 1002 ¶¶ 176–77). Petitioner also argues that a person of ordinary skill in the art would have been motivated to combine Schmidt and Keslin for the reasons discussed in Petitioner's Schmidt/Keslin ground. Pet. 73 (citing Pet. 39–68 (§ XI.B); Ex. 1002 ¶ 183); *see supra* § III.E.1.f. Petitioner therefore argues that a person of skill in the art would have been motivated to combine the teachings of Schmidt, Keslin, and the IEEE 802.3 Standard. Pet. 73–74 (citing Pet. 68–72 (§ XI.C); Ex. 1002 ¶ 184). Petitioner further argues there would have been a reasonable expectation of success because the combination does not require any modifications to Schmidt's use of Ethernet, but rather uses Ethernet in the intended manner, with the interframe spacing working as intended in Schmidt. *Id.* at 72 (citing Ex. 1006, 39; Ex. 1002 ¶ 178), 73–74 (citing Ex. 1002 ¶¶ 183–84).

Patent Owner responds that Petitioner's premise that Schmidt uses the standards set out in the IEEE 802.3 Standard publication provided by Petitioner is incorrect. PO Resp. 58 (citing Pet. 69). Patent Owner asserts

that "[t]hat standard was actually the original version of Ethernet in 1983 that provided a maximum transmission rate of 10 Mbps," but "Schmidt expressly stated in 1999 that it was using Fast Ethernet (100 Mbps transmission rate), not the much slower 10 Mbps transmission rate specified by the IEEE 802.3 Standard." *Id.* at 58–59 (citing Ex. 1004, 34–36; Ex. 1006, iii, vi; Ex. 2003, 1; Ex. 2016 ¶ 115). Patent Owner contends that Schmidt's Fast Ethernet is instead governed by *later* versions of the IEEE standards. *Id.* at 60 (citing Ex. 1004, Abstract, 44; Ex. 2004). Patent Owner argues that "the Petition did not rely on any disclosure of a 10 Mbps Ethernet connection in Schmidt," and moreover, the Quake example of Schmidt that Petitioner relies on would be inoperable at 10 Mbps. *Id.* at 61 (citing Ex. 1004, 44, 45; Ex. 1002 ¶ 136; Ex. 2016 ¶ 115).

As for the Fast Ethernet employed by Schmidt, Patent Owner argues that Petitioner offered no evidence to conclude that Fast Ethernet employs any type of interFrameSpacing. PO Resp. 61–62 (citing Pet. 70). According to Patent Owner, "Petitioner relies solely on Schmidt's reference to 'ethernet' as a basis to include its interFrameSpacing in Schmidt," but provides no evidence that all versions of Ethernet are the same. *Id.* at 62 (citing Pet. 69–70).

In response, Petitioner states that "as explained in the Petition and by Dr. Fuchs, a [person of ordinary skill in the art] would have understood Schmidt to use interframe spacing because—in Quake and every other disclosed example—(1) Schmidt's system uses Ethernet, and (2) Ethernet uses a CSMA/CD procedure that includes interframe spacing." Pet. Reply 23 (citing Ex. 1002 ¶¶ 171–174; Pet. 70–71). Petitioner contends that data rate has nothing to do with this understanding because the authors of the IEEE 802.3 Standard state that "subsequent editions of the standard will

provide similar specifications" for "other data rates," and the standard contemplates use of the CSMA/CD protocol for "20 Mb/s." *Id.* at 23–24 (citing Ex. 1006, 13; Ex. 1004, 45; Ex. 1035 ¶ 78).

Petitioner also points us to the later 1998 version of the standard as confirming "that 100mbps Ethernet uses interframe spacing, just like the original version of Ethernet." *Id.* at 24–25 (citing Ex. 1034, 94; Ex. 1006, 38; Ex. 1042, 156:10–157:6; Ex. 1035 ¶ 80). Petitioner explains that the 1998 version "provides additional evidence of 'the knowledge that skilled artisans would bring to bear in reading' Schmidt and the [IEEE] 802.3 Standard, further confirming claim 4's obviousness as set forth in the Petition." *Id.* at 25 (citing *Anacor Pharms., Inc. v. Iancu*, 889 F.3d 1372, 1380-81 (Fed. Cir. 2018)).

