

No. 2022-2118

**UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT**

SONY INTERACTIVE ENTERTAINMENT LLC,

Appellant,

v.

INTELLECTUAL PIXELS LIMITED,

Appellee.

Appeal from the United States Patent and Trademark Office,
Patent Trial and Appeal Board in No. IPR2021-00237

**BRIEF FOR APPELLANT
SONY INTERACTIVE ENTERTAINMENT LLC**

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PATENT CLAIMS AT ISSUE

Claims 1-12 of United States Patent No. 10,681,109.

1. A method of hosting an interactive software application comprising:

running at a server the interactive software application;

receiving at the server user input signals from a client device, wherein the user input signals are used to control updating the state of the interactive software application;

generating at least one updated image at the server in response to updating the state of the interactive software application; and

compressing the at least one updated image and transmitting the compressed updated image to the client device, wherein the server transmits the updated image as a compressed frame that can be decompressed and displayed as an updated image at the client device.
2. The method as recited in claim 1 wherein a first bandwidth for transmitting the user input data between the client device and the server and a second bandwidth for transmitting the compressed updated image from the server to the client device are asymmetric.
3. The method as recited in claim 1 wherein the server is configured for bidirectional communications with a plurality of client devices, the bidirectional communication including receiving at the server user input signals and transmitting the compressed updated image.
4. The method as recited in claim 1 wherein the server is configured to receive user input data and transmit compressed updated images with a plurality of client devices.
5. The method as recited in claim 1 wherein at least two of the plurality of client devices include different device platforms.
6. The method as recited in claim 1 wherein the client device is a mobile device.
7. The method as recited in claim 1 wherein the interactive software application is an interactive game that is configured to run at the server,

which is in bidirectional communication with a plurality of client devices, and wherein said updating the state of the software application includes updating the game state of the interactive game.

8. An image display system, comprising:

a server having a processor and memory configured to execute an interactive software application and further configured for:

receiving at the server user input signals from a client device, wherein the user input signals are used to control updating the state of the interactive software application;

generating at least one updated image at the server in response to updating the state of the interactive software application running on the server by the user input signals; and

compressing the at least one updated image and transmitting the compressed updated image to the client device, wherein the server transmits the updated image as a frame and wherein the client device is configured for decompressing of the compressed updated image and displaying the updated image on a display coupled to the client device.

9. The image display system of claim 8, wherein the user input signals are generated at the client device to update the state of the interactive software application from the state that initiated the current image displayed on the display coupled to the client device.

10. The image display system of claim 8 wherein the server is configured to exchange user input data and compressed updated images with a plurality of client devices.

11. The image display system of claim 8 wherein the interactive software application is a game and wherein the client device is a mobile device.

12. The image display system of claim 10 wherein the interactive software application is a game and wherein at least one of the plurality of client devices is a mobile device.

Appx49(9:55-10:59).

CERTIFICATE OF INTEREST

Counsel for Appellant Sony Interactive Entertainment LLC certifies the following:

1. Represented Entities. Fed. Cir. R. 47.4(a)(1). Provide the full names of all entities represented by undersigned counsel in this case.

Sony Interactive Entertainment LLC

2. Real Party in Interest. Fed. Cir. R. 47.4(a)(2). Provide the full names of all real parties in interest for the entities. Do not list the real parties if they are the same as the entities.

Sony Group Corporation (formerly known as Sony Corporation), Sony Corporation of America, Sony Interactive Entertainment Inc.

3. Parent Corporations and Stockholders. Fed. Cir. R. 47.4(a)(3). Provide the full names of all parent corporations for the entities and all publicly held companies that own 10% or more stock in the entities.

Sony Group Corporation (formerly known as Sony Corporation), Sony Corporation of America

4. Legal Representatives. List all law firms, partners, and associates that (a) appeared for the entities in the originating court or agency or (b) are expected to appear in this court for the entities. Do not include those who have already entered an appearance in this court. Fed. Cir. R. 47.4(a)(4).

WILMER CUTLER PICKERING HALE AND DORR LLP: Daniel V. Williams, S. Dennis Wang

5. Related Cases. Provide the case titles and numbers of any case known to be pending in this court or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal. Do not include the originating case number(s) for this case. Fed. Cir. R. 47.4(a)(5). See also Fed. Cir. R. 47.5(b).

Intellectual Pixels Limited v. Sony Interactive Entertainment LLC, No. 8:20-cv-01422-JVS-KES (C.D. Cal.)

Intellectual Pixels Limited v. Sony Interactive Entertainment LLC, No. 8:19-cv-10432-JVS-KES (C.D. Cal.)

Sony Interactive Entertainment LLC v. Intellectual Pixels Limited, No. 2022-1546 (Fed. Cir.)

6. Organizational Victims and Bankruptcy Cases. Provide any information required under Fed. R. App. P. 26.1(b) (organizational victims in criminal cases) and 26.1(c) (bankruptcy case debtors and trustees). Fed. Cir. R. 47.4(a)(6).

None.

Dated: November 14, 2022

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STATEMENT OF RELATED CASES

There have been no previous appeals from this *inter partes* review proceeding to this Court or any other appellate court. The Court's decision in this appeal may directly affect or be directly affected by the following pending cases: *Intellectual Pixels Limited v. Sony Interactive Entertainment LLC*, No. 8:20-cv-01422-JVS-KES (C.D. Cal.); *Intellectual Pixels Limited v. Sony Interactive Entertainment LLC*, No. 8:19-cv-10432-JVS-KES (C.D. Cal.); and *Sony Interactive Entertainment LLC v. Intellectual Pixels Limited*, No. 2022-1546 (Fed. Cir.).

JURISDICTIONAL STATEMENT

Sony Interactive Entertainment LLC ("SIE") appeals from the Patent Trial and Appeal Board's ("Board's") Final Written Decision ("FWD") in an *inter partes* review ("IPR") proceeding involving U.S. Patent No. 10,681,109 (the "'109 patent"), IPR2021-00237. The FWD is final and appealable under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73(a). The Board entered its FWD on June 8, 2022, and SIE filed a timely notice of appeal on August 10, 2022. Appx1; Appx4642-4646. The Court has jurisdiction under 28 U.S.C. § 1295(a)(4)(A) and 35 U.S.C. §§ 141(c), 319.

INTRODUCTION

SIE’s IPR Petition challenged the patentability of all eighteen claims of the ’109 patent, arguing that the claims would have been obvious to a skilled artisan from the teaching of the prior art—including a U.S. patent reference named Wiltshire. Shortly after SIE filed its Petition, Patent Owner Intellectual Pixels Limited (“PO” or “IPL”) disclaimed method claims 13-18, leaving only claims 1-12 at issue with claims 1 and 8 as the only independent claims. Claim 1 is directed to a well-known method for hosting an interactive software application in a distributed server-client system. Claim 8 is directed to a system that performs essentially the same method as claim 1.

As relevant to this appeal, SIE’s Petition demonstrated that the Wiltshire reference disclosed the challenged claims’ requirement for “**generating** at least one updated image at the server in response to updating the state of the interactive software application.” Appx49(9:62-64).¹ The Petition demonstrated how Wiltshire disclosed this “generating” limitation by its express teaching that an updated “image is **generated** by game computer program 112 and passed to server/host interface program 114” for transmission as a “compressed video MPEG stream” to a client. Appx4036; Appx1343(7:17-20); Appx1324(Fig. 2).

¹ Emphasis has been added in quotations unless otherwise noted.

IPL’s Patent Owner Preliminary Response (“POPR”) did not dispute that Wiltshire disclosed the claims’ “generating” limitation. Appx4136 (“Wiltshire disclosed that an *image generated* by a gaming program, located on the server, was transmitted to the client over a network.”); Appx4147 (“Wiltshire explained that ‘[t]he *image is generated* by game computer program 112’”). IPL neither sought a narrowing construction of the broad “generating” term, nor argued that Wiltshire’s express disclosure of “generating” somehow failed to meet the claims’ requirement. *Id.*

Agreeing with SIE’s Petition, the Board’s Institution Decision (“ID”) found that Wiltshire disclosed that the “image is *generated*” and found “a reasonable likelihood” that the asserted prior art combinations based on Wiltshire rendered one or more of the challenged claims obvious. Appx4197 (in describing Wiltshire’s Figure 2, finding that “[t]he image is generated”); Appx4206 (finding that “Petitioner has established a reasonable likelihood that it would prevail”); Appx4201-4202 (discussing the “generating” step). As relevant here, the ID reviewed the Petition’s evidence that Wiltshire taught “generating” updated images, as recited in the ’109 patent’s challenged claims, and the ID “determine[d] that the information presented supports ... Petitioner’s assertions as to this limitation.” Appx4201-4202. The ID also recognized that this point was undisputed, observing: “Patent Owner does not specifically respond to this

contention.” Appx4202. In the Overview of Prior Art, the ID also found that in Wiltshire, “[t]he image is generated.” Appx4197. Unsurprisingly, the parties’ subsequent briefing did not propose to construe the term “generating” and the hearing focused on claim limitations other than the “generating” limitation.

Yet, despite this record, and having not raised a single question about the “generating” limitation at the hearing, the Board’s Final Written Decision (“FWD”) made the “generating” limitation the basis for its decision—concluding, contrary to the ID, that the Petition had failed to show that Wiltshire taught “generating” as claimed. Appx32. To reach this conclusion, the FWD committed multiple reversible errors.

First, the FWD erred by concluding that Wiltshire’s express use of the term “generated” fails to disclose the ’109 patent claims’ “generating” requirement, even though both the ’109 patent and Wiltshire are U.S. patents within the same technological field, filed with priority dates within approximately two years of each other,² and use identical terminology to describe image generation. In fact, the FWD does not even squarely address Wiltshire’s express use of the “generated” term.

² The Wiltshire patent was filed on November 24, 1998 (Appx1320), approximately two years before the ’109 patent’s priority date of January 24, 2001 (Appx38).

Second, to find that “generated” in Wiltshire does not mean “generating” in the ’109 patent, the FWD had to construe “generating” in the ’109 patent and “generated” in Wiltshire to be mutually exclusive. The FWD did so by improperly construing “generating” in the ’109 patent to exclude the use of pre-existing images while construing “generated” in Wiltshire to be limited to the use of pre-existing images. The FWD erred in both respects. The FWD’s narrow construction of the ’109 patent claims’ broad term “generating” as solely covering only one form of image generation is contrary to the plain claim language and the specification’s disclosure, and is thus incorrect as a matter of law. And the FWD erred by incorrectly concluding that Wiltshire’s disclosure was limited to the use of pre-existing images. Appx20 (holding that “generating an updated image, as claimed, requires creation of a new image”); Appx22 (holding that “selecting a pre-existing image does not meet the ‘generating’ limitation”). As demonstrated below, Wiltshire is replete with evidence to the contrary, which the FWD unjustifiably dismisses or altogether ignores.

For example, the FWD erred by concluding that Figure 2 of Wiltshire is limited to casino games that only use pre-existing images, directly contradicting the words of Wiltshire itself. Appx26-27. Wiltshire’s Figure 2 depicts a server executing a “game program” that generates “update[d] image[s]” in response to received “input commands.” Appx1324(Fig. 2). Wiltshire defines “the terms

‘game’ and ‘gaming,” “*as used herein*,” to include many types of games, including “video based games such as Doom.” Appx1340(1:26-43). It was undisputed before the Board that the Doom video game program generates new images on the fly in response to the game state and the user’s input as opposed to pre-existing images. Appx3219(54:11-18); Appx1823-1825(38:7-40:14) (confirming that the Doom video game is part of Wiltshire’s disclosure); Appx1836-1839(51:10-54:9) (explaining Dr. Hart’s personal experiences with the Doom video game). Unable to reconcile this teaching of Wiltshire with its conclusion, the FWD found that the “game” programs executed by Figure 2’s server cannot run Doom despite Wiltshire’s lexicography expressly defining such “games” to include Doom. *See* Appx27. Such a finding lacks substantial evidence.

Third, the FWD commits each of the foregoing errors without either party having advanced any arguments about the claims’ “generating” limitation, without providing SIE an opportunity to respond, and without a legal or factual basis for doing so.³ The FWD thus violated the Administrative Procedure Act (“APA”).

³ Instead, the FWD places undue emphasis on two paragraphs from the declaration of IPL’s declarant, Dr. John C. Hart, where Dr. Hart states opinions about a **different** claim limitation (“compressing”) and not the limitation at issue (“generating”). Appx25 (citing Appx3118-3119(¶¶ 62-63)). Dr. Hart’s declaration does not dispute the broad plain meaning of “generating,” does not provide substantial evidence sufficient to set aside that plain meaning, and does not contend that Wiltshire fails to teach the claims’ “generating” limitation. In short,

In particular, the FWD violates the APA by failing to examine the relevant data (Wiltshire’s express disclosure that “[the] image is generated”), and by failing to articulate a satisfactory explanation for its action (its conclusion that Wiltshire’s express disclosure that “[the] image is generated” does not disclose “generating” an image), including a rational connection between the facts found and the choice made. The FWD also violated Petitioner’s procedural rights under the APA by construing the previously undisputed term “generating” for the first time in its FWD.

These errors, individually and collectively, require vacating the FWD.

STATEMENT OF ISSUES ON APPEAL

Whether the FWD commits reversible error by: (1) finding that Wiltshire does not disclose “generating” an updated image as recited in independent claims 1 and 8 of the ’109 patent even though Wiltshire expressly teaches that an “*image is generated* by [the] game computer program”; (2) narrowly construing the claim term “generating” in claims 1 and 8 of the ’109 patent so as to exclude the use of pre-existing images without any support from the claim language or the rest of intrinsic record; (3) limiting Wiltshire’s disclosure of “generated” to mean only the use of pre-existing images, despite Wiltshire’s clear teachings to the contrary,

Dr. Hart’s declaration neither addresses Wiltshire’s disclosure of “generating” nor supports the FWD’s construction.

including express disclosure that Wiltshire’s system runs “game” programs like the Doom video game that undisputedly generate new images; and (4) violating the APA by (i) not adequately articulating its grounds for finding that Wiltshire’s disclosure that an “image is generated” does not mean that an image is generated such that the Board’s reasoning may be “reasonably discerned,” and by (ii) construing the term “generating” for the first time at the FWD, where the term was never disputed or proposed for construction, depriving Petitioner of an opportunity to respond.

STATEMENT OF FACTS

A. The Parties

Appellant Sony Interactive Entertainment LLC (“SIE”) is a corporate entity of Sony Group Corporation managed by Sony Group Corporation’s U.S. subsidiary, Sony Corporation of America. SIE is involved in the distribution of PlayStation video game consoles. SIE also works with affiliated video game studios to develop and distribute video games that are played on PlayStation video game consoles.

Appellee Intellectual Pixels Limited (“IPL”) was incorporated in the United Kingdom in February 2019, shortly before suing SIE in the Central District of California. IPL does not develop, manufacture, or sell any products.

B. Technology Background and Prior Art

The '109 patent generally relates to a server-client computer architecture in which a remote server runs a software program, such as a video game, that communicates with a client computer that a user can use to play the video game. By clicking a mouse or keyboard, or manipulating a joystick, the user can cause the client computer to generate commands, such as to rotate a game character's field of view to the right or left, or to cause the character to step forward or backward. These commands are transmitted from the client computer to the remote server over a network, such as the internet, where, upon receipt of a command, the game program running on the server updates its state accordingly. Depending upon the nature of the command, the program executing on the server may respond by generating an updated image for display on the client computer. For example, if the command from the client is to step forward, the game program may generate an updated image that makes objects on the display appear to move closer. After generating such updated images, the server can compress and transmit them to the client for display. From the user's perspective, display of the updated image at the client computer thus appears responsive to the user's manipulation of the user's input device (e.g., displayed objects get closer when the joystick is pressed forward).

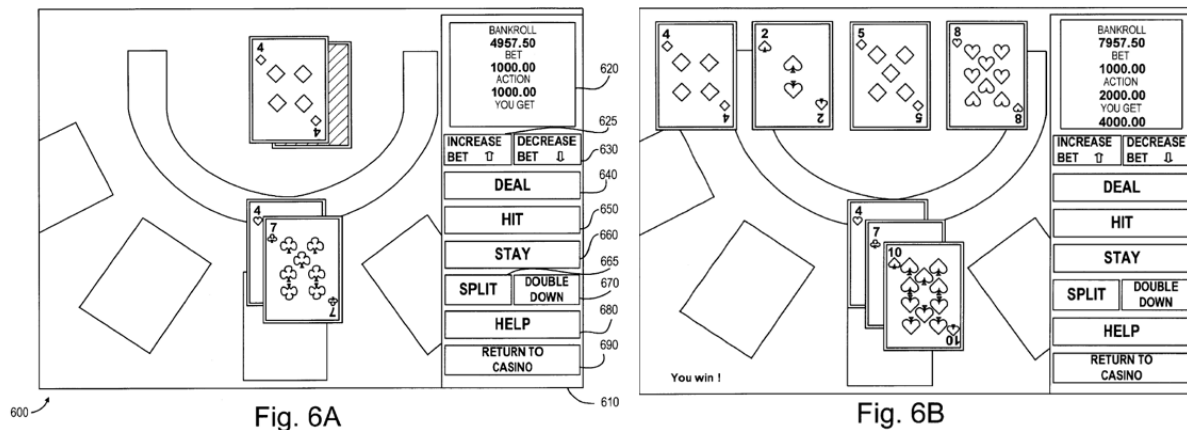
Server-client computer architectures as described above have long been known in the prior art since well before the '109 patent, as the patent itself acknowledges. Appx45(1:37-57). For example, Wiltshire was filed in 1998—about two years before the priority date of the '109 patent—and taught a computer gaming system in which a server executing a game program, such as the video game Doom, communicates via a network interface, such as the internet, with one or more remote client computers having a display and input controls, such as a mouse, keyboard, or joystick. Appx1340(1:26-43); Appx1341(3:61-4:29). A sequence of updated images generated by the Doom video game program is reproduced below:





Appx2315-2317(¶ 42). As depicted above, the Doom video game program would respond to a command to step forward by generating updated images that make objects on the display appear to move closer to other objects on the display—in this example, giving the appearance that the player’s character walks up stairs and into a room. *Id.*

Wiltshire also discloses casino games like blackjack that operate in a similar manner. For example, a sequence of images from a blackjack game is shown in Figures 6A and 6B of Wiltshire:



Appx1330-1331(Figs. 6A-6B). As explained in the Petition, the image on the left (Fig. 6A) shows a simulated blackjack table after the cards have been dealt and is awaiting the player's input. The image on the right (Fig. 6B) shows the resulting image if the player selects "Double Down" from the menu, showing the card dealt to the user (ten of spades) and the dealer's cards. Appx4056-4059; Appx1071-1073(¶¶ 143-144) (Dr. Fuchs explaining Figures 6A-6B).

As noted above, in Wiltshire's system, "the gaming program executed on the server/host computer" would receive "input" commands transmitted from a client device (e.g., commands generated based on a player's manipulation of "a joystick input device") and would respond by generating "output streams of the gaming program" for display on the client's display. Appx1320(Abstract);

Appx1341(3:61-4:29). Wiltshire depicts this operation in its Figure 2, reproduced below. Appx1341(3:15-16) (“Fig. 2 is a flow diagram of the operation of [the] computer gaming system of Fig. 1.”).