Patent Owner responds that the 1998 version clearly shows that CSMA/CD would not have been used in Schmidt because Schmidt employed "switched, full-duplex 100Mbps ethernet." PO Sur-reply 22 (citing Ex. 1004, 34). Patent Owner contends that "the 1998 standard stated with respect to full duplex operation that 'the multiple access (i.e., CSMA/CD) algorithms are unnecessary,'" and that "full duplex mode DTEs do not implement the CSMA/CD algorithms traditionally used to arbitrate access to shared-media LANs." *Id.* (quoting Ex. 1034, 1, 2). Patent Owner argues that it was well recognized by the late 1990s that CSMA/CD technology based on detecting collisions in Ethernet was obsolete and unused on full duplex Ethernet, such as the one in Schmidt, and that "a [person of ordinary skill in the art] in 2001 would have understood that Schmidt's Quake example was not using the CSMA/CD algorithms, relied upon by Petitioner in its Petition, which were by then becoming obsolete." *Id.* at 22–23 (citing Ex. 2021, 91; Ex. 2022, 19–20).

We are persuaded by Patent Owner's arguments and evidence that the "full-duplex 100Mbps ethernet" employed by Schmidt does not use the CSMA/CD protocol, and therefore, Petitioner has not shown that the proposed combination of Schmidt with the IEEE 802.3 Standard renders claim 4 obvious. The Petition relies on the CSMA/CD protocol's interFrameSpacing from the original 1983 IEEE 802.3 Standard as teaching the claimed sending of signals after "a specified elapsed time." Pet. 69. The IEEE 802.3 Standard states:

> Whenever the medium is busy, the CSMA/CD MAC sublayer *defers to the passing frame* by delaying any pending transmission of its own. After the last bit of the passing frame . . . , the CSMA/CD MAC sublayer continues to defer for a proper interFrameSpacing . . . . If, at the end of the interFrameSpacing, a frame is waiting to be transmitted, transmission is initiated independent of the value of carrierSense.

Id. at 69–70 (quoting Ex. 1006, 38) (emphasis in original omitted; emphasis added). Petitioner explains that this means that

> when an Ethernet device wants to transmit a packet of information (called an Ethernet frame), *and there is already a pending transmission*, the Ethernet device must wait for that pending transmission to complete and then wait a specified elapsed time period of 9.6 microseconds (the interframe spacing) before transmitting the frame.

Id. at 70 (citing Ex. 1002 ¶ 173) (emphasis added).

The later 1998 Ethernet standard makes clear that in full duplex operation, CSMA/CD algorithms are unnecessary. *See* Ex. 1034, 2. Specifically, the newer standard states that "[f]ull duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode." *Id.*; *see also id.* at 1 ("full duplex mode DTEs do not implement the CSMA/CD

algorithms traditionally used to arbitrate access to shared-media LANs"); Ex. 2021, 91.

Patent Owner also persuasively argues that Schmidt uses Fast Ethernet which complies with the later standard, not the older IEEE 802.3 Standard. PO Resp. 59. Schmidt clearly states that it uses a "switched, full-duplex 100Mbps ethernet with Foundry FastIron Workgroup switches in [its] experiments." Ex. 1004, 34; *see also id.* at 36 (Table 3). Specifically, as to the Quake application Schmidt states that "a 100Mbps interconnection fabric can support streaming video and Quake at display rates and resolutions which provide a high-fidelity user experience." *Id.* at Abstract, 44 ("[I]t is important to note that in all cases, a 10 Mbps interconnection fabric would not be able to provide adequate performance."), 45 (listing network speeds necessary for Quake). We are therefore persuaded that a person of ordinary skill in the art would have understood Schmidt as using full-duplex 100Mbps Ethernet. Because Petitioner has not met its burden to show by a preponderance of the evidence that that standard utilizes the CSMA/CD protocols or algorithms from the IEEE 802.3 Standard that Petitioner relies on for its obviousness combination, Petitioner has not shown that the subject matter of claim 4 of the '093 patent would have been obvious over Schmidt, Keslin, and the IEEE 802.3 Standard.

1. Petitioner's New Argument as to the 1998 IEEE Standard

In its Supplemental Reply, Petitioner contends that "Patent Owner's argument that full duplex mode may not use the full 'CSMA/CD algorithms traditionally' used in half-duplex mode is irrelevant because the *interframe spacing* time period is used in both modes." Pet. Supp. Reply 1 (citing PO Sur-reply 22). Specifically, Petitioner argues that the 1998 standard discloses the use of an interFrameSpacing even in full duplex mode of

operation. *Id.* (citing PO Sur-reply 22; Ex. 1034, 43, 54, 55). We find that this argument is a new theory presented for the first time in Petitioner's Supplemental Reply, and we therefore do not consider it. *See Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1301 (Fed. Cir. 2016) (vacating the Board's decision where "key factual assertion was not in fact made in [Petitioner's] reply, but only at oral argument" and Patent Owner was not afforded the opportunity to present rebuttal arguments or evidence).

Petitioner asserts it "has never argued that Schmidt's clients need to detect collisions or use all CSMA/CD procedures to render claim 4 obvious," and that "Petitioner's ground is based on Ethernet's 'interframe spacing,' which is independent of whether interframe spacing is used as part of a collision detection operation using CSMA/CD technology or a full duplex operation." Pet. Supp. Reply 2. The Petition and Petitioner's Reply, however, reflect otherwise. As discussed above, the Petition specifically relies on the "the CSMA/CD protocol described in the [original] IEEE 802.3 Standard," explaining that interFrameSpacing is necessary "when an Ethernet device wants to transmit a packet of information (called an Ethernet frame), *and there is already a pending transmission*." Pet. 69–70 (emphasis added). The Petition quotes the portion of the standard that states that

> Whenever the medium is busy, the CSMA/CD MAC sublayer defers to the passing frame by delaying any pending transmission of its own. After the last bit of the passing frame (that is, when carrierSense changes from true to false), the CSMA/CD MAC sublayer continues to defer for a proper interFrameSpacing.

Id. at 69 (quoting Ex. 1006, 38). The Petition further asserts that "Schmidt expressly teaches that the SLIM system uses the Ethernet protocol, and therefore uses Ethernet's *CSMA/CD procedure*." *Id.* at 70 (emphasis added). The Petition reiterates that "[p]er the Ethernet protocol, input control signals

sent by the SLIM client *will wait if there is a pending transmission on the network*, and then transmit after a specified elapsed time period (the interframe spacing period)." *Id.* at 71 (citing Ex. 1002 ¶ 175) (emphasis added). In the Petition, the Petitioner therefore relied on disclosure of the original standard's interframe spacing *only* as it was used in CSMA/CD's collision detection functionality.

In its Reply, Petitioner similarly argued that "(1) Schmidt's system uses Ethernet, and (2) Ethernet uses a CSMA/CD procedure that includes interframe spacing." Pet. Reply 23 (citing Pet. 70-71; Ex. 1002 ¶¶ 171–174). The Reply points to the new standard as providing additional evidence of the knowledge that skilled artisans would bring to bear in reading Schmidt and the original IEEE 802.3 Standard, but once again relies on portions of the new standard that relate to collision detection, and nothing else. *Id.* at 24–25 (quoting Ex. 1034, 54 ("Whenever the medium is busy, the CSMA/CD MAC defers to the passing frame by delaying any pending transmission of its own.")).

Dr. Fuchs's testimony in both his declarations was similarly limited to identifying the use of interframe spacing in collision detection as the feature teaching the claimed "specified elapsed time." *See, e.g.*, Ex. 1035 ¶ 78 ("The very purpose of the CSMA/CD protocol used in Ethernet is to prevent collisions on the medium."); *see generally* Ex. 1002 ¶¶ 171–174; Ex. 1035 ¶¶ 77–79.

As discussed above, we determine that in full duplex mode (the mode used by Schmidt), the Ethernet standard does not use collision detection and Petitioner's original argument, therefore, fails. Petitioner's reliance, in its Supplemental Reply, on the newer version of the standard—which Petitioner did not cite until its Reply—as disclosing interFrameSpacing (possibly not

used for collision detection[9]) in full duplex mode is an entirely new position that Patent Owner had no notice of and was therefore deprived of the opportunity to present rebuttal arguments or evidence. *See Dell*, 818 F.3d at 1301; *see also Qualcomm Inc. v. Intel Corp.*, 6 F.4th 1256, 1264–65 (Fed. Cir. 2021) (citing *Dell*, 818 F.3d at 1301) (finding that "the Board violated [Patent Owner's] procedural rights under the APA" where Patent Owner "was given no opportunity to supply any evidence, whether expert or documentary, to address why a skilled artisan would have understood" the claim as construed); *In re Magnum Oil*, 829 F.3d at 1380 ("[we] must base [our] decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond"); PO Sur-reply 25.