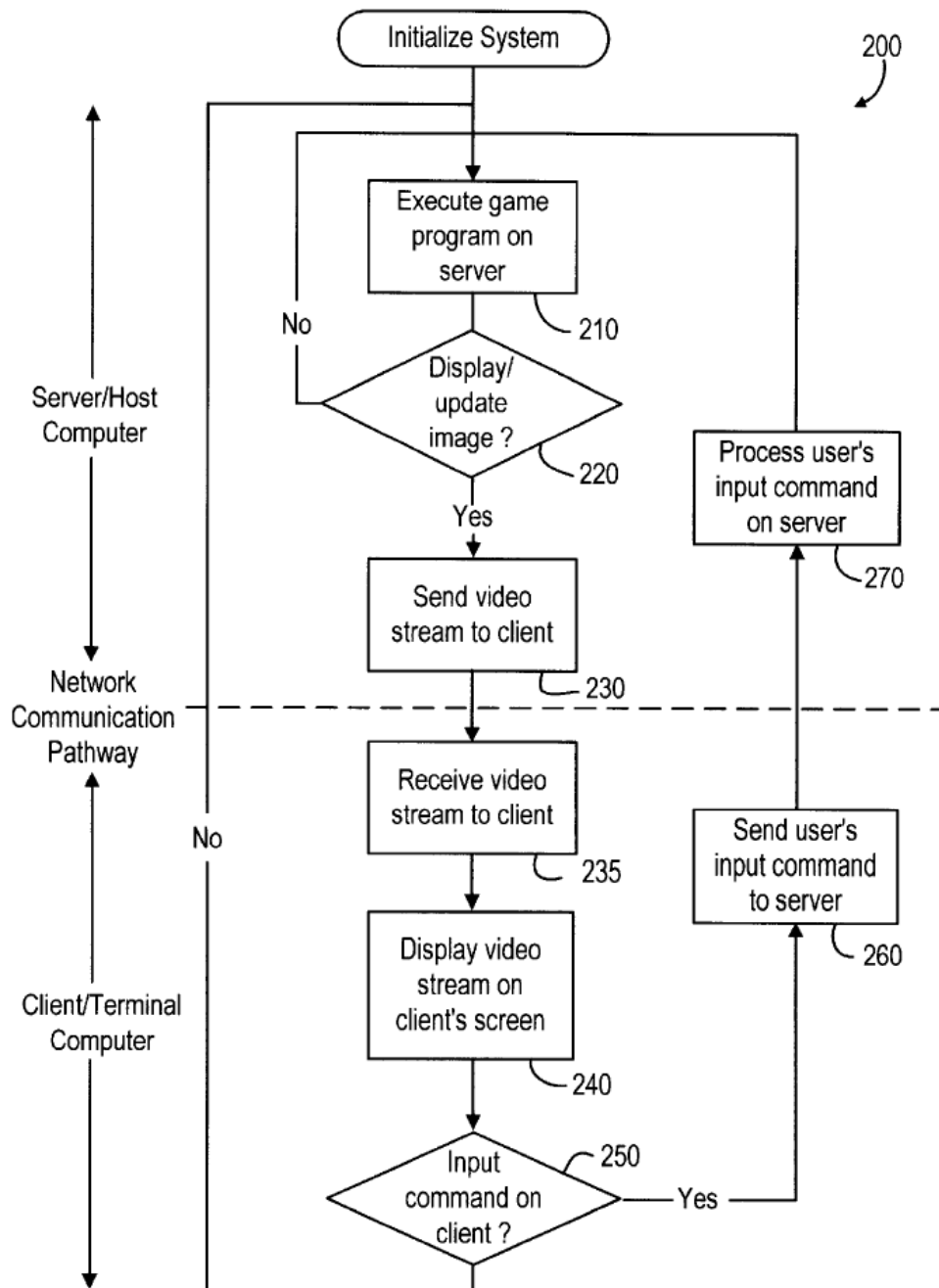


Fig. 2

Appx1324(Fig. 2).

Wiltshire's Figure 2 depicts operations performed by a "server/host computer" above the central dashed line, depicts operations performed by a "client/terminal computer" below the dashed line, and shows that these computers are connected via a "network communication pathway," represented by the dashed line. Appx1324(Fig. 2). As shown, following an initialization step, Wiltshire's system enters an operational loop in which the server computer executes a game program (e.g., the Doom video game or a casino game like blackjack) that generates images for display on a client computer, and receives and responds to input commands sent from the client computer. *Id.* For example, when a game is first booted, the system is initialized (e.g., started) and the game's software program executes on the server, causing the server to generate an initial image for display at the client. *Id.*

As game play commences, the system continually iterates through Figure 2 in a loop. For example, the current game state may be such that a player's character is standing at the bottom of a flight of stairs. Wiltshire's Figure 2 above shows that a user can then enter at the client an "input command," such as a command to step forward, shown in Figure 2 as step 250. Appx1343(7:28-29). That command is then "transmitted back to the server/host computer" (step 260). Appx1343(7:35-36). The game program on the server "processes the input command" (step 270), executes the game program based on the input command

(step 210), and decides if it needs to “update” the image (step 220) in response to the changed game state resulting from the received input command.

Appx1343(7:41-45); Appx1324(Fig. 2). For example, the game program could respond to a command to step forward by generating updated images that make objects on the display appear to move closer to each other—e.g., giving the appearance that the player’s character walks up stairs and into a room. These updated “images [] generated by game computer program 112” running on the server are then “sent from the server/host computer 110 to client/terminal computer 120” as a “video stream” (steps 230 and 235) “such as a compressed video MPEG stream.” Appx1343(7:13-15, 18-20). The client “causes the image[s] to be displayed on the screen of the client/terminal computer 120” (step 240).

Appx1343(7:26-27). Wiltshire’s system continues iterating in this manner, with the server generating updated images each time it receives user input commands that change the game state, for the duration of game play. Appx1343(7:30-45).

Notably, in Wiltshire’s server-client system, all “gaming programs and the associated gaming display generation programs are executed entirely on the server/host computer[.]” Appx1340(2:45-49). Wiltshire confirms that the “[g]ame program 112 is *any type of gaming program* that runs on an operating system 116 executed on server/host computer 110.” Appx1342(5:45-47). And Wiltshire specifically identifies “video based games such as Doom” as an example of a type

of “game” program that can be executed on Wiltshire’s server, expressly defining the terms “game” and “gaming” as “*used herein*” to include a large variety of different types of games:

[A]ll types of electronic, electromechanical or mechanical gambling and casino game facsimiles (as defined in 15 U.S.C. 11719(a) (2) or (3), such as faro, monte, roulette, keno, bingo, fan-tan, twenty-one, blackjack, seven-and-a-half, big injun, klondike, craps, poker, chuck-a-luck, Chinese cuck-a-luck (dai shu), wheel of fortune, chemin de fir, baccarat, pai gow, beat the banker, panguingui, slot machines, video poker machines, etc.; lottery, sports betting and pari-mutuel wagering as well as games of skill and or strategy such as chess, checkers, backgammon, “board” games such as Monopoly and Scrabble, card games such as Pinochle, Hearts, Spades; *video based games such as Doom*, Pong, Packman, Myst; video games based on sports such as golf, baseball, football, basketball, soccer, rugby; arcade type games; non-house stake games between two or more players; games defined by IGRA (Indian Gaming Regulatory Act) as class II games.

Appx1340(1:26-43). Wiltshire thus makes clear that its “gaming system”—including is operation depicted in Figure 2—encompasses all such games as defined above, and all types of “generating” updated images that the above games entail. Appx1340(1:26-44); Appx1342(5:45-47). Once an image is generated, Wiltshire teaches to compress the resulting updated images for transmission to the client computer using an industry standard compression format “such as a compressed video MPEG stream.” Appx1343(7:13-18, 62-64).⁴

⁴ Wiltshire states “[t]his bandwidth requirement can be further reduced using data compression techniques to about 100 KB/sec.” Appx1343(7:62-64). As explained by Dr. Fuchs, this confirms that a skilled artisan would understand that the

Finally, the breadth of Wiltshire's disclosure is confirmed by Wiltshire's specification description that while "[t]he operation of specific examples of casino games supported by game program 112 are further discussed with respect to FIGS. 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A, 8B, 9A, 9B, 9C and 9D," Wiltshire's Figures 1-3 are not so limited and instead cover "*any type of gaming program* that runs on an operating system 116 executed on server/host computer 110." Appx1342(5:45-50); *see also* Appx1345(12:10-13) (explaining the invention is "not limited to any particular game" and can include "any casino game or other non-casino games")).

C. THE '109 PATENT

The '109 patent claims priority to Provisional Application No. 60/263,854 filed on January 24, 2001. Appx37-38. It is undisputed that Wiltshire is prior art to the challenged claims. Appx8.

Like Wiltshire, the '109 patent purports to relate "to computer graphics and a graphical image display system" in which a "server" is used to "generate and transmit images to a client." Appx45. Also, like Wiltshire, Figure 1 of the '109 patent depicts this relationship, with server 12 connected to clients 16, 18, and 20 via a network or the internet 14:

transmitted images in Wiltshire are compressed to improve bandwidth utilization. Appx1043-1044(¶ 81).

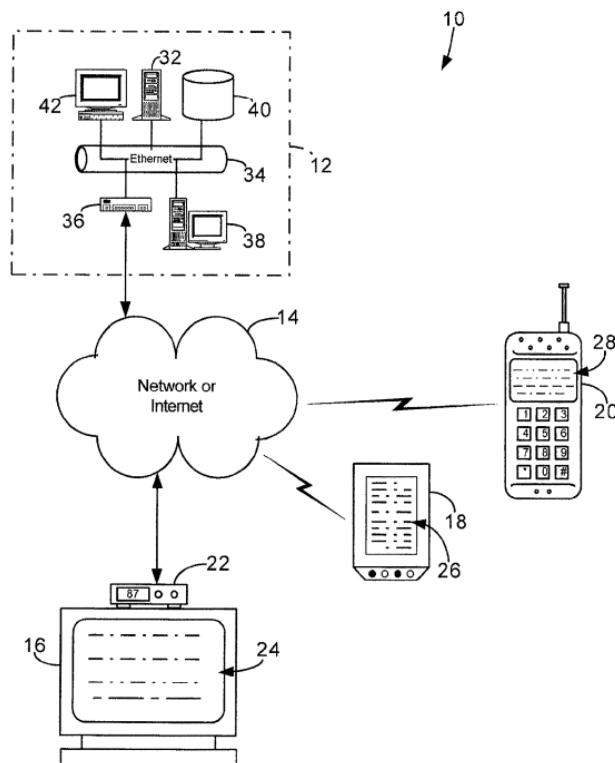


Fig. 1

Appx41. The '109 patent states that server 12 can “run standard software application[s], such as games, that are the same as version[s] running on standard personal computers, with the visual server 12 providing the computing power of the PC to the data generated at the client 16, 18, 20 for purposes of image modification.” Appx48-49(7:19-24, 9:18-20). Server 12 can thus run a standard game program, like the Doom video game, that receives input commands sent from a remote client, like 16, 18, or 20, and can generate updated images in response to those commands. The updated images may be compressed using a standard compression format “such as MPEG” and transmitted to the client, including as

one of various standard media file formats, such as “.ASF,” “.RM,” and “.MOV.”

Appx47(6:55-60); *see also* Appx46-49(3:51-57, 5:2-5, 6:29-38, 9:32-24).

The '109 patent describes the operation of its system nearly identically to Wiltshire, using a substantially similar flow diagram depicting steps performed at a server (Figures 2B and 2D below) and steps performed at a client (Figures 2A and 2C below):

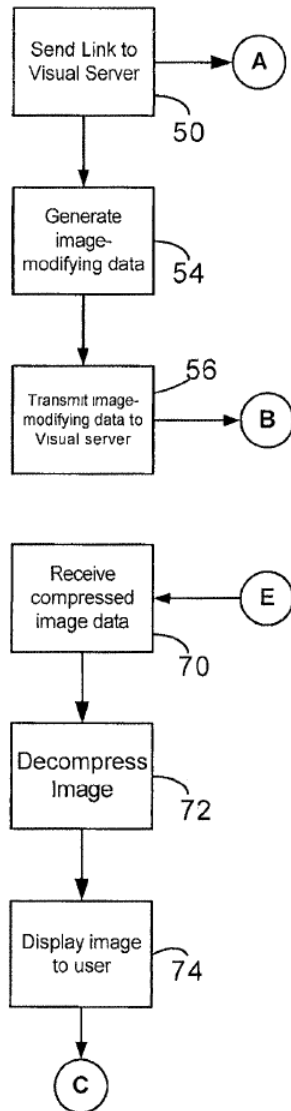


Fig. 2A

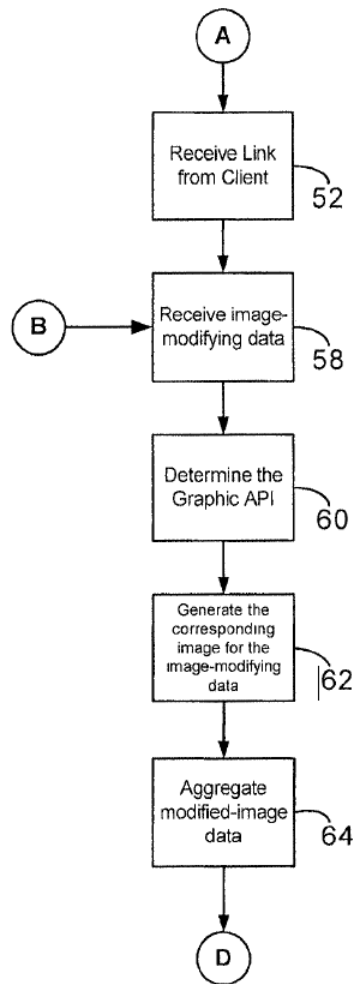


Fig. 2B

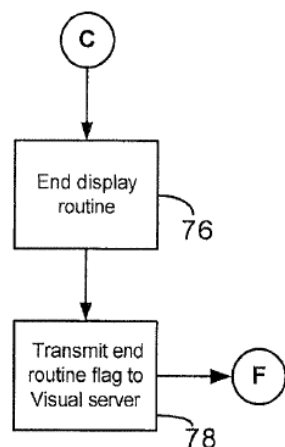


Fig. 2C

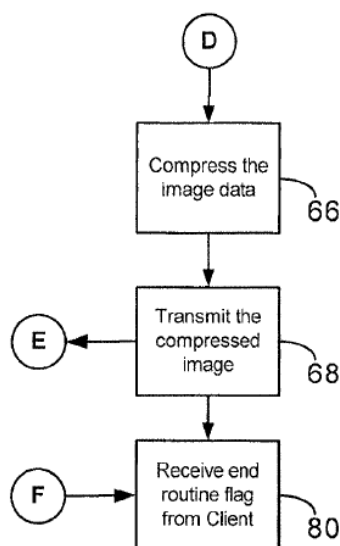


Fig. 2D

Appx42-43(Figs. 2A-2D). As shown above, following initialization (steps 50, 52), the system of the '109 patent enters an operational loop in which server 12 executes a game program that generates images to be transmitted and displayed on a client computer, and receives and responds to “image modifying data” sent from the client computer. Appx42(Figs. 2A-2B). As game play proceeds, the system of the '109 patent continually iterates through Figures 2A-2D in a loop. The '109 patent's Figure 2A (shown above) shows that the client can then generate “image modifying data” at the client device, shown in Figure 2A as step 54. Appx42(Figs. 2A-2B). The client then “transmits the image-modifying data [command] to the visual server 12, as shown at step 56.” Appx48(7:57-60). After the server “receives the image-modifying data” command (step 58), it processes that

command by first determining “the graphic API” (step 60), and then “generat[ing] the corresponding image for the image-modifying data” (step 62). Appx48(7:61-8:6).

For example, the ’109 patent’s game program could respond to image-modifying data from the client that instructs the game program to step forward by generating updated images that make objects on the display appear to move closer to each other—e.g., giving the appearance that the player’s character walks up stairs and into a room. These updated images are then “compress[ed]” using “an industry standard image compression protocol such as MPEG” (step 66; Appx49(9:32-33)), and transmitted “from the visual server 12 to the client 16, 18, 20” (steps 68, 70) via network 14. Appx48(8:9-17); *see also* Appx46-49(3:51-57, 5:2-5, 6:29-38, 6:55-60, 9:32-24). After receiving and decompressing the updated image, the client then “displays the decompressed image on the client image display” (step 74). Appx48(8:20-22). The ’109 patent’s system continues iterating in this manner, with the server generating updated images each time it receives image-modifying data from the client, for the duration of game play. Appx42-43(Figs. 2A-2D).

Notably, the ’109 patent admits that “methods of client-server graphics that employ image transmission” and use “real-time image compression and decompression” were well known in the prior art. Appx45(1:58-61). The ’109

patent admits, moreover, that generating updated images as recited in the claims was nothing new—admitting this step can be performed by “industry standard application programming interfaces” (i.e., graphics APIs) that had long been known since well before the ’109 patent. Appx49(9:23-25). Similarly, the ’109 patent admits there was nothing new about compressing or decompressing such images for transmission—admitting that this was performed by “industry standard image compression protocol[s] such as MPEG.” Appx49(9:32-34). And just like Wiltshire, the ’109 patent states that by executing game programs on a server using standardized image generation and compression techniques, the resulting system could be implemented using then-existing commercially available hardware and software. *Compare* Appx49(9:4-34) (’109 patent disclosure) *with* Appx1340-1341(2:45-3:3) (Wiltshire disclosure).

Moreover, and particularly with respect how the claimed server “generates” updated images, the ’109 patent specification covers all types of image generation, whether the images are created from scratch or selected from pre-existing images. For example, while describing the image generating operation of server 12 in Figure 2B of the ’109 patent, the specification explains that “image-modifying data” received from a client “*corresponds* to an image in a graphics API recognizable to the visual server 12”—confirming that “generating” in the ’109 patent broadly includes using data received from a client to select from among a

set of pre-existing images, one of which corresponds to the received image-modifying data. Appx48(7:61-65). The '109 patent specification also explains that the generated image can be a file, such as a “.ASF,” “.RM,” or “.MOV” video file. Appx47(6:48-62). And finally, the '109 specification says that the “Visual Server runs *standard software*, such as games, that are the same versions running on standard personal computers” without limiting the software to only those which use new images as opposed to using pre-existing images. Appx49(9:18-20).

D. PROCEEDINGS BELOW

SIE petitioned for *inter partes* review of claims 1-18 of the '109 patent. Appx4011. In response, IPL disclaimed claims 13-18, leaving only claims 1-12 remaining for review with claims 1 and 8 as the only remaining independent claims. Appx2501. Each of these remaining claims is directed to a server-client system that generates updated images at a server, compresses those updated images, and transmits the compressed updated images to a client for display. Each recites “generating at least one updated image at the server in response to updating the state of the interactive software application” See Appx49(9:62-64, 10:35-37).

SIE’s Petition demonstrated obviousness of claims 1-12 based upon Wiltshire in combination with one or more additional prior art references. Appx4029-4060; Appx4069-4075. The Petition cited evidence from Wiltshire

expressly teaching the “generating” limitation—that “image[s]” are “**generated** by game computer program 112 and passed to server/host interface program 114” for transmission as a “compressed video MPEG stream” to a client. Appx4036; Appx1343(7:7-20); Appx1324(Fig. 2). The Petition further explained how Wiltshire taught that the “game program” executing on server 110 in Figures 1 and 2 can be “any type of game program that runs on an operating system”—whether that program is a casino game, like blackjack, poker, or slots, or video games, like Doom. Appx4036; Appx1340(1:26-44); Appx1342(5:45-47). And the Petition demonstrated how the updated images generated by the game program executing on Wiltshire’s server 110 can be compressed as “an encoded audio/video stream such as a compressed video MPEG stream.” Appx4036; Appx1343(7:15-18, 7:62-63) (“This bandwidth requirement can be further reduced using data compression techniques to about 100 KB/sec”).

IPL’s POPR did not dispute that Wiltshire taught the ’109 patent claims’ “generating” limitation, admitting that an “image [is] generated” at the server. *See* Appx4136 (POPR stating that “Wiltshire disclosed that an **image generated** by a gaming program, located on the server, was transmitted to the client over a network”); Appx4147 (POPR stating that “Wiltshire explained that ‘[t]he **image is generated** by game computer program 112’”); *see also* Appx4145-4152 (POPR not raising any arguments about the “generating” limitation).

The Board's ID agreed with SIE's Petition, finding "a reasonable likelihood" that the asserted prior art combinations based on Wiltshire rendered one or more of the challenged claims obvious. Appx4201-4202. As relevant here, the ID reviewed the Petition's evidence that Wiltshire taught "generating" as claimed, and "determine[d] that the information presented supports ... Petitioner's assertions as to this limitation." *Id.* The ID also recognized that this point was undisputed, observing: "Patent Owner does not specifically respond to this contention." Appx4202. Indeed, in describing Wiltshire's operation in the "Overview of the Asserted Prior Art," the ID Board stated that "[t]he image is **generated**, then transmitted" Appx4197.

The parties' subsequent briefing and the hearing thus focused on other limitations and did not focus on whether Wiltshire disclosed "generating" an updated image. Appx4262-4273 (POR proposed construction of certain terms but not "generating"); Appx4276-4291 (POR arguments focusing on "compressing the at least one updated image" and "frame"); Appx4397-4402 (Sur-Reply arguments focusing on "compressing the at least one updated image" and "frame").

For example, in its Patent Owner Response ("POR"), IPL did not dispute that Wiltshire disclosed the limitation "generating at least one updated image at the server in response to updating the state of the interactive software application." *See* Appx4276-4291 (POR disputing the "compressing" and "frame" limitations).

Instead, IPL focused on whether Wiltshire discloses “compressing the at least one updated image” and whether Wiltshire or a second prior art reference named Saha disclosed transmitting an image as a “compressed frame.” Appx4270-4273. The POR did not quibble with the “generating” limitation. Indeed, the POR again *admitted* that “Wiltshire disclosed that an image *generated* by a gaming program, located on the server, was transmitted to the client over a network.” Appx4261.

In its IPR Reply, SIE accordingly addressed the limitations in dispute, such as Wiltshire’s disclosure of the “compressing the at least one updated image” and “compressed frame” limitations, but did not further address the “generating” limitation, which IPL did not dispute in its POR. Appx4347-4355. IPL’s IPR Sur-Reply once again focused on the claims’ “compressing” and “frame” limitations. Appx4397-4402.

Moreover, during the IPR oral hearing, the Board never asked a question about the claims’ “generating” limitation. *See generally* Appx4547-4641.

Nevertheless, the FWD erroneously reversed the ID’s finding that Wiltshire undisputedly disclosed the “generating” limitation, and instead found that SIE’s Petition had failed to show how Wiltshire disclosed “generating” despite Wiltshire’s express disclosure that “[t]he image is generated,” and on that sole basis the FWD held that claims 1-12 had not been shown unpatentable. Appx32-34. In other words, the FWD resolved SIE’s Petition using a newly-minted

construction of “generating” neither requested by nor addressed in the parties’ briefing, despite repeated IPL admissions that Wiltshire disclosed “generating” updated images, and without providing the parties an opportunity to address what ultimately became the deciding issue. Appx30-34. In doing so, the FWD made a number of legal and factual errors as discussed further below.

SUMMARY OF THE ARGUMENT

The FWD should be vacated for three reasons.

First, the FWD erred by finding no “specific disclosure” of “generating” in Wiltshire (Appx30), even though Wiltshire discloses “[t]he image is **generated**,” as stated in the Petition. Appx4036. In fact, the FWD’s finding contradicts the testimony of IPL’s own expert, Dr. Hart, who testified that in Wiltshire, there are “image[s] **generated** by the game program.” Appx3118-3119(¶¶ 62, 63, 64). The FWD thus erred by ignoring express disclosure in the prior art and contradicting the Patent Owner’s own expert’s testimony.

Second, the FWD erred by construing “generating” in the ’109 patent to exclude the use of pre-existing images while at the same time construing Wiltshire’s disclosure that “[the] image is generated” to be limited to pre-existing images. This is a two-part error, each of which, while related, independently warrants vacating the FWD.

Specifically, the FWD first erroneously narrows the “generating” term in the ’109 patent claims to require “creation of a new image” and to exclude generating by selecting from pre-existing images. Appx20; Appx22. This is legal error because nothing in the intrinsic record supports excluding certain types of image generation performed by software applications, much less image generation based on pre-existing images. To the contrary, the specification contemplates that “generating” includes selecting among pre-existing images.

Then, based on the above false premise that “generating” excludes the use of pre-existing images, the FWD erroneously and inconsistently interprets Wiltshire’s use of virtually the same word “generated” to *only* mean selecting from pre-existing images. This finding is contradicted by repeated, express, and unequivocal disclosures in Wiltshire, including examples of casino games displaying “animated and *dynamically* variable image[s],” and Wiltshire’s express teaching that its system can run Doom—a video game that undisputedly generates new images. *See, e.g.*, Appx2322-2324(¶ 49-50); Appx1836-1839(51:10-54:9). Indeed, in order for the FWD to reach its conclusion that Wiltshire’s image generation is limited to pre-existing images, the FWD had to find that Wiltshire did *not* work with the Doom video game, directly contradicting Wiltshire’s clear lexicography that defined the term “game” “as used herein” to include a variety of

games, specifically including “video based games such as Doom ... [and] arcade type games.” Appx1343(7:45); Appx1340(1:26-43); Appx1342(5:45-47).

Finally, and at a minimum, the FWD should be vacated and remanded because it violates the Administrative Procedure Act’s (APA) in two ways. First, the FWD violates the requirement that the grounds be adequately disclosed. *In re NuVasive, Inc.*, 842 F.3d 1376, 1382 (Fed. Cir. 2016). The FWD did not adequately explain its rationale for finding that Wiltshire’s statement that “[t]he image is generated” does not actually mean the image is generated, and thus the FWD’s reasoning cannot be reasonably discerned and judicial review cannot meaningfully be achieved. Second, the FWD violates Petitioner’s procedural rights under the APA by construing the term “generating” for the first time in the FWD. The term “generating” was given its plain meaning in the ID, neither party offered a construction or disputed the plain meaning of the term throughout the proceedings, and the Board never asked a question about “generating” during the hearing. Thus, Petitioner did not have the opportunity to address or respond to a claim construction necessary to the FWD’s conclusion.

ARGUMENT

I. STANDARD OF REVIEW

Obviousness is a legal conclusion reviewed *de novo*, with underlying factual findings reviewed for substantial evidence. *See Almirall, LLC v. Amneal Pharms.*

LLC, 28 F.4th 265, 271-272 (Fed. Cir. 2022); *Harmonic Inc. v. Avid Tech. Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016).

Claim construction determinations are reviewed *de novo*. *Personalized Media Commc'ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1339 (Fed. Cir. 2020) (citing *Knowles Elecs. LLC v. Cirrus Logic, Inc.*, 883 F.3d 1358, 1361-1362 (Fed. Cir. 2018)). Factual findings underpinning a construction are reviewed for substantial evidence. *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1279-80 (Fed. Cir. 2015), *aff'd sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131 (2016); *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 333 (2015).

The Board's procedure and compliance with the APA is reviewed *de novo*. *Sirona Dental Sys. GmbH v. Institut Straumann AG*, 892 F.3d 1349, 1352 (Fed. Cir. 2018).

II. THE BOARD ERRED BY HOLDING THAT “GENERATED” DOES NOT MEAN “GENERATING”

The Board's sole basis for finding the challenged claims not unpatentable is that it found that Wiltshire does not disclose “generating” an updated image. Appx32-33. The Board's finding lacks substantial evidence because Wiltshire explicitly teaches that “[t]he image is *generated*,” as confirmed by the testimony of IPL's own expert Dr. Hart.

Independent claims 1 and 8 of the '109 patent recite “*generating*” at least one updated image at the server in response to updating the state of the interactive

software application[.]” Appx49(9:62-64, 10:35-37). No party proposed a construction of “generating” before the Board, with each party giving “generating” its broad plain meaning throughout briefing and at the hearing.

Wiltshire discloses a “game program 112” that “is executed on [a] server/host computer 110,” where “update[d] image[s]” are “*generated* by game program 112 and passed to server/host interface program 114” for transmission to a client computer as a “compressed” “video stream”:

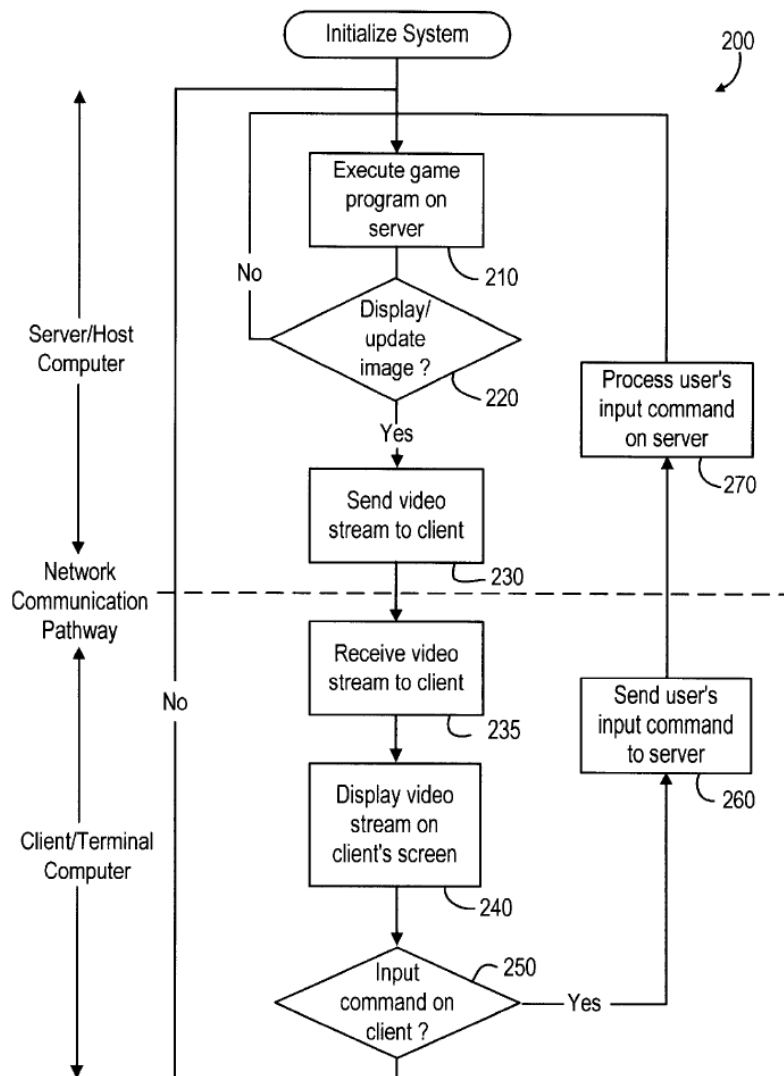


Fig. 2

Appx1343(7:8-9, 18-22, 62-64); Appx1324(Fig. 2 (steps 210-235)); *see also* Appx1340(2:45-47) (“the gaming program and the associated gaming display **generation** programs are executed entirely on the server/host computer”).

Wiltshire’s server 110 “generates” these “update[d] image[s]” in response to receiving an “input command”—such as “a keystroke, movement or clicking of the

mouse, a voice activated command,” “clicking of a ‘virtual button’ on a touch screen” or manipulation of a “joystick”—that “updates the state of the game accordingly.” Appx1341(4:18-21) (“displays with separate input controls such as a six degrees of freedom joystick/mouse”); Appx1342(5:59-65) (“input commands such as mouse movements, mouse clicks or keystrokes ... are sent directly to the server/host based game program for context interpretive processing”); Appx1343(7:31-34) (“The input command may be a keystroke, movement or clicking of the mouse, a voice activated command or even the clicking of a ‘virtual button’ on a touch screen.”); Appx1343(7:39-43) (“game program 112 processes the input command and updates the state of the game accordingly”); Appx1324(Fig. 2). Finally, Wiltshire discloses that the updated images “generated” by the game program running on the server are then compressed, transmitted, and “displayed on a screen of a client/terminal computer.” Appx1343(7:26-27).

Yet despite the foregoing disclosures of Wiltshire that say it “generate[s]” an image, the FWD wrongly held that “Petitioner’s contentions as to the ‘generating’ claim limitation are based not on a specific disclosure in Wiltshire” and concluded that Wiltshire did not disclose “generating” an image. Appx30. The FWD is wrong for the following reasons.

First, contrary to the FWD, the Petition clearly and repeatedly identified “specific disclosures” in Wiltshire of “generating” updated images as the reason why Wiltshire discloses this limitation. *See* Appx4034-4037 (quoting Wiltshire’s disclosure that “[t]he **image is generated by game program 112** and passed to server/host interface program 114”) (emphasis in original). The Petition is equally clear that game program 112 is software executed on the server. Appx4036 (citing Appx1343(7:8-9) (“Initially, **game program 112 is executed on server/host** computer 110 in stage 210.”) (emphasis in original)); *see also* Appx1341(4:34-38) (“One or more game programs 112 executed on server/host computer 110 runs on top of the server/host interface program 114, also executed on server/host computer 110.”). Thus, the FWD’s assumption that the Petition did not rely on a “specific disclosure” in Wiltshire for the “generating” limitation is incorrect.

Second, the FWD never squarely deals with Wiltshire’s explicit teaching that “[t]he image is **generated** by game computer program 112.” Appx1343(7:18-22). Instead, the FWD relies on Dr. Hart’s testimony for a *different* limitation: “compressing” the updated image after it has been generated. Appx25. Specifically, the FWD found “persuasive Dr. Hart’s testimony ... ‘that the “image [] generated by the game computer program” could include the contents of a pre-existing compressed image file.’” *Id.* But, as the quoted sentence itself shows, that testimony does not support the Board’s conclusion, as it refers to a generated

image to which contents of a pre-existing compressed image file could be included.

Dr. Hart never testified that Wiltshire does not disclose “generating” images.

Instead, focusing on the “compressing” limitation, Dr. Hart contended that

Wiltshire could add “contents of a pre-existing compressed image file” to an image “generated” by the game computer program. Appx3118-3119(¶¶ 62-63).

Specifically, Dr. Hart argued that Wiltshire’s compression disclosure meant that pre-compressed files could be “somehow attach[ed]” to or included with a

“generated image.” Appx3119(¶ 63) (“One way would be to decompress the file on the server/host and combine the decompressed image with *any other image*

elements generated by the game program. Another way would be to somehow

attach the compressed image file to *the generated image* for transfer from the

server/host to the client/terminal.”); *id.* ¶ 64 (contending that “an MPEG file ...

could be included in the *image generated* by the game program”). In other words,

Dr. Hart’s testimony about “compressing” acknowledges that Wiltshire discloses

generating an image—directly contrary to the FWD’s conclusion. Thus, Dr. Hart’s

testimony does not constitute substantial evidence capable of supporting the

FWD’s finding that Wiltshire’s disclosure that the “image is generated” does not

mean the image is generated.

Indeed, the testimony upon which the FWD relied *reinforces* Wiltshire’s disclosure that updated images are generated because Dr. Hart admitted that

Wiltshire discloses “generating” images as claimed. Appx3317-3118(¶ 61) (admitting to “the image **generated** by the game program running on the server/host computer” in Wiltshire); Appx3119(¶ 63) (referencing “image elements **generated** by the game program” and attaching a file “to the **generated** image”); *id.* (¶ 64) (referencing “the image **generated** by the game program”). Thus, the FWD not only ignored express, unequivocal disclosures in Wiltshire that images are “generated,” but it contradicted IPL’s own expert’s testimony **admitting** that images are “generated” in Wiltshire. In sum, the Board’s FWD’s finding lacks substantial evidence and should be vacated.

III. TO REACH ITS ERRONEOUS RESULT, THE FWD BOTH MISCONSTRUES “GENERATING” IN THE ’109 PATENT CLAIMS AND MISINTERPRETS “GENERATED” IN WILTSHIRE

For the FWD to justify its finding that “generat[ing]” in Wiltshire does not mean “generating” in the ’109 patent, the FWD had to go to great lengths to construe virtually the same term (“generating” and “generated”), appearing in two U.S. patents, with priority dates within approximately two years of each other, describing the same subject matter and technology, but in two different and mutually exclusive ways. There is no meaningful difference between the word “generating” and “generated” given that both use the same root word “generate.” *See S.I.SV.EL. Societa Italiana per lo Sviluppo dell’Elettronica, S.p.A. v. Rhapsody Int’l Inc.*, No. CV 18-69-CJB, 2020 WL 4584355, at *7 (D. Del. Aug. 10, 2020)

(construing the term “automatically generate” and “automatically generating” identically); *Multimatic, Inc. v. Edscha Auto. Michigan, Inc.*, No. 19-12598, 2020 WL 6054693, at *8-9 (E.D. Mich. Oct. 14, 2020) (finding “no apparent meaningful distinction between” the “root word” “deform,” “deformed,” and “deformation”); *Integrity Worldwide, LLC v. Rapid-EPS LTD.*, No. 3:17-CV-0055-K, 2018 WL 3609430, at *5 (N.D. Tex. May 29, 2018) (finding no difference in meaning to a person of ordinary skill in the art between “the regular noun form [lock] and ... the gerund form [locking]”).

Thus, the FWD commits two more reversible errors: first, by misconstruing “generating” in the ’109 patent claims to exclude pre-existing images without intrinsic support; and second, by misinterpreting “generated” in Wiltshire to be limited to pre-existing images, contrary to express disclosures in Wiltshire itself and without substantial evidence. Each error independently requires vacating the FWD, as demonstrated below.

A. The FWD Misconstrues “Generating” In The ’109 Patent’s Claims

Although no party sought a construction of the claims’ “generating” limitation, and although the FWD conducts no formal claim construction analysis, the FWD necessarily rests on construing the ’109 patent’s claims’ use of “generating” to require “creation of a new image” and to exclude generating

updated images by selecting from pre-existing images. Appx20; Appx22. This construction was legal error.

No explicit construction of the term “generating” is needed to resolve this appeal because, as set forth in Section II, both the ’109 patent claims and Wiltshire use the same “generat[ing]” term in the same manner. *See supra* Section II; *Vivid Techs., Inc. v. American 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).