Because we conclude, based on the evidence and arguments timely presented by Petitioner in its Petition and the Reply, that Petitioner has not met its burden to show by a preponderance of the evidence that a person of ordinary skill in the art would have understood the combination of Schmidt and the IEEE 802.3 Standard as teaching sending user input control signals are after a specified elapsed time, as claimed, Petitioner has not shown that the subject matter of claim 4 of the '093 patent would have been obvious over Schmidt, Keslin, and the IEEE 802.3 Standard.

G. Obviousness over Schmidt

Petitioner contends that claims 1–3 are also unpatentable under 35 U.S.C. § 103 as obvious over Schmidt alone. Pet. 24–50. Patent Owner raises several arguments in response, including that Schmidt fails to teach or

[9] The 1998 standard clearly states that "[i]n full duplex mode, the CSMA/CD MAC does not defer pending transmissions based on the carrierSense signal from the PLS." Ex. 1035, 54. Instead, it uses a delay to "maintain proper MAC state while the transmission is in progress." *Id.*

suggest "receiving, from said server, said 3-dimensional graphics in the form of a compressed stream of images," or "decompressing said compressed stream of images." PO Resp. 23–45, 49–57. Because we determine that claims 1–3 are unpatentable as obvious under 35 U.S.C. § 103(a) in view of the combination of Schmidt and Keslin, we need not reach Petitioner's obviousness ground based on Schmidt alone.

H. Obviousness over Schmidt and the IEEE 802.3 Standard

Petitioner also contends that claim 4 is unpatentable under 35 U.S.C. § 103 as obvious over Schmidt and the IEEE 802.3 Standard. Pet. 68–72. Petitioner contends that the IEEE 802.3 Standard teaches the additional limitation recited in dependent claim 4 for the same reasons as those discussed above with respect to Petitioner's obviousness ground based on Schmidt, Keslin, and the IEEE 802.3 Standard. *See supra* § III.F.

For the reasons described above (*supra* § III.F), we determine that Petitioner has not shown by a preponderance of the evidence that the subject matter of claim 4 of the '093 patent would have been obvious over Schmidt and the IEEE 802.3 Standard.

IV. CONCLUSION

For the reasons discussed above, Petitioner has demonstrated, by a preponderance of the evidence, that claims 1–3 of the '093 patent are unpatentable, but Petitioner has not demonstrated, by a preponderance of the

evidence, that claim 4 of the '093 patent is unpatentable.[10] Our conclusions regarding the Challenged Claims are summarized below:

Claims Challenged	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–3	103(a)	Schmidt[11]		
1–3	103(a)	Schmidt, Keslin	1–3	
4	103(a)	Schmidt, IEEE 802.3 Standard		4
4	103(a)	Schmidt, Keslin, IEEE 802.3 Standard		4
Overall Outcome			1–3	4

[10] 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).

[11] Because we have determined that claims 1–3 are unpatentable as obvious under 35 U.S.C. § 103(a) in view of Schmidt and Keslin, we need not reach Petitioner's obviousness ground based on Schmidt alone.

V. ORDER

It is, therefore,

ORDERED that claims 1–3 of U.S. Patent No. 8,667,093 B2 are determined to be unpatentable;

FURTHER ORDERED that claim 4 of U.S. Patent No. 8,667,093 B2 is not determined to be unpatentable; and

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

FOR PETITIONER:

Joseph Haag
Daniel Williams
WILMER CUTLER PICKERING HALE & DORR LLP
joseph.haag@wilmerhale.com
daniel.williams@wilmerhale.com

FOR PATENT OWNER:
Douglas R. Wilson
Michelle E. Armond
Forrest M. McClellen
ARMOND WILSON LLP
doug.wilson@armondwilson.com
michelle.armond@armondwilson.com
forrest.mcclellen@armondwilson.com