However, the Board incorrectly construed “generating” in the FWD as the “creation of a new image in response to updating the state of the interactive software application.” Appx20. The Board explained that under this construction “selecting a pre-existing image does not meet the ‘generating’ limitation.” Appx22. This construction is erroneous as a matter of law under *Phillips* because it narrows the ’109 patent claims’ broad “generating” language to solely one type of generating (creating new images from scratch) and excludes another (selecting from among pre-existing images) without any support from the intrinsic record. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (“[I]t is ‘unjust to the public, as well as an evasion of the law, to construe [claims] in a

manner different from the plain import of its terms.”). Critically, the FWD narrowed “generating” without identifying any clear disclaimer of claim scope or lexicography anywhere in the specification or file history of the ’109 patent, as required under Federal Circuit law. *Continental Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019) (“To disavow claim scope, the specification must contain ‘expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.’”); *Phillips*, 415 F.3d at 1316 (claim scope may be narrowed by “intentional disclaimer, or disavowal of claim scope by the inventor” and/or the inventor’s “special definition” lexicography); *see also Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1358 (Fed. Cir. 2016) (identifying lexicography and clear disavowal as the “only two exceptions to this general rule”); *SuperGuide Corp. v. DirectTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (“[I]t is important not to import into a claim limitations that are not a part of the claim”). To the contrary, as explained below, the FWD’s construction is inconsistent with the patent’s specification and would result in excluding disclosed embodiments from the scope of the claims—a result that this Court has observed as “rarely if ever correct.” *Network-1 Techs., Inc. v. Hewlett-Packard Co.*, 981 F.3d 1015, 1024 (Fed. Cir. 2020).

Starting from the claim language, the ’109 patent claims recite “generating at least one updated image at the server in response to updating the state of the

interactive software application[.]” Appx49(claims 1 and 8). The claims’ “generating” requirement does not recite any restriction on how this “generating” must be performed, other than that it must be in “response to updating the state of the interactive software application.” The plain claim language contains no restrictions on the type of generating, much less requiring “new images” or excluding generating an updated image by using pre-existing images.

There is no other language recited in the ’109 patent claims that would restrict the plain meaning of “generating.” The limitations recited before the term “generating” relate to “hosting an interactive software application” on the server (“running at a server”) and receiving user inputs from a client (“receiving at the server user input signals”), neither of which restrict the meaning of “generating” updated images. Appx49(claims 1 and 8). The limitations recited after the term “generating” concern data compression (“compressing the at least one updated image”), transmission (“transmitting the compressed updated image to the client device”), and display (“decompressed and displayed as an updated image on the client device”), none of which restrict the meaning of “generating.” *Id.* Again, all of the claim language is consistent with “generating” updated images in any manner, including by selecting from pre-existing images. The claim language itself thus refutes the FWD’s claim construction. *See Vitronics Corp. v.*

Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996) (“First, we look to the words of the claims themselves ... to define the scope of the patented invention.”).

Turning to the specification, the ’109 patent is devoid of any lexicography or clear and unmistakable disclaimer sufficient to narrow the plain meaning of “generating” to exclude the use of pre-existing images. *See Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (“To act as its own lexicographer, a patentee must ‘clearly set forth a definition of the disputed claim term’ other than its plain and ordinary meaning.”); *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1306 (Fed. Cir. 2011) (“To disavow claim scope, the specification must contain ‘expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.’”).

To the contrary, embodiments disclosed in the ’109 patent specification contemplate generating updated images by selecting from among pre-existing images. For example, in discussing Figure 2B of the ’109 patent, the specification explains that “as shown at step 58” “the image modifying data” received by the server “*corresponds to* an image in a graphics API recognizable to the visual server 12.” Appx48(7:61-65). By stating there is a “correspond[ing]” image to the received image modifying data, the specification discloses selection from stored pre-existing images because the only way that a server could “recognize” the “correspond[ence]” between received “data” and an “image in a graphics API” is if

both things already exist to be compared. To that end, the '109 patent specification discloses “a database 40 for storing the image related information.” Appx47(6:2).

By further example, the '109 specification explains that the generated image can be a video file. According to the specification, “modified image data” sent from the server to the client can be in “streaming formats such as Windows Media .ASF standard, Real .RM standard, Apple .MOV standard.” Appx47(6:48-62). The terms “.ASF,” “.RM,” and “.MOV” are file extensions for specific types of video files. According to the FWD, references in Wiltshire to various file types means that the generated image “could simply be a pre-existing image file.”

Appx25. If the FWD is correct that Wiltshire’s reference to “files” like a “JPEG file” contemplates pre-existing image files, then by the same reasoning, the '109 patent’s reference to “.ASF,” “.RM” and “.MOV” files must also contemplate pre-existing image files.

Finally, the '109 specification contemplates all forms of image generation by “standard software application[s].” Appx48(7:19-24) (“The visual server 12 can also run *standard software application*, such as games, that are the same as versions running on standard personal computers”); Appx49(9:18-20) (“The Visual Server runs *standard software*, such as games, that are the same as versions running on standard personal computers”); Appx46(3:43-45) (same). The FWD’s

construction would improperly exclude standard software applications that use pre-existing images.

The '109 patent thus contemplates embodiments in which updated images are “generated” in response to received inputs by the server selecting from among pre-existing images. The FWD’s construction would preclude such embodiments and is therefore incorrect as a matter of law. *Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1220 (Fed. Cir. 2020) (quoting *Nobel Biocare Servs. AG v. Intradent USA, Inc.*, 903 F.3d 1365, 1381 (Fed. Cir. 2018)) (“[T]here is a strong presumption against a claim construction that excludes a disclosed embodiment.”).

Because the FWD’s opinion relies on legal error in reaching an unsupported claim construction, the FWD should be vacated. And when that error is corrected, Wiltshire clearly discloses the '109 patent claims’ “generating” updated images limitation exactly as the ID found (and Dr. Hart admitted). *See supra* Section II; Appx4197 (ID finding that “[t]he image is generated” in Wiltshire); Appx4201-4202 (ID finding that Wiltshire discloses “generating”); Appx3117-3119(¶¶ 61, 63, 64) (Dr. Hart admitting that Wiltshire discloses generated images).

B. Wiltshire Discloses “Generating” Even Under The FWD’s Erroneous Construction

After construing “generating” in the '109 patent to require new images and exclude pre-existing images, the FWD then construes the virtually identical term “generated” in Wiltshire to have the exact opposite meaning.

Contrary to the FWD’s findings, Wiltshire discloses the ’109 patent’s “generating” limitation—even under the FWD’s erroneous construction—because it discloses multiple, specific examples of a game program (both casino and non-casino games) running on the server generating new images (as opposed to selecting from pre-existing images).

1. Wiltshire’s Disclosure of Non-Casino Games Like “Doom” Confirms That Wiltshire Discloses Generating New Images

Wiltshire makes clear that the operation described in its Figure 2 includes running “all types of games,” including non-casino games like Doom that undisputedly generate “new” images:

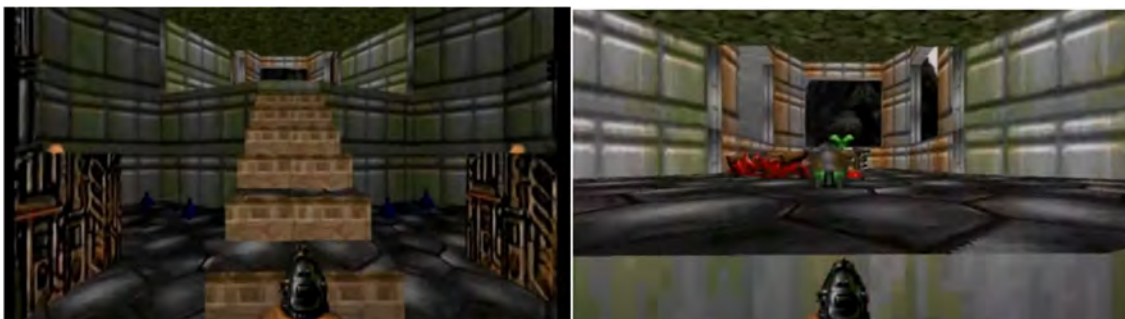
The terms “*game*” and “*gaming*,” *as used herein*, include *all types* of electronic, electromechanical or mechanical gambling and casino game facsimiles (as defined in 15 U.S.C. 11719(a) (2) or (3), such as faro, monte, roulette, keno, bingo, fan-tan, twenty-one, blackjack, seven-and-a-half, big injun, klondike, craps, poker, chuck-a-luck, Chinese cuck-a-luck (dai shu), wheel of fortune, chemin de fir, baccarat, pai gow, beat the banker, panguingui, slot machines, video poker machines, etc.; lottery, sports betting and pari-mutuel wagering as well as games of skill and or strategy such as chess, checkers, backgammon, “board” games such as Monopoly and Scrabble, card games such as Pinochle, Hearts, Spades; *video based games such as Doom*, Pong, Packman, Myst; *video games* based on sports such as golf, baseball, football, basketball, soccer, rugby; *arcade type games*; non-house stake games between two or more players; games defined by IGRA (Indian Gaming Regulatory Act) as class II games.

Appx1340(1:26-43); *see also* Appx1342(5:45-47) (“Game program 112 is *any type of gaming program* that runs on an operating system”); Appx1345(12:8-12)

(noting that “the invention is not limited to any particular game” and contemplates “non-casino games”).

There is no dispute that the Doom video game generates new images on the fly based on the user’s actions in the game in real time instead of selecting from pre-existing images. Appx1034(¶ 57) (Dr. Fuchs explaining how interactive software applications like the Doom video game generate images in response to user commands); Appx1042-1043(¶¶ 75-78) (Dr. Fuchs explaining that in Wiltshire, “the decision to update an image is tied to the updated game state”); Appx2315-2318(¶ 42-43); Appx2322-2324(¶ 49-50) (Dr. Fuchs describing how “in Doom, the player’s perspective changes dynamically based on what the user is doing in real time, and each image must be updated to reflect the current state of the player within the game world”); Appx1823-1825(38:7-40:14) (Dr. Hart confirming that the Doom video game is part of Wiltshire’s disclosure); Appx1836-1839(51:10-54:9) (Dr. Hart explaining personal experiences with the Doom video game and how Doom displayed generating a sequence of images in response to inputs from the keyboard).

As explained by Dr. Fuchs, the Doom video game requires images to be generated in real-time in response to user input commands to reflect the game character’s movement throughout the game environment:



Appx2315-2318(¶¶ 42-43). Indeed, “[e]ach image is updated to reflect the current state of the player within the game world” and “[p]re-loading an image would not work in this type of game because the client would not know what action the player would take at every instant in time.” *Id.* ¶ 43; *see also supra* Section B (Technology Background).

Despite the clear evidence to the contrary, the FWD improperly limits Wiltshire’s Figure 2 to casino games.⁵ Appx27 (“Given Wiltshire’s use solely of casino gaming stations for its description of the invention ... we are not persuaded that a person of ordinary skill in the art would have understood that every video game mentioned on the list in the background section could also be implemented using the operation disclosed in Wiltshire’s Figure 2.”). The FWD relies on the fact that “the *only* mention of Doom in Wiltshire appears in a lengthy list of games ... provided in the ‘Related Art’ section of Wiltshire.” *Id.* (emphasis in original).

⁵ As explained below, even if one were to limit Figure 2 to casino games such as those shown Figures 6A, 6B and 8B, those Figures demonstrate generating new images on the fly. *See infra* Section III.B.2.

But the FWD ignores that Wiltshire defined “game” and “gaming” for the *entire* disclosure by explicitly telling the reader that “*as used herein*,” the word “game” includes a wide variety of games, including Doom. Appx1340(1:26-43). And the FWD ignores that in Wiltshire’s “Detailed Description of the Embodiment” section, Wiltshire states again that “[g]ame program 112 is *any type* of gaming program,” mirroring the lexicography set forth at the beginning of Wiltshire to include “any” game such as Doom. Appx1342(5:45-47). And the FWD ignores that at the end of the specification, Wiltshire says, yet again, that the Wiltshire invention “is not limited to any particular game” and can be used with “non-casino games.” Appx1345(12:8-13).

Thus, Wiltshire’s express lexicography, defining the “game” program of its Figure 2 to include game programs such as Doom, demonstrates that the FWD’s finding lacks substantial evidence. Because Wiltshire is clear that the “game program” executing on the server in Wiltshire’s Figure 2 includes “any type of game program that runs on an operating system” (Appx1342(5:45-47)), and because such “game” programs are defined in Wiltshire to include Doom (Appx1340(1:26-38)), performing the loop of Figure 2 where Doom is the “game program” in step 210 executing on server 110 is an expressly disclosed embodiment of Wiltshire that must be accounted for in analyzing obviousness. Appx1343(7:7-9).

The FWD was required to analyze these disclosures in Wiltshire from the perspective of a skilled artisan when determining whether Wiltshire discloses the “generating” limitation. 35 U.S.C. § 103; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007); *Braintree Labs. Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1353 (Fed. Cir. 2014). By suggesting, contrary to Wiltshire’s express disclosure, that the Doom video game is *not* an embodiment of Figure 2, the FWD violated that requirement. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987) (requiring prior art to be considered as a whole). Not only does the FWD misinterpret Figure 2 as limited to casino games—contrary to Wiltshire’s express lexicography (Appx27)—it also fails to provide a legal and factual basis for disregarding the patentee’s lexicography in Wiltshire. *Cf. Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009) (“[W]hen a patentee explicitly defines a claim term in the patent specification, the patentee’s definition controls.”).

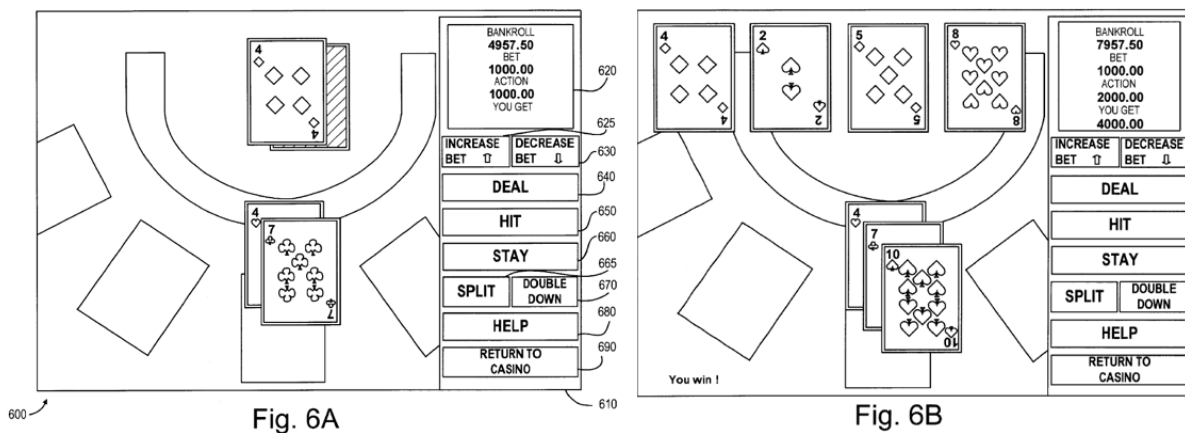
The FWD should be vacated and remanded so that the obviousness of claims 1-12 of the ’109 patent can be analyzed in view of Wiltshire’s actual disclosure—which includes the embodiment using Doom as Figure 2’s game program.

2. Wiltshire’s Disclosure of Casino Games That Generate New Images

The FWD also erred when it found that the casino games shown in Figures 4A-9D of Wiltshire “could have simply been pre-existing images and would not

necessarily need to be generated in real time.” Appx30. The FWD relies on Dr. Hart’s testimony, but Dr. Hart’s testimony only addresses a few cherry-picked images from Wiltshire for which he contended could use a pre-compressed video recording. *Id.*; Appx3120-3121(¶¶ 66-67) (Dr. Hart discussing Figures 4A, 4B, 8A, and 9A). The FWD errs by ignoring contrary evidence from Wiltshire of casino games that *do* generate new images.

As explained in the Petition, Wiltshire’s Figures 6A and 6B depict a “specific example[] of [a] casino game[]” running on the system described in Figure 2, and “illustrates the images displayed on screen 140 of client/terminal computer 120 during operation 200 of computer gaming system 100.” Appx1342-1343(5:45-50, 8:38-41); Appx4056-4059; Appx1071-1073(¶¶ 143-144); Appx1343(7:7-8) (“FIG. 2 is a flow diagram of operation 200”).



As shown above, Figure 6A on the left is an image generated by a casino blackjack card game after the cards are dealt, and Figure 6B on the right is the image generated by the same game program after the user presses the “Double Down” button.

Wiltshire makes clear that Figure 6B is an updated, new image that the server generates on the fly in response to the user pressing the Double Down button. Appx4056-4059 (Petition explaining Figures 6A-6B); Appx1071-1073(¶¶ 143-144) (Dr. Fuchs explaining how Figures 6A-6B are images displayed in response to user inputs). If it were otherwise, and Figure 6B was a “pre-existing” image as the FWD incorrectly contends (Appx27-30), that would mean the blackjack game would have to store a pre-existing image for *every possible permutation* of the cards that could be displayed during the game. The server would have to store over 674 *billion* pre-existing images to be able to cover all the possible permutations—and for just seven cards shown in Figure 6B.⁶ If there was just one additional card displayed (e.g., if the dealer had to hit one more time), that would require over 30 *trillion* pre-existing images.⁷ The number grows

⁶ Assuming a standard 52-card deck, there would be $52 * 51 * 50 * 49 * 48 * 47 * 46 = 674,274,182,400$ permutations.

⁷ $52 * 51 * 50 * 49 * 48 * 47 * 46 * 45 = 30,342,338,208,000$ permutations.

astronomically for each card in addition to the number of cards shown in 6B.⁸

Thus, no person of ordinary skill would understand Figures 6A and 6B of Wiltshire to be images pre-existing on the server, and there is no contrary evidence introduced by IPL or its expert Dr. Hart regarding Figures 6A and 6B.

As another example from the Petition, Wiltshire discloses images from a slot machine game that generates displays that include virtual reels that “spin” with “animated” and “*dynamically variable image[s]*.” Appx4068 (citing Appx1345(11:7-30)) (emphasis in original); Appx1084-1085(¶¶ 189-190) (Dr. Fuchs describing the virtual slot machine example). In particular, Figure 8B of Wiltshire depicts an image displayed during operation of a virtual slot machine:

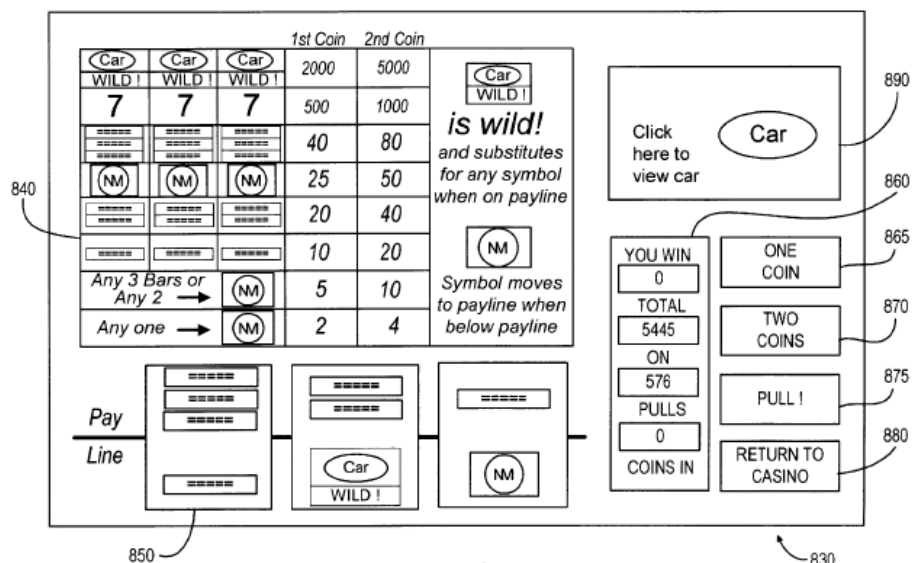


Fig. 8B

⁸ 9 cards would require 1,335,062,881,152,000 permutations, 10 cards would require 57,407,703,889,536,000 permutations, and so on.

In the above Figure 8B of Wiltshire, box 850 contains “reels” that “simulate turning of mechanically implemented slot machine from a prior era.”

Appx1345(11:3-4.) When the user presses a button, the reels shown in box 850 will “spin.” *Id.* (11:9-10). Prize window 890 in Figure 8B above displays an “animated and dynamically variable image of a prize” that is also shown within box 850 and 840. Thus, the image shown in Figure 8B is not a static, pre-existing image, but one of a series of new images generated on the fly and displayed during the operation 200. *See* Appx1083-1085(¶¶ 187-190) (Dr. Fuchs testifying that the virtual slot machine of Figure 8B shows “an animated sequence of images in response to user input control signals sent by the client.”); Appx1343(8:38-41) (Wiltshire stating that Figure 8B illustrates the “images displayed on screen 140 ... during operation 200 of computer gaming system 100”). Again, neither IPL nor Dr. Hart introduced any evidence to the contrary regarding Figure 8B.

By ignoring the embodiments of casino games in Wiltshire that demonstrate generating new images, the FWD finding that the casino games in Wiltshire are limited to pre-existing images lacks substantial evidence and should be vacated.

3. Wiltshire’s Disclosure of a Client Computer Having Pre-Loaded Images Is Not Relevant to the Server’s Image Generation

In support of its erroneous conclusion that Wiltshire is limited to selecting pre-existing images, the FWD points to an embodiment in Wiltshire in which

“images for use by computer gaming system 100 are preloaded into a memory of *client/terminal* computers 120 to further reduce the amount of communication network bandwidth required.” Appx1343(8:8-11); Appx25. But the fact that “some embodiments” of Wiltshire’s *client* computer may have images “preloaded into a memory” to avoid having to transmit those images over a “network” is clearly distinct from how the game program running on Wiltshire’s *server* “generate[s]” updated images specifically for transmission to the client as a video stream. Appx1343(7:18-22) (“The image is generated by game computer program 112 and passed to server/host interface program 114. In turn, the image is transferred over communication pathway 130 to client/terminal computer 120 via the network services provided by server operating system 116.”); Appx1324(Fig. 2) (Step 230 “send video stream to client”). Nowhere does Wiltshire describe its *server* as storing any preloaded images.

In sum, Wiltshire’s disclosure of a “client” computer preloading images in one embodiment—without any disclosure that the *server* preloads images—is not substantial evidence capable of supporting the FWD.

4. Wiltshire’s Disclosure of “Files” Does Not Justify Ignoring Wiltshire’s Disclosures of “MPEG Stream”

Finally, in support of its erroneous conclusion that Wiltshire is limited to pre-existing images, the FWD improperly relies on Wiltshire’s disclosure that the server may transmit the updated images it has generated to the client as a “file.”

Appx25. But the sentence in Wiltshire that the FWD quotes directly refutes the FWD's conclusion: "The image may include **any type** of graphical information including a bitmap, a JPEG file, a TIFF file or even an encoded audio/visual **stream** such as compressed video MPEG **stream**." Appx1343(7:14-18). As shown above, the quote makes clear that the image can include "**any** type of graphical information," including an "encoded audio/visual stream such as a compressed video MPEG stream." *Id.* The "files" are just two examples of the type of images that may be generated. The Petition repeatedly discussed Wiltshire transmitting a "stream" (Appx4027; Appx4040-4044; Appx4061-4063; Appx4067), and relied on this disclosure as teaching the claimed "generating" limitation. But the FWD neglected to consider Wiltshire's disclosure of a video MPEG stream when analyzing Dr. Hart's testimony. It also failed to consider that the claims of Wiltshire recite sixteen times that the invention involves a server with "input and output **streams**." Appx1345-1346(claims 1, 7-9, 15, 20-23, and 28). As Dr. Fuchs testified, to display the output of the various video games contemplated by Wiltshire such as the Doom video game, a person or ordinary skill would understand that the video MPEG streams in Wiltshire are dynamically generated in real time in response to user inputs. Appx2322-2324(¶¶ 49-51).

In sum, Wiltshire's disclosure of "files" as examples of the type of images that may be generated is not substantial evidence capable of supporting the FWD.

IV. THE BOARD'S FWD SHOULD BE VACATED FOR VIOLATING THE APA

Finally, the FWD should be vacated and remanded because it violates the APA in two ways.

First, the FWD violates the APA's requirement to “examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made.” *In re NuVasive, Inc.*, 842 F.3d 1376, 1382 (Fed. Cir. 2016) (quoting *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (cleaned up)); see also *In re Hyatt*, 211 F.3d 1367, 1371 (Fed. Cir. 2000) (“[T]he Board must explain the basis for its rulings sufficiently to enable meaningful judicial review.”).

The FWD did not meet this requirement. Here, the FWD did not adequately explain its rationale for finding that, where Wiltshire expressly states that “[t]he image is generated,” this does not actually mean that the image is generated. Appx1343(7:13-15); Appx25. As explained in Section II above, the only treatment the FWD gives to Wiltshire's image generation statement is an ambiguous reference to Dr. Hart's testimony regarding a *different* limitation (“compressing”), in which Dr. Hart admits that Wiltshire teaches generating images. See *supra*, Section II; Appx25; Appx3118-3119(¶¶ 62-63).

Indeed, in describing Wiltshire in the “Overview of the Asserted Prior Art” in its ID, the Board originally stated that “[t]he image is generated, then transmitted”:

Figure 2 is a flow diagram showing the operation of Wiltshire’s system. *Id.* at 7:7-8. Wiltshire explains that “an image is sent from server/host computer 110 to client/terminal computer 120,” where the “image may include ... an encoded audio/video stream such as a compressed video MPEG stream.” *Id.* at 7:11-18. ***The image is generated, then transmitted*** to the client/terminal computer 120, where “program 122 then causes the image to be displayed on a screen of client/terminal computer 120 in stage 240.” *Id.* at 7:18-27. If an input command, such as a keystroke or a mouse click, is detected at stage 250, that command is transmitted back to the server at stage 260. *Id.* at 7:27-38.

Appx4197. However, in the Board’s FWD, the Board used the identical description of Wiltshire from its ID, only omitting the phrase “[t]he image is generated”—without any explanation:

Figure 2 is a flow diagram showing the operation of Wiltshire’s system. Ex. 1004, 7:7-8. Wiltshire explains that “an image is sent from server/host computer 110 to client/terminal computer 120,” where the “image may include any type of graphical information including a bitmap, a JPEG file, a TIFF file or even an encoded audio/video stream such as a compressed video MPEG stream.” *Id.* at 7:11-18. ***The image transmitted*** to the client/terminal computer 120, where “program 122 then causes the image to be displayed on a screen of client/terminal computer 120 in stage 240.” *Id.* at 7:18-27. If an input command, such as a keystroke or a mouse click, is detected at stage 250, that command is transmitted back to the server at stage 260. *Id.* at 7:27-38.

Appx13-14.

Because the Board’s rationale for deciding Wiltshire’s unequivocal statement that “[t]he image is generated” does not mean that an image is generated cannot be “reasonably discerned,” the FWD should be vacated and remanded. *NuVasive*, 842 F.3d at 1385 (vacating and remanding the PTAB’s decision because “we cannot ‘reasonably discern’ the PTAB’s reasoning” and “judicial review cannot ‘meaningfully [be] achieved’”).

Second, the FWD violates Petitioner’s procedural rights under the APA by construing an undisputed term “generating” for the first time in the FWD. The term “generating” was never raised as a term for construction by either party at any time during the IPR proceedings. The Petition did not propose “generating” for construction, nor did Patent Owner in its POPR. In fact, IPL’s POPR conceded that Wiltshire disclosed that an image is “generated” at the server. *See, e.g.*, Appx4136 (“Wiltshire disclosed that an ***image generated*** by a gaming program, located on the server, was transmitted to the client over a network.”). The Board’s ID also did not find any reason to construe “generating,” and instead correctly recognized that Wiltshire discloses that “[t]he image is generated.” Appx4196; Appx4201-4202. IPL’s POR also did not propose “generating” as a term for construction, and again conceded that “Wiltshire disclosed that an ***image generated*** by a gaming program, located on the server, was transmitted to the client over a network.” Appx4261. Petitioner’s Reply brief thus focused on other

claim terms where IPL had raised a dispute (Appx4347-4355), and IPL's Sur-Reply similarly focused on those other disputed terms. Appx4397-4402. At the hearing, the Board did not ask any questions about the construction of "generating." Yet, in the FWD, the Board changed course from the plain meaning of "generating" and construed "generating" to require the "creation of a new image" and to *exclude* generating by selecting from pre-existing images. Appx20; Appx22.

Accordingly, this case is analogous to *Qualcomm Inc. v. Intel Corp.*, where this Court held it "is difficult to imagine either party anticipating that already-interpreted terms were actually moving targets" and stated that it is "unreasonable to expect parties to 'have briefed or argued, in the alternative, hypothetical constructions not asserted by their opponent.'" 6 F.4th 1256, 1263 (Fed. Cir. 2021), quoting *SAS Inst., Inc. v. ComplementSoft, LLC*, 725 F.3d 1341, 1351 (Fed. Cir. 2016), *rev'd on other grounds sub nom. SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018). So too here. It is difficult to imagine either party anticipating that the "generating" term which the ID found disclosed by Wiltshire, and which IPL and its expert repeatedly conceded was disclosed by Wiltshire's teaching that an "image is generated by game computer program 112," was actually a moving target. And it is equally unreasonable to expect SIE to have briefed or argued, in the alternative, hypothetical constructions of "generating" that neither IPL nor the

Board asserted at any time prior to the FWD. Because the FWD deprived Petitioner of its opportunity to respond to the new claim construction of the “generating” limitation upon which the FWD’s decision was based, the FWD violated Petitioner’s procedural rights and should be vacated. *Id.* at 1265.

CONCLUSION

For the foregoing reasons, the Board’s Final Written Decision should be vacated and remanded.

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November 14, 2022

ADDENDUM

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY INTERACTIVE ENTERTAINMENT LLC,
Petitioner,

v.

INTELLECTUAL PIXELS LIMITED,
Patent Owner.

IPR2021-00237
Patent 10,681,109 B2

Before JENNIFER MEYER CHAGNON, STACY B. MARGOLIES, and
IFTIKHAR AHMED, *Administrative Patent Judges*.

AHMED, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
Granting In Part Patent Owner's Motion to Exclude
35 U.S.C. § 318(a)

I. INTRODUCTION

Sony Interactive Entertainment LLC (“Petitioner”) requested an *inter partes* review of claims 1–18 of U.S. Patent No. 10,681,109 B2 (Ex. 1001, “the ’109 patent”). Paper 3 (“Petition” or “Pet.”). Intellectual Pixels Limited (“Patent Owner”) filed a Preliminary Response. Paper 11. In its Preliminary Response, Patent Owner informed us that it had disclaimed claims 13–18. *Id.* at 5 (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 1–12 (the “Challenged Claims”)¹ of the ’109 patent. Paper 13 (“Inst. Dec.”).

After institution, Patent Owner filed a Patent Owner Response (Paper 17, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 22, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 26, “PO Sur-reply”). An oral hearing was held on March 10, 2022, 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

¹ Because Patent Owner filed a statutory disclaimer of claims 13–18 of the ’109 patent (*see* Ex. 2001) prior to our institution decision, no *inter partes* review was instituted as to those claims. Inst. Dec. 6–7; *see also* 37 C.F.R. § 42.107(e) (“No *inter partes* review will be instituted based on disclaimed claims.”).

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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) (2020).

Having reviewed the arguments and the supporting evidence, we determine that Petitioner has not shown, by a preponderance of the evidence, that claims 1–12 of the ’109 patent are unpatentable.

II. BACKGROUND

A. *Related Proceedings*

The ’109 patent is asserted in *Intellectual Pixels Ltd. v. Sony Interactive Entertainment LLC*, No. 8:20-cv-01422-JVS-KES (C.D. Cal). Pet. 1; Paper 5, 1. That proceeding has been stayed pending resolution of this *inter partes* review. Paper 7, 2.

B. *The ’109 Patent (Ex. 1001)*

The ’109 patent, titled “Image Display System with Visual Server,” was filed on June 29, 2017, and claims priority to a provisional application filed on January 24, 2001. Ex. 1001, codes (22), (54), (60), (63). The ’109 patent issued on June 9, 2020.² *Id.* at code (45). The ’109 patent “relates to computer graphics and a graphical image display system that use a visual server to generate and transmit images to a client.” *Id.* at 1:30–33.

² In our decision to institute *inter partes* review, we determined that the ’109 patent has an effective filing of at least November 15, 2011, and was therefore eligible for *inter partes* review on December 4, 2020, the filing date of the Petition. Inst. Dec. 8–9.

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Figure 1 of the '109 patent is reproduced below.

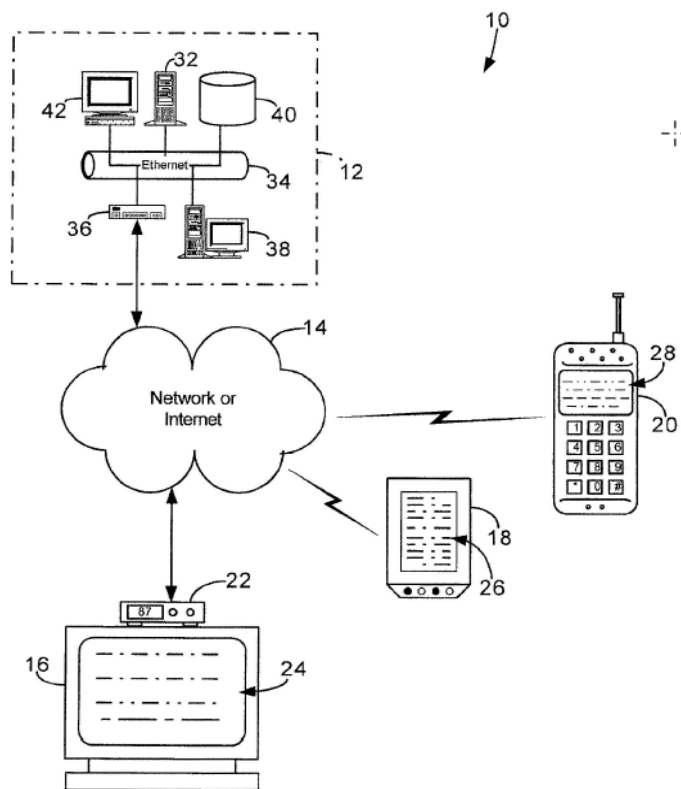


Figure 1 shows image display system 10 including visual server 12 and associated components in communication with a plurality of clients (i.e., set-top box 22, personal digital assistant (“PDA”) 18, and cellular telephone 20). Ex. 1001, 5:36–54. The '109 patent notes that “for reasons of cost, size, and power consumption, sophisticated three dimensional graphics are not available on common consumer client devices such as personal digital assistants (PDAs) mobile telephones and set-top boxes.” Ex. 1001, 3:26–30; *id.* at 5:51–52 (listing Palm Pilot and Handspring Visor as examples of PDAs).

The '109 patent describes displaying such graphics on these clients “through the use of the resources of a remote visual server.” Ex. 1001, 3:41–43. The server has image data processing capabilities, receives image-modifying data corresponding to a generated image from a client, generates

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a modified image based on that image-modifying data, and transmits the modified image as compressed data back to the client. *Id.* at 3:51–57.

Figures 2B and 2D of the '109 patent are reproduced below.

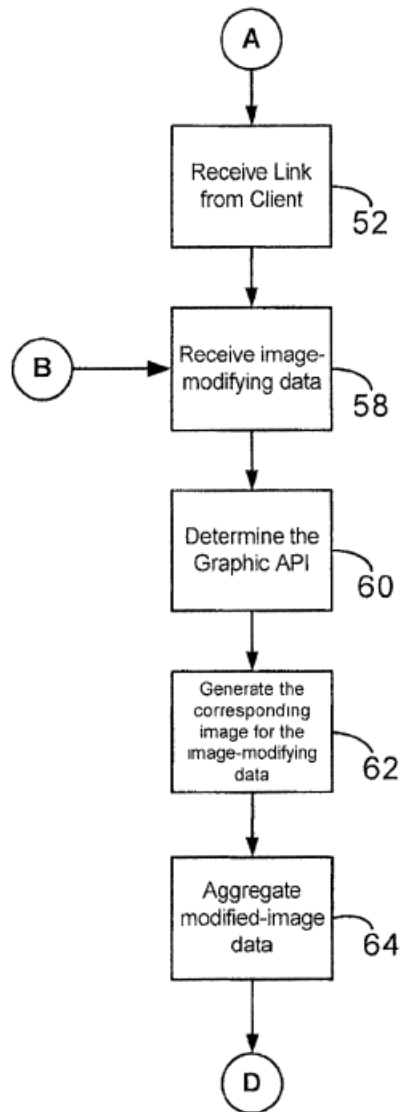


Fig. 2B

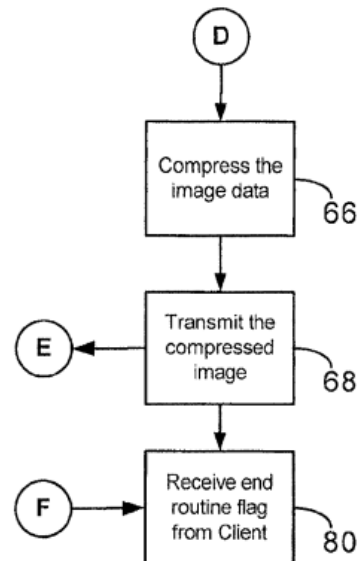


Fig. 2D

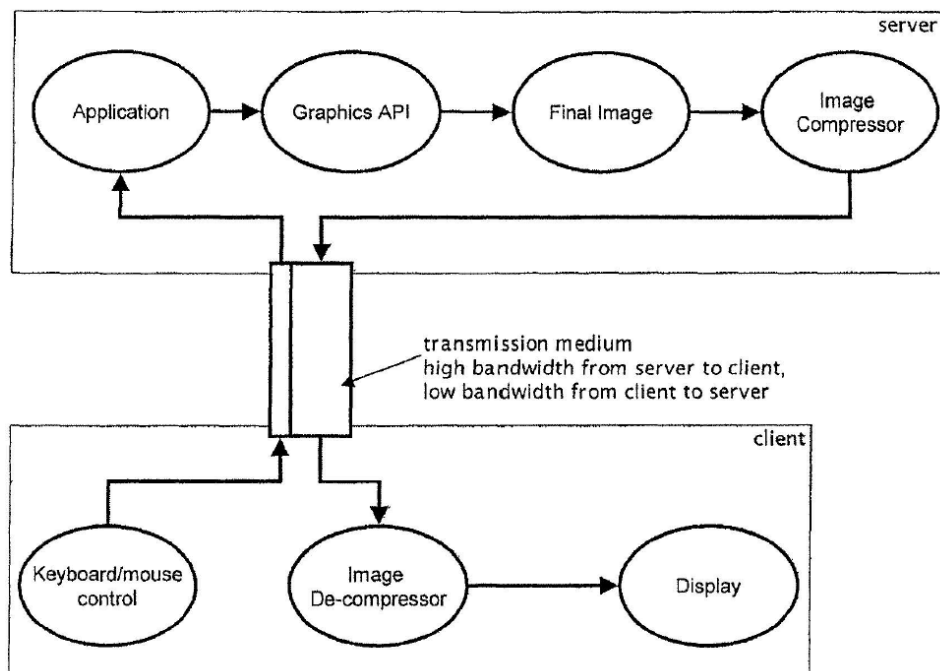
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Figures 2B and 2D show a flowchart of the process on the server in receiving image-modifying data from the client, and then generating and transmitting a modified client image to the client. Ex. 1001, 5:24–29.

“In generating the image-modifying data at the client and processing the image-modifying data at the visual server, the typical data processing segment is a frame,” and “compressed data comprising a frame” is transmitted to the client. Ex. 1001, 4:10–12, 4:48–55, 6:63–7:1. The ’109 patent teaches use of “a protocol such as MPEG4” for compressing and transmitting an image to a client. *Id.* at 9:26–28. According to the patent, “[t]he use of an industry standard image compression protocol such as MPEG allows . . . use of facilities that are already present in most clients.” *Id.* at 9:32–34. The clients include “processing ability to uncompress the compressed image data . . . and display the image defined by the decompressed data on the client image display.” *Id.* at 3:67–4:3.

Figure 3 of the ’109 patent is reproduced below.



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Figure 3 is a schematic of data and procedural flow in an embodiment of the '109 patent. Ex. 1001, 5:30–31. The '109 patent describes that image data is compressed at the server and transmitted to the client, where it is decompressed and displayed to the user. *See id.* at 8:1–22; *see also id.* at Figs. 2A–2D (a flowchart illustrating the processes executed on the server as well as the client to facilitate image generation).

C. Challenged Claims

We instituted review on independent claims 1 and 8, and dependent claims 2–7 and 9–12. Claim 1 is reproduced below.

1. A method of hosting an interactive software application comprising:
 - running at a server the interactive software application;
 - receiving at the server user input signals from a client device, wherein the user input signals are used to control updating of the state of the interactive software application;
 - generating at least one updated image at the server in response to updating the state of the interactive software application; and
 - compressing the at least one updated image and transmitting the compressed updated image to the client device, wherein the server transmits the updated image as a compressed frame that can be decompressed and displayed as an updated image at the client device.

Ex. 1001, 9:55–10:2.

D. The Instituted Grounds of Unpatentability and Declaration Evidence

As against the Challenged Claims, Petitioner asserts the following grounds of unpatentability, relying on the declaration testimony of Dr. Henry Fuchs (Exs. 1002, 1033). Pet. 3–4, 19–73.

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Claim(s) Challenged	35 U.S.C. § ³	References
1, 3–12	103(a)	Wiltshire ⁴ , Saha ⁵
2	103(a)	Wiltshire, Saha, Chen ⁶
6, 11, 12	103(a)	Wiltshire, Saha, PC Magazine ⁷

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. 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”)). This 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).

³ Because the Challenged Claims of the ’109 patent have an effective filing date before March 16, 2013 (*see supra* n.2), patentability is governed by the pre-AIA version of 35 U.S.C. § 103.

⁴ U.S. Patent No. 6,409,602 B1, filed Nov. 24, 1998, issued June 25, 2002 (Ex. 1004, “Wiltshire”).

⁵ U.S. Patent No. 6,404,817 B1, filed Nov. 20, 1997, issued June 11, 2002 (Ex. 1005, “Saha”).

⁶ Walter Y. Chen, The Development and Standardization of Asymmetrical Digital Subscriber Line, IEEE COMMUNICATIONS MAGAZINE, Vol. 37, No. 5, 68–72 (May 1999) (Ex. 1006, “Chen”).

⁷ PC MAGAZINE, Vol. 18:16, Sept. 21, 1999 (Ex. 1007, “PC Magazine”).

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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. *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). 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 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

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(2) a master’s degree in computer science, electrical engineering, or equivalent subject, together with one year of postgraduate experience in computer graphics.” Pet. 14 (citing Ex. 1002 ¶ 23). Patent Owner agrees. See PO Resp. 10 (citing Ex. 2009 ¶¶ 24–25).

We determine that the parties’ agreed level of ordinary skill is consistent with the ’109 patent and the asserted prior art. 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). We adopt that level of ordinary skill in determining the patentability of the Challenged Claims.

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). 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*

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Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

Petitioner initially asserts that it “does not believe the claim terms need to be construed to resolve the issues presented in this Petition.”

Pet. 18–19. Patent Owner proposes two claim terms for construction: “frame” and “mobile device.” PO Resp. 10–21. In its Reply, Petitioner disagrees with Patent Owner’s proposed constructions for both of those terms. Pet. Reply 1–12. We do not find it necessary, however, to resolve the parties’ claim construction dispute to decide the issues in this proceeding.

D. Overview of the Asserted Prior Art

1. Wiltshire (Ex. 1004)

Wiltshire discloses a “slim terminal gaming system” that claims to “drastically reduce[] the cost and substantially increase[] the tamper resistance of individual gaming stations” by “allow[ing] concurrent access to multiple computer gaming programs from individual gaming stations by a patron.” Ex. 1004, code (54), 2:21–28.

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Figure 1D of Wiltshire is reproduced below.

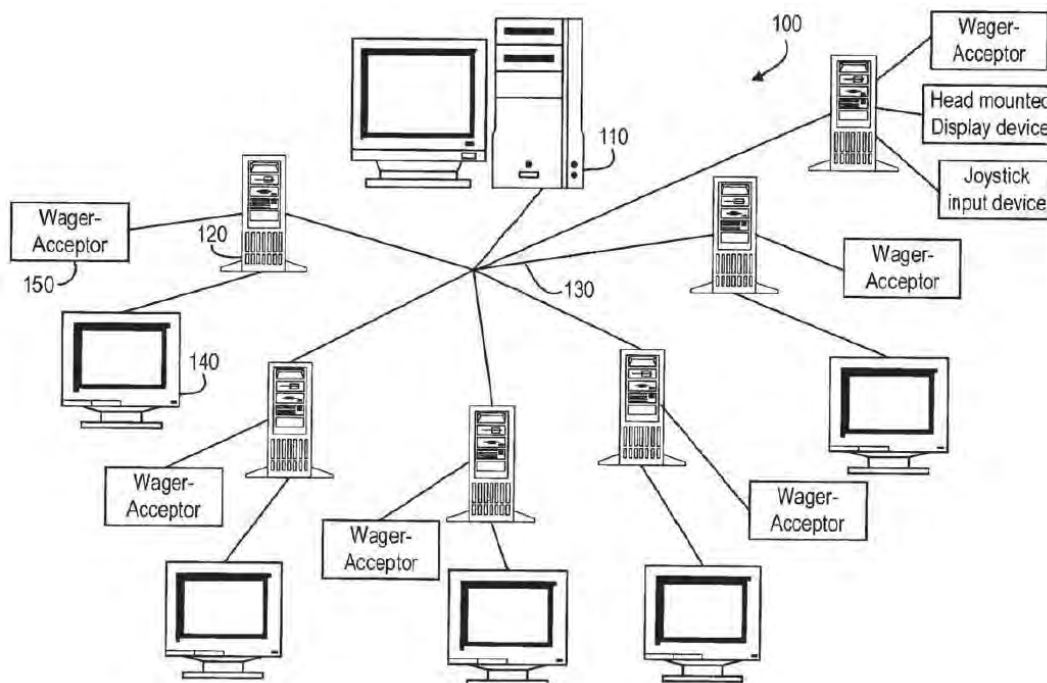


Figure 1D shows an overview of Wiltshire's system, with "server/host computer 110 connected to a plurality of remote client/terminal computers 120." Ex. 1004, 3:62–66. The client computers may have minimal storage, memory, and processing power because "the overwhelming majority of the gaming related and regulated processing is performed on the server/host computer." *Id.* at 5:17–23. The game program running on the server determines which images are to be displayed on the display connected to each client computer (e.g., display devices 140) and also processes any input commands detected by the client computer. *Id.* at 5:50–65.

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Figure 2 of Wiltshire is reproduced below.

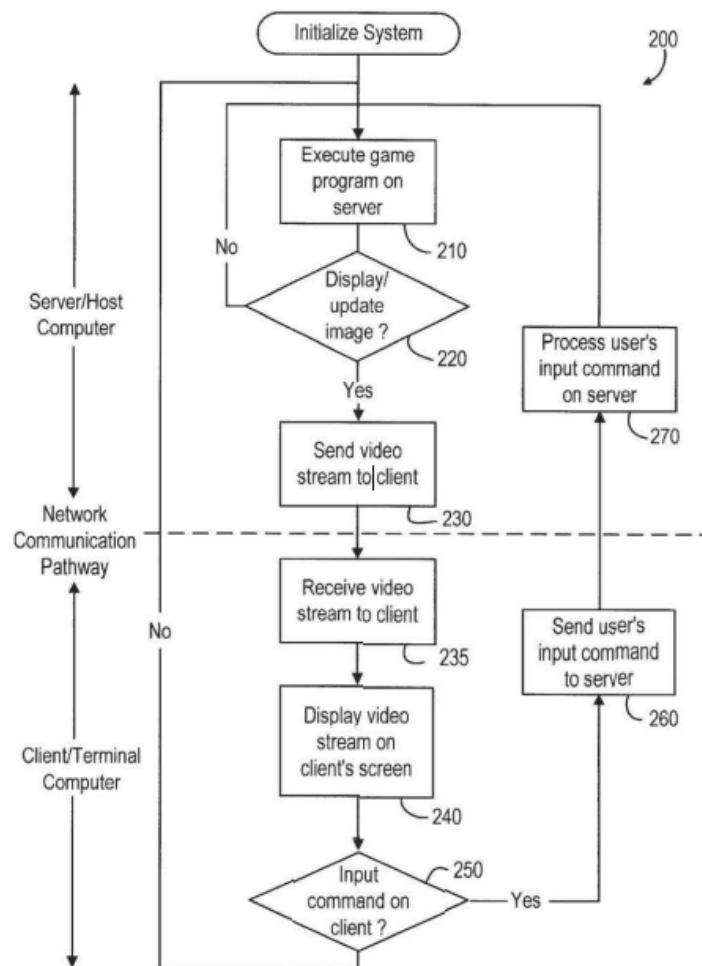


Figure 2 is a flow diagram showing the operation of Wiltshire's system.

Ex. 1004, 7:7–8. Wiltshire explains that “an image is sent from server/host computer 110 to client/terminal computer 120,” where the “image may include any type of graphical information including a bitmap, a JPEG file, a TIFF file or even an encoded audio/video stream such as a compressed video MPEG stream.” *Id.* at 7:11–18. The image transmitted to the client/terminal computer 120, where “program 122 then causes the image to be displayed on a screen of client/terminal computer 120 in stage 240.” *Id.* at 7:18–27. If an input command, such as a keystroke or a mouse click, is detected at stage

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250, that command is transmitted back to the server at stage 260. *Id.* at 7:27–38.

2. *Saha (Ex. 1005)*

Saha “relates to the field of video compression, and in particular to a video decoder which provides robust error detection and concealment.” Ex. 1005, 1:6–8, 5:66–67. Saha describes that in contrast to intraframe or still image compression techniques, “video compression algorithms for motion video use a concept referred to as interframe compression to remove temporal redundancies between frames.” *Id.* at 1:24–28, 1:44–47. Saha discloses that the “compression standard referred to as MPEG (Moving Pictures Experts Group) compression is a set of methods for compression and decompression of full motion video images[,] which uses the interframe and intraframe compression techniques.” *Id.* at 1:64–2:1. Saha explains

Interframe compression methods such as MPEG are based on the fact that, in most video sequences, the background remains relatively stable while action takes place in the foreground. The background may move, but large portions of successive frames in a video sequence are redundant. MPEG compression uses this inherent redundancy to encode or compress frames in the sequence.

An MPEG stream includes three types of pictures, referred to as the Intra (I) frame, the Predicted (P) frame, and the Bi-directional Interpolated (B) frame. The I (intra) frames contain the video data for the entire frame of video and are typically placed every 10 to 15 frames . . . and are generally only moderately compressed. Predicted frames are encoded with reference to a past frame, i.e., a prior Intraframe or Predicted frame. Thus P frames only include changes relative to prior I or P frames [and] receive a fairly high amount of compression.

Id. at 2:14–30.

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3. *Chen (Ex. 1006)*

Chen discusses the development and standardization of asymmetrical digital subscriber line (“ADSL”), one of a variety of digital subscriber line (“DSL”) systems built upon the existing twisted-pair telephone technology. Ex. 1006, Abstract, 68.⁸ Chen discusses that ADSL can provide higher speed download bandwidth to a user along with lower speed upload bandwidth from the user, making it “well suited to the concept of a video-on-demand service.” *Id.* at 69. The video, audio channel, and associated overhead can be transmitted within a 1.5 Mb/s downstream channel, sufficient to receive on-demand MPEG video. *Id.* An upstream channel of 16–64 kb/s is provided to send back control signals for interactive commands such as pause, play, and so forth. *Id.*

4. *PC Magazine (Ex. 1007)*

PC Magazine is a magazine article that provides details about Apple’s then newly-announced iBook portable computer. Ex. 1007, 9. The article describes the iBook as weighing 6.6 pounds, with a 12.1 inch display, a 300 MHz G3 processor, and a battery life of over six hours. *Id.* According to the article, iBook users can roam up to 150 feet from base stations using Apple’s AirPort wireless technology that supports data-transfer rate of 11 Mbps. *Id.*

E. Obviousness of Claims 1 and 3–12 over Wiltshire and Saha

Petitioner contends that claims 1 and 3–12 are unpatentable as obvious over the combination of Wiltshire and Saha. Pet. 13–58. For the reasons that follow, we are not persuaded that Petitioner has established by a

⁸ Page numbers cited in this Decision are the underlying page numbers of the references themselves.

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preponderance of the evidence that these claims are unpatentable under § 103(a) in view of Wiltshire and Saha.

1. Independent Claims 1 and 8

Patent Owner argues that the combination of Wiltshire and Saha fails to teach or suggest the “generating at least one updated image” limitation of independent claims 1 and 8. PO Resp. 24–32. Specifically, Patent Owner contends that claims 1 and 8 each include distinct limitations directed to “generating,” “compressing,” and “transmitting,” and also require that the three steps be performed or be configured to be performed in that order. *Id.* at 24–26 (citing Ex. 1001, 6:33–38, 8:4–6, 8:10–14, 9:62–66, 10:39–40, Figs. 2B, 2D; Ex. 2009 ¶¶ 41–42). Patent Owner argues that Wiltshire, the reference that Petitioner primarily relies upon as teaching those limitations, “never describe[s] ‘generating at least one updated image,’ ‘compressing the at least one updated image,’ and then ‘transmitting the compressed updated image.’” *Id.* at 28; *see id.* at 27–32. We focus our analysis below on the “generating” limitation.

a) Petitioner’s Contentions

Petitioner contends that Wiltshire teaches the “generating” limitation because Wiltshire discloses that at stage 270 of Wiltshire’s method, the game program processes the input command and updates the state of the game accordingly. Pet. 24–25 (citing Ex. 1004, 7:41–45, Fig. 2; Ex. 1002 ¶¶ 73–74). Petitioner further contends that at stage 220 of Wiltshire’s method, the determination of whether an image is to be displayed includes deciding whether to update the image on the client in response to updates to the game state. *Id.* at 26 (citing Ex. 1004, 8:61–63). According to Petitioner, a person of ordinary skill in the art would have understood that the game program at the server would determine whether to generate an

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updated image in response to the updated game state. *Id.* (citing Ex. 1002 ¶ 76). Petitioner contends that it is the server that generates the updated image in Wiltshire. *Id.* (citing Ex. 1004, 2:35–39, 2:45–46, 5:44–46, 7:8–9, 7:18–20; Ex. 1002 ¶¶ 77–78).

b) Patent Owner’s Arguments

Patent Owner argues that Wiltshire does not disclose generating an updated image in response to user input, as required by the claims. *See* PO Resp. 24–32. Patent Owner argues that although Wiltshire discloses sending an image from the server to a client and that the image may include “a compressed video MPEG stream,” Wiltshire is entirely silent as to the content or origin of that compressed video MPEG stream, and therefore does not disclose generating an updated image, compressing that updated image, and then transmitting the compressed updated image. *Id.* at 27–28 (citing Ex. 1004, 7:13–18). According to Patent Owner, Wiltshire’s failure to teach the generating step is confirmed by Wiltshire’s disclosure that “in some embodiments, images for use by computer gaming system 100 are preloaded into a memory of client/terminal computers 120 to further reduce the amount of communication network bandwidth required.” *Id.* (quoting Ex. 1004, 8:8–11). Patent Owner argues images that are preloaded onto the client are preexisting images and are not “generated” in response to “updating the state of the interactive software application” as required by claims 1 and 8. *Id.* at 28–29 (citing Ex. 2009 ¶¶ 61–63).

Patent Owner also faults Petitioner’s characterization of step 220 shown in Figure 2 of Wiltshire, arguing that Petitioner simply assumes the single word “update” in Figure 2 means that Wiltshire would generate an “updated image” in response to updated software state when it could simply mean update the display by choosing a different preexisting image to

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display, possibly an image that is already resident on the client.

PO Resp. 29–30 (citing Ex. 1004, 7:9–12, 8:8–11, Fig. 2); *see also*

Tr. 42:3–14, 42:25–43:17. Patent Owner further asserts that aside from the use of “update” in Figure 2, Wiltshire does not disclose compressing any updated image, but instead describes “moving straight from determining whether an image was to be displayed at the client (step 220) to sending the image (step 230).” PO Resp. 30 (citing Ex. 1004, 7:9–15).

c) Petitioner’s Reply

In its Reply, Petitioner responds that “Wiltshire disclos[es] the ‘update image’ step 220 in Figure 2 and ‘modifying’ an image based on the game state on the server.” Pet. Reply 12 (citing Pet. 24–27; Ex. 1004, 8:61–63, Fig. 2). Petitioner contends that “Wiltshire discloses that the decision to ‘update’ or ‘modify’ an image at the server is in response to the updated game state running on the server, meaning that the server will update or modify the image in response to the updated game state when the answer to step 220 is yes.” *Id.* (citing Pet. 26; Ex. 1033 ¶ 41). According to Petitioner, Wiltshire describing “preloading images onto the client” is only for “some embodiments,” whereas “[t]he main embodiment described in Figure 2 relies on transmitting an updated image ‘from the server/host computer 110 to client/terminal computer 120,’ or as shown in the flow chart of Figure 2, ‘Send[ing] video stream to client’ 230 following the step 220 of ‘update image.’” *Id.* at 12–13 (citing Ex. 1004, 7:13–15, Fig. 2); *see also* Tr. 85:21–86:25. Petitioner asserts that “[p]re-loaded images would also make no sense for interactive video games like ‘Doom,’ which generate updated images in response to user inputs in real time.” Pet. Reply 13 (citing Ex. 1025, 52:16–23, 53:19–54:9; Ex. 1004, 1:26–43; Ex. 1033 ¶¶ 42–43).

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d) Analysis

We agree with Patent Owner that Petitioner has failed to show by a preponderance of the evidence that the combination of Wiltshire and Saha teaches “generating at least one updated image at the server in response to updating the state of the interactive software application,” as recited in claim 1. We also agree with Patent Owner that Petitioner has failed to show by a preponderance of the evidence that the combination of Wiltshire and Saha teaches a server configured for “generating at least one updated image at the server in response to updating the state of the interactive software application,” as recited in claim 8. Petitioner relies on Wiltshire’s Figure 2 and Wiltshire’s description of that figure as teaching the “generating” limitation. *See* Pet. 24–27; Pet. Reply 12–18. Specifically, Petitioner argues that the “determination of whether an image is to be displayed at stage 220 includes deciding whether to ‘update’ the image,” and “stage 220 will ‘display/update [the] image’ in response to updates to the game state.” Pet. 26 (citing Ex. 1004, 8:61–63, Fig. 2) (alteration in original). According to Petitioner, a person of ordinary skill in the art would have understood that “the game program at the server will determine whether to *generate an updated image* in response to the updated game state.” *Id.* (citing Ex. 1002 ¶ 76) (emphasis added).

For the reasons discussed below, we find that Wiltshire fails to include express disclosure of generating an updated image at the server, as claimed. The parties disagree as to how a person of ordinary skill in the art would have understood Wiltshire’s gaming system to operate, based on the limited disclosure in Wiltshire on this point. We are not persuaded, by a preponderance of the evidence, that an ordinarily skilled artisan would have understood Wiltshire’s system to necessarily operate as Petitioner proposes,

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but rather find Patent Owner’s proposal just as likely to have been understood by such an artisan.

As an initial matter, Patent Owner argues that the claimed steps reflect the invention described in the specification in which the server *generates* a modified image based upon the image-modifying data received from the client. PO Resp. 24–25 (citing Ex. 1001, 8:4–6, Figs. 2B, 2D; Ex. 2009 ¶¶ 40–43). Patent Owner distinguishes the claimed “generating” step from mere selection of pre-existing images, which Patent Owner contends Wiltshire discloses. *Id.* at 27–31. We agree with Patent Owner that generating an updated image, as claimed, requires creation of a new image in response to updating the state of the interactive software application.

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Figures 2A and 2B from the '109 patent are reproduced below.

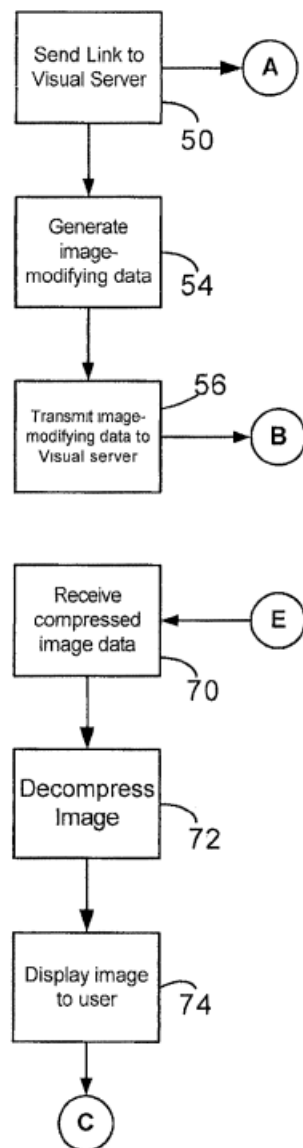


Fig. 2A

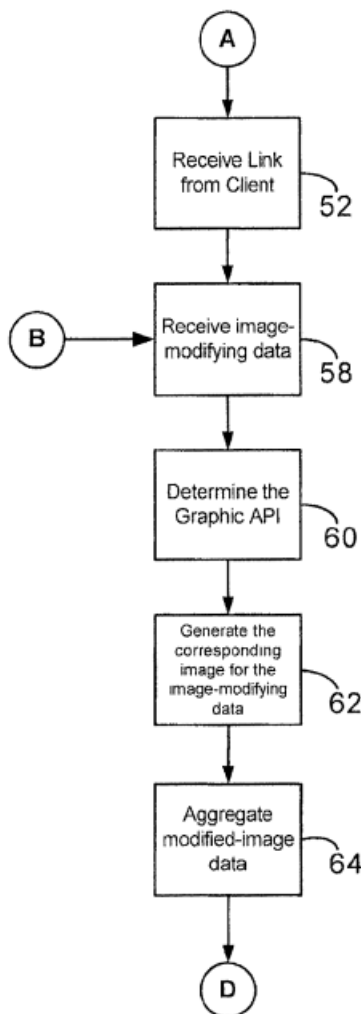


Fig. 2B

Figure 2A shows a flowchart of the process on the client in communication with the server to facilitate image generation. Ex. 1001, 5:21–23. Figure 2B shows a flowchart of the process on the server in receiving image-modifying data from the client, and then generating and transmitting a modified client image to the client. *Id.* at 5:24–27. As evident from Figures 2A and 2B, the

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generating step involves generating the “corresponding image for the image-modifying data” received from the client, i.e., creating a new image based on data received from the client. *See also id.* at 8:4–6 (“The virtual server 12 otherwise determines the graphic API, as shown at step 60, based upon the image-modifying data receiving, and then generates the corresponding modified image based upon the image-modifying data received from the client 16, 18, 20, as shown at step 62.”). The claimed steps track this disclosure, requiring receiving user input signals from the client, using those signals to update the state of the interactive software application, and generating an updated image in response to updating the state of the interactive software application. *See, e.g., id.* at 9:58–64; *see also* Ex. 2009 ¶ 40 (“The second ‘generating’ step generates an updated image in response to these user input signals (specifically to reflect the new state of the interactive software application updated according to the user input signals).”). We therefore agree with Patent Owner that modifying what is displayed on the client device merely by selecting a pre-existing image does not meet the “generating” limitation. In view of this determination, we are not persuaded, by a preponderance of the evidence, that Wiltshire discloses the “generating” limitation.

To start with, step 220 of Wiltshire’s Figure 2 does not disclose *generating* an updated image in response to the updated game state. Instead, it merely states “display/update image?” Ex. 1004, Fig. 2. The description accompanying Figure 2 of Wiltshire does not explain what “display/update image?” means. *See* Ex. 1001, 7:6–44. Rather, the cited disclosure in Figure 2 is located only within a decision symbol—a symbol used to indicate a *question* in the flow diagram, not the steps that occur after the decision. In describing step 220, Wiltshire discloses that “[s]tage 220 then

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determines *whether an image is to be displayed* on the screen of client/terminal computer 120, in which case operation 200 proceeds to stage 230.” *Id.* at 7:9–12 (emphasis added); PO Resp. 29. That is, even though the flowchart at step 220 shows “display/update image?” it does not disclose actually updating the image; it merely discloses asking the question, and discloses “determining whether an image is to be displayed.” According to Wiltshire:

In stage 230, an image is sent from server/host computer 110 to client/terminal computer 120. The image may include any type of graphical information including a bitmap, a JPEG file, a TIFF file or even an encoded audio/video stream such as a compressed video MPEG stream.

Ex. 1004, 7:12–16. Step 230, in response to the “display/update image?” decisional step, discloses *sending* the image to the client computer. It does not disclose how that image is obtained at the server.

We agree with Petitioner that Wiltshire separately discloses that “Game program 112 . . . responds to input command 112 by updating the state of the game and *possibly modifying the image displayed* on screen 140,” and that disclosure teaches that the displayed image is possibly modified, but, beyond that, Wiltshire does not disclose *how* the displayed image is modified. Ex. 1004, 8:61–63 (emphasis added). When read in context of Wiltshire’s preceding discussion of Figure 2 and Wiltshire’s disclosure of preloaded images, Petitioner has not persuasively shown that modifying the image displayed involves generating an updated image. Rather, we are persuaded that modifying the display refers to selecting an already available image to display on the client. *See, e.g.*, Ex. 1004, 7:9–14 (“Stage 220 then determines *whether an image is to be displayed* on the screen of client/terminal computer” (emphasis added)). Moreover,

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Wiltshire’s disclosure of possibly modifying the image displayed on the screen relates to user interactions where a user selects one of the games displayed in the casino floor image shown in Figure 4B, where the screen is modified to display the image shown in Figure 5A. *See id.* at 8:42–67. As discussed in further detail below, Petitioner has not persuasively shown that each of these “updated” or “modified” casino floor and game displays are generated as opposed to selected from pre-existing images.

In support of Petitioner’s contentions, Dr. Fuchs testifies that

Wiltshire discloses that the decision to “update” or “modify” an image at the server is in response to the updated game state running on the server, meaning that *the server will, at times, update or modify the image in response to the updated game state.* . . . For example, if the decision at step 220 of Figure 2 is to “update [the] image,” Wiltshire’s server will do so, as Wiltshire explicitly describes, including at column 8, lines 61–63.

Ex. 1033 ¶ 41 (citing Ex. 1002 ¶¶ 71–79) (emphasis added). We do not find Dr. Fuchs’s testimony persuasive because Wiltshire’s disclosure does not support that “updating” or “modifying” the image displayed on the client necessarily requires *generating* an updated image in response to the updated game state instead of simply selecting a pre-existing image to display, as argued by Patent Owner. *See* PO Resp. 24–25 (arguing that the claimed steps reflect the invention described in the specification in which the server generates a modified image) (citing Ex. 1001, 8:4–6, Figs. 2B, 2D; Ex. 2009 ¶¶ 40–43); Ex. 2009 ¶ 40 (“The second ‘generating’ step generates an updated image in response to these user input signals (specifically to reflect the new state of the interactive software application updated according to the user input signals).”). As discussed above, the cited portion of Wiltshire merely discloses “*possibly modifying the image displayed on screen,*”

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without explaining how the displayed image may be modified. As Patent Owner points out, Petitioner does not argue that Wiltshire renders the “generating” limitation obvious or that a person of ordinary skill in the art would have found it obvious to modify Wiltshire’s system to implement the generating step. *See* Pet. 24–27 (“Wiltshire discloses this limitation.”); Ex. 1002 ¶¶ 71–79; Ex. 1033 ¶ 41; *see also* PO Resp. 31–32 (arguing that Petitioner does not argue that Wiltshire renders the “generating” limitation obvious). Wiltshire’s silence on how images displayed at the client are updated or modified renders Petitioner’s contentions deficient.

Instead, we find persuasive Dr. Hart’s testimony that a person of ordinary skill in the art would have understood Wiltshire’s disclosure “that the ‘image [] generated by the game computer program’ could include the contents of a pre-existing compressed image file,” rather than requiring the image be updated. Ex. 2009 ¶ 62 (emphasis added); *id.* ¶ 63 (testifying that a person of ordinary skill in the art would have understood at least two ways to include contents of a pre-existing image file in view of Wiltshire’s disclosure). Dr. Hart bases his testimony on the fact that Wiltshire’s disclosure regarding its step 230 states that that image “may include any type of graphical information” and that graphical information could include “a JPEG file” or “a TIFF file.” *Id.* ¶ 62 (citing Ex. 1004, 7:18–19). The fact that Wiltshire specifically refers to the use of a *file* supports Dr. Hart’s testimony that the updated image that Wiltshire refers to could simply be a pre-existing image file. *See id.* ¶ 63; *see also* PO Resp. 28 (providing a potential scenario that need not “involve the creation of a new image or compression because the video clip may come from a file held on the server just for that purpose”).

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Wiltshire further discloses that “in some embodiments, images for use by computer gaming system 100 are preloaded into a memory of client/terminal computers 120 to further reduce the amount of communication network bandwidth required.” Ex. 1004, 8:8–11. Petitioner does not argue these preloaded images are generated in response to “updating the state of the interactive software application” as required by the claims. See PO Resp. 29; *see generally* Pet. Reply. Petitioner instead argues that preloading images is only for “some embodiments” of Wiltshire’s system, and not the “main embodiment.” Pet. Reply 12–13. That argument misses the point. Wiltshire’s discussion here is directed to reducing the amount of network bandwidth required rather than how the images themselves are obtained. Wiltshire’s reference to “some embodiments” therefore distinguishes the location where those pre-existing images are stored, not the very use of preexisting images. See Ex. 1004, 8:8–11; *see also* 7:65–8:2 (explaining how caching the transmitted images can also reduce the amount of bandwidth required); Tr. 46:17–47:5.

Petitioner contends “[p]re-loaded images would also make no sense for interactive video games like ‘Doom,’ which generate updated images in response to user inputs in real time.” Pet. Reply 13 (citing Ex. 1004, 1:26–43). Dr. Fuchs testifies, with an example of gameplay from Doom, that the Doom player’s perspective changes dynamically based on what the user is doing in real time, and that “[e]ach image is updated to reflect the current state of the player within the game world.” Ex. 1033 ¶¶ 42–43 (citing <https://www.youtube.com/watch?v=8mEP4cflrd4>). Dr. Fuchs explains that “[p]re-loading an image [in Wiltshire] would not work in this type of game because the client would not know what action the player would take at every instant in time.” *Id.* ¶ 43. But Wiltshire does not teach

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using the operation disclosed in Figure 2 with Doom, and we find nothing in Wiltshire to suggest that a person of ordinary skill in the art would have understood that Wiltshire's system could possibly have supported that game in the manner proposed by Petitioner. In fact, the *only* mention of Doom in Wiltshire appears in a lengthy list of games that Wiltshire states as included in the definition of the term "game" or "gaming"—provided in the "Related Art" section of Wiltshire. *See* Ex. 1004, 1:26–44. Given Wiltshire's use solely of casino gaming stations for its description of the invention (as discussed below), we are not persuaded that a person of ordinary skill in the art would have understood that every video game mentioned on the list in the background section could also be implemented using the operation disclosed in Wiltshire's Figure 2. *See, e.g., id.* at 1:15–25 (describing computer gaming systems in the related art), 2:20–3:3 (summary of Wiltshire's invention); PO Sur-reply 12–13; Ex. 1025, 45:10–19, 48:11–49:2.

On the other hand, Wiltshire's disclosure only provides details as to how its system is used to implement casino games such as Bertha, Blackjack, Video Poker, Slots, and Keno. *See* Ex. 1004, 8:37–11:53; *id.* at 8:42–9:2 (discussing the virtual casino floor that allows a user to select one of many casino games supported by the gaming system). Figures 4A–9D illustrate the images displayed on the client computer's screen during operation of Wiltshire's gaming system. *Id.* at 8:38–41. For example, Wiltshire's Figure 4A, reproduced below, shows an "attract mode" image displayed on the client screen. *Id.* at 8:42–44.

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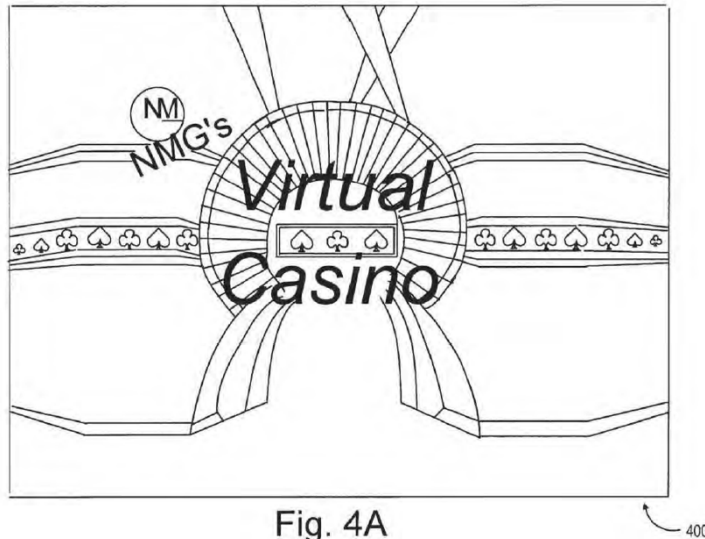


Fig. 4A

Figure 4A is an image displayed on the screen of a client computer in attract mode. Ex. 1004, 3:20–21.

Dr. Hart testifies that a person of ordinary skill in the art would have understood that these graphic elements “need not be generated in real-time and an efficient implementation would have used a premade video file for these elements.” Ex. 2009 ¶ 66; Tr. 45:7–46:14. Once a user activates Wiltshire’s gaming system by touching the screen, the casino floor image shown in Figure 4B, reproduced below, is displayed on screen. Ex. 1004, 8:45–51.

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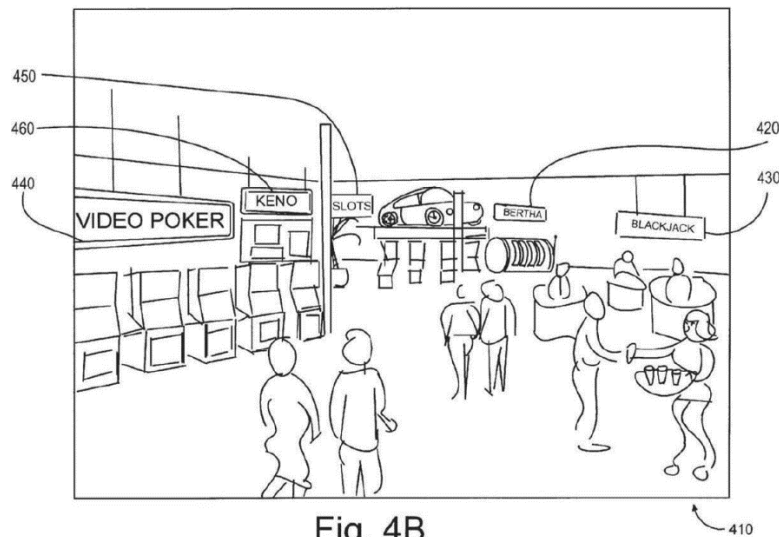


Fig. 4B

Figure 4B is an image displayed on the screen of a client computer showing a virtual casino floor.

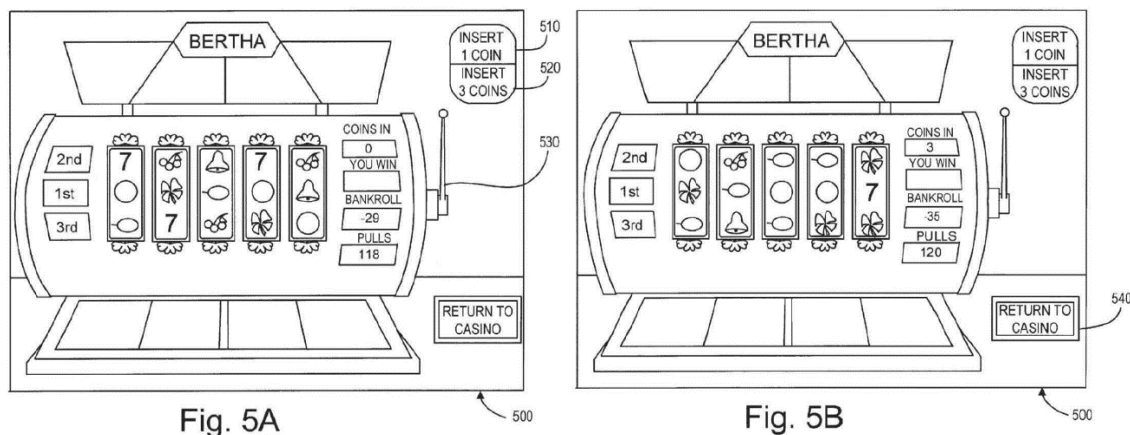
Ex. 1004, 3:22–24.

Dr. Hart testifies that a person of ordinary skill in the art would have similarly understood that the appropriate manner in which to display such a casino floor image would have been through a pre-encoded MPEG file that would be utilized for the display. Ex. 2009 ¶ 67. Wiltshire discloses that each of the available games is represented by a virtual button and once the user selects any of those games by clicking on a section of the screen, that command is passed along to game program 112, which updates the state of the game possibly modifying the image displayed on the client's screen. Ex. 1004, 8:51–63. For example, if the user selects Bertha on display shown in Figure 4B, the image shown in Figure 5A is displayed to the user, and when the user pulls the lever shown in Figure 5A to activate the slot machine, the image shown in Figure 5B is displayed to the user. *Id.* at 8:66–9:8.

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Figures 5A and 5B of Wiltshire are reproduced below.



Figures 5A and 5B are a images displayed on the screen of a client computer showing a front view of a slot machine. Ex. 1004, 3:26–30.

In view of Wiltshire’s disclosure, Dr. Hart’s testimony that each of these “updated” or “modified” displays could have been accomplished through the use of pre-encoded files is persuasive. *See* Ex. 2009 ¶ 62; Tr. 47:17–48:25. Wiltshire’s example screens in Figures 4A–9D suggest that these could have simply been pre-existing images and would not necessarily need to be generated in real time. We therefore agree with Patent Owner that “Wiltshire’s disclosure [is] completely silent as to the content or origin of that ‘compressed video MPEG stream’” and that Petitioner imparts to Wiltshire something Wiltshire never discloses. PO Resp. 27–28 (citing Ex. 2009 ¶¶ 60–68).

Fundamentally, Petitioner’s contentions as to the “generating” claim limitation are based not on a specific disclosure in Wiltshire but rather on how a person of ordinary skill in the art would have understood Wiltshire’s gaming system to operate from Wiltshire’s limited disclosure. As explained above, the examples provided by Petitioner do not persuade us by a preponderance of the evidence that one of ordinary skill in the art would

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have understood Wiltshire's system as operating differently than as proposed by Patent Owner. As a result, we do not find it more probable than not that one of ordinary skill in the art would have understood Wiltshire's system to operate as Petitioner proposes. And even though one of ordinary skill in the art would have recognized that client display in Wiltshire's system is updated in response to user input signals, we find that Petitioner has not established by a preponderance of the evidence that an updated image is *generated* as part of that process.

Moreover, in arguing that Patent Owner fails to show how each of the interactive games listed in Wiltshire's background section would be implemented in Wiltshire's system, Petitioner improperly attempts to shift the burden to Patent Owner. *See, e.g.*, Pet. Reply 13. "In an *inter partes* review, the burden of persuasion is on the petitioner to prove 'unpatentability by a preponderance of the evidence,' 35 U.S.C. § 316(e), and that burden never shifts to the patentees." *Dynamic Drinkware*, 800 F.3d at 1378. Even in the context of the burden of production, "no burden shifts from the patent challenger to the patentee . . . where the only issues to be considered are what the prior art discloses, whether there would have been a motivation to combine the prior art, and whether that combination would render the patented claims obvious." *Magnum Oil Tools*, 829 F.3d at 1376. Patent Owner's argument is that Wiltshire's disclosure is silent as to the content or origin of that MPEG stream, and therefore, Wiltshire fails to teach the "generating" limitation. *See* PO Resp. 28. It is Petitioner's burden to demonstrate, by a preponderance of the evidence, that a person of ordinary skill in the art would have necessarily understood Wiltshire's disclosure in the manner that Petitioner proposes. *See, e.g., Magnum Oil Tools*, 829 F.3d at 1377–79 (holding that the Board

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erred where it required Patent Owner to rebut Petitioner’s assertions that a skilled artisan would have been motivated to combine the prior art references, where Petitioner’s evidence failed to support its assertion in the first place).

We find that Petitioner has failed to meet that burden as to the “generating” limitation of claims 1 and 8 of the ’109 patent.

2. *Conclusion as to Obviousness of Claims 1, 3–12*

“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). Because we conclude, based on the evidence and arguments 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 Wiltshire and Saha as teaching “generating at least one updated image at the server in response to updating the state of the interactive software application,” as claimed, Petitioner has not shown that the subject matter of claims 1 and 8 of the ’109 patent would have been obvious over Wiltshire and Saha at the time of the invention. For the same reasons, we conclude that Petitioner has not shown that the subject matter of dependent claims 3–7 and 9–12 of the ’109 patent would have been obvious over Wiltshire and Saha at the time of the invention. *Mylan Pharm. Inc. v. Research Corp. Techs., Inc.*, 914 F.3d 1366, 1376 (Fed. Cir. 2019) (“Dependent claims, with added limitations, are generally not obvious when their parent claims are not.”); Pet. 34–41, 45–51.

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F. Obviousness over Wiltshire, Saha, and Chen; Obviousness over Wiltshire, Saha, and PC Magazine

Petitioner contends that the subject matter of claim 2 would have been obvious in view of Wiltshire, Saha, and Chen. Pet. 3, 58–65. Petitioner further contends that the subject matter of claims 6, 11, and 12 would have been obvious in view of the combination of PC Magazine with Wiltshire and Saha. *Id.* at 3–4, 66–73. In each of these grounds, however, Petitioner relies upon the same analysis discussed above in connection with the Wiltshire and Saha ground for the “generating” limitation of independent claims 1 and 8. *See* Pet. 58–73. Accordingly, for the same reasons discussed above regarding the “generating” limitation of claims 1 and 8 in the context of the Wiltshire-Saha ground, Petitioner has not shown by a preponderance of the evidence that the combined teachings of Wiltshire, Saha, and Chen would have rendered the subject matter of claim 2 obvious or that the combined teachings of Wiltshire, Saha, and PC Magazine would have rendered the subject matter of claims 6, 11, and 12 obvious to one of ordinary skill in the art at the time of the invention.

IV. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner filed a motion to exclude Exhibits 1024, 1029, and 1030, and a portion of Dr. Fuchs’s declaration (Exhibit 1033 ¶ 79). Paper 31, 1–6; Paper 33, 1–5.

Exhibit 1024 is an exhibit to the deposition of Dr. Hart, and Petitioner does not refer to that exhibit in its briefing. Paper 32, 10. Petitioner has no objection to excluding Exhibit 1024 from the record. *Id.* Accordingly, Patent Owner’s motion to exclude as to Exhibit 1024 is *granted*.

Petitioner relies on Exhibits 1029 and 1030 as well as paragraph 79 of Dr. Fuchs’s declaration in Petitioner’s Reply for demonstrating that a person

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of ordinary skill in the art would have been motivated to combine Chen with Wiltshire and Saha. See Pet. Reply 25–27. Under the particular circumstances in this case, we need not assess the merits of Patent Owner’s Motion to Exclude as to these exhibits. As discussed above, because we determine that Petitioner has not demonstrated by a preponderance of the evidence that the combination of Wiltshire and Saha teaches the “generating” limitation of independent claims 1 and 8 of the ’109 patent, we do not address Petitioner’s contentions based on the combination of Wiltshire, Saha, and Chen as to dependent claim 2 of the ’109 patent. Accordingly, Patent Owner’s motion to exclude as to Exhibits 1029 and 1030 as well as paragraph 79 of Exhibit 1033 is *dismissed* as moot.

V. CONCLUSION

For the reasons discussed above, Petitioner has not demonstrated, by a preponderance of the evidence, that claims 1–12 of the ’109 patent are unpatentable. 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, 3–12	103(a)	Wiltshire, Saha		1, 3–12
2	103(a)	Wiltshire, Saha, Chen		2
6, 11, 12	103(a)	Wiltshire, Saha, PC Magazine		6, 11, 12
Overall Outcome				1–12

VI. ORDER

It is, therefore,

ORDERED that claims 1–12 of U.S. Patent No. 10,681,109 B2 are not determined to be unpatentable;

FURTHER ORDERED that Patent Owner’s motion to exclude (Paper 31) is *granted in part* and *dismissed in part*; 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.

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(12) **United States Patent**
Kent et al.

(10) **Patent No.:** **US 10,681,109 B2**

(45) **Date of Patent:** ***Jun. 9, 2020**

(54) **IMAGE DISPLAY SYSTEM WITH VISUAL SERVER**

(71) Applicant: **Intellectual Pixels Limited**, Surrey (GB)

(72) Inventors: **Osman Kent**, Surrey (GB); **David R. Baldwin**, Surrey (GB); **Nicholas J. N. Murphy**, Surrey (GB)

(73) Assignee: **INTELLECTUAL PIXELS LIMITED**, Chertsey, Surrey (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/638,020**

(22) Filed: **Jun. 29, 2017**

(65) **Prior Publication Data**

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Related U.S. Application Data

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(51) **Int. Cl.**
G06F 15/16 (2006.01)
H04L 29/08 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC **H04L 67/00** (2013.01); **A63F 13/12** (2013.01); **A63F 13/25** (2014.09); **G06T 9/00** (2013.01);

(Continued)

(58) **Field of Classification Search**

CPC **H04L 65/607**; **H04N 21/23412**
See application file for complete search history.

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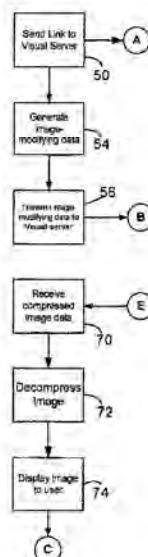
Primary Examiner — Yves Dalencourt

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(57) **ABSTRACT**

An image display system with one or more client computers in selective communication with a visual server having image processing capabilities. The client computer generates image-modifying data corresponding to a generated image, and transmits the data to the visual server. The visual server receives the image-modifying data, generates a modified image based upon the image-modifying data, and transmits the modified image as compressed data to the client. The client decompresses the modified image data and displays the modified image. In the system, the visual server and client can provide a sequential display of modified frames on client to support animation with complex 3-dimensional graphics.

18 Claims, 4 Drawing Sheets



Appx37

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Related U.S. Application Data

- continuation of application No. 13/296,776, filed on Nov. 15, 2011, now Pat. No. 8,667,093, which is a continuation of application No. 12/538,347, filed on Aug. 10, 2009, now Pat. No. 8,131,826, which is a continuation of application No. 10/037,688, filed on Jan. 4, 2002, now Pat. No. 7,587,520.
- (60) Provisional application No. 60/263,854, filed on Jan. 24, 2001.
- (51) **Int. Cl.**
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A63F 13/25 (2014.01)
G06T 9/00 (2006.01)
G06T 15/00 (2011.01)
A63F 13/30 (2014.01)
- (52) **U.S. Cl.**
 CPC **G06T 15/005** (2013.01); **H04L 65/607** (2013.01); **G06T 2200/16** (2013.01)

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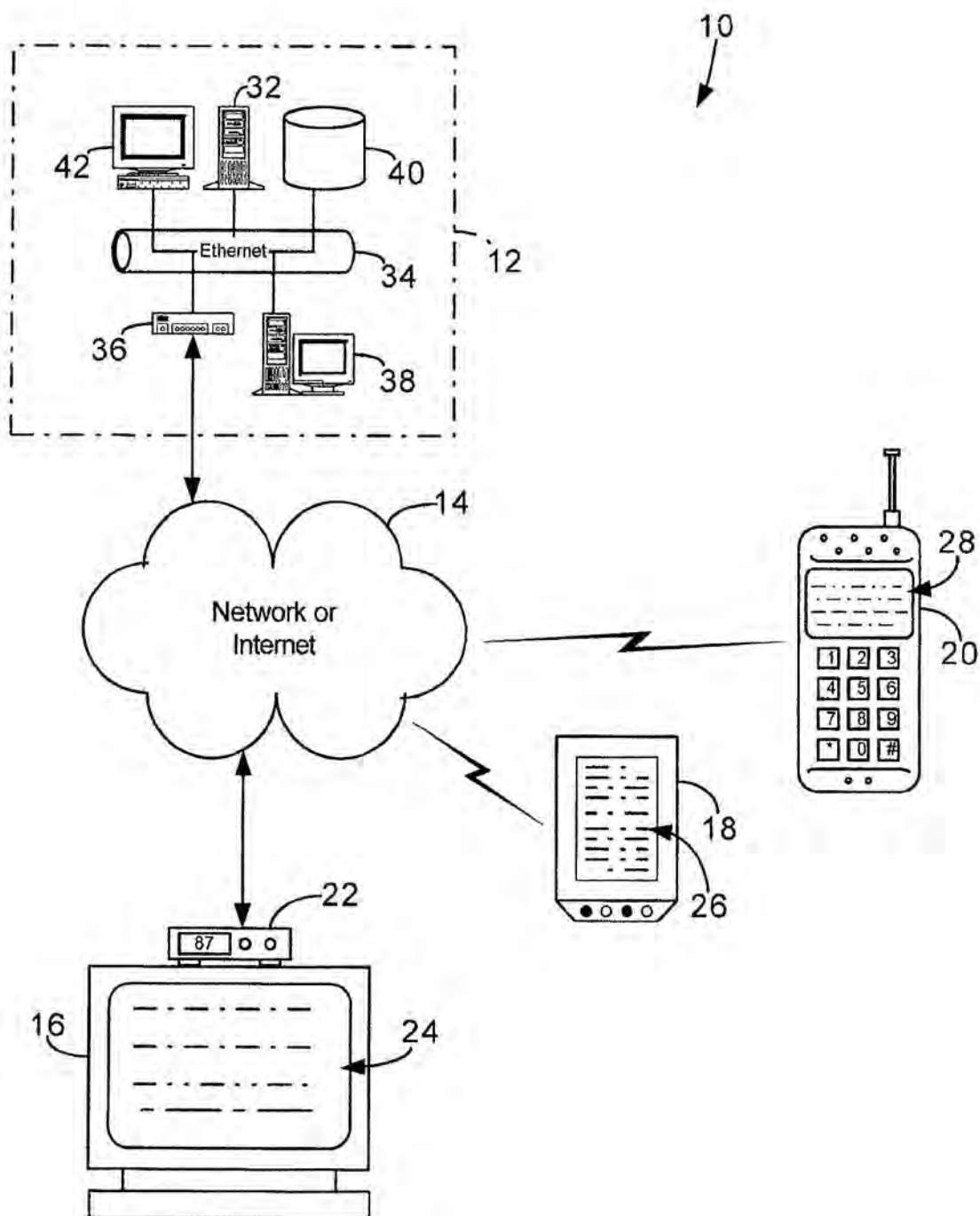


Fig. 1

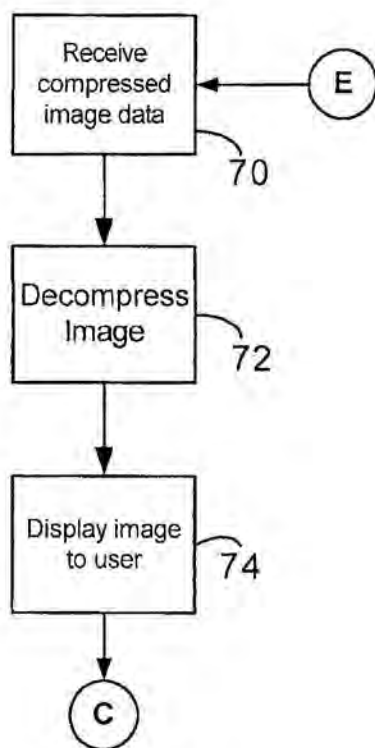
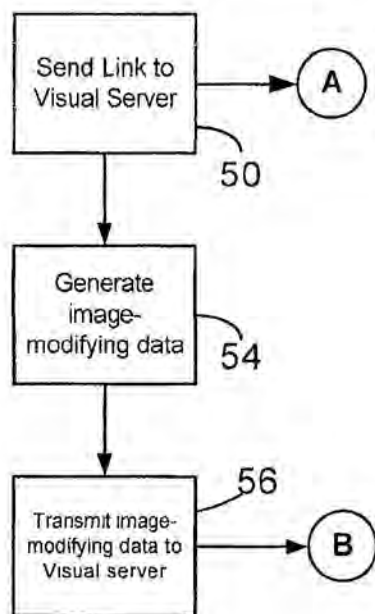


Fig. 2A

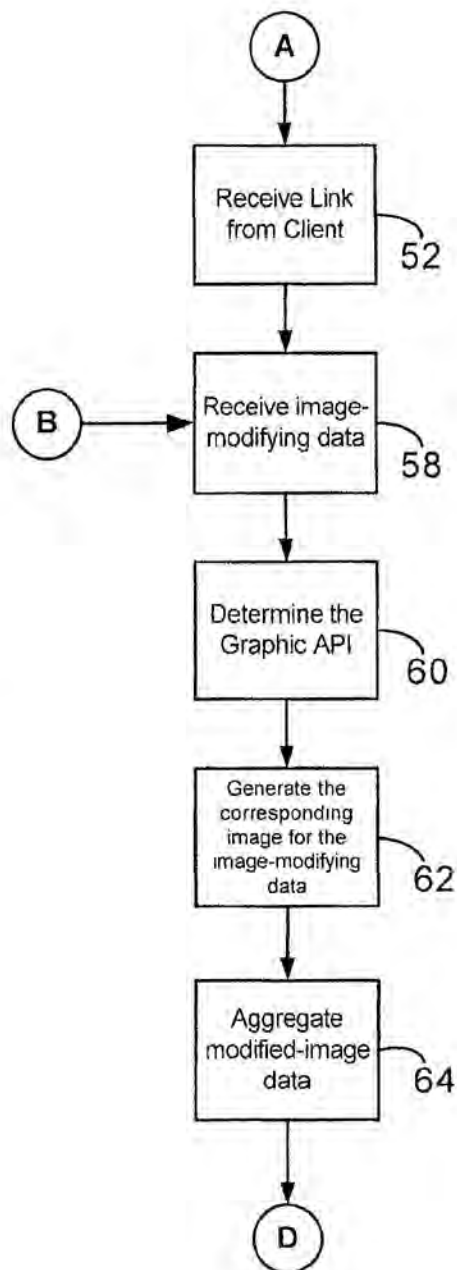


Fig. 2B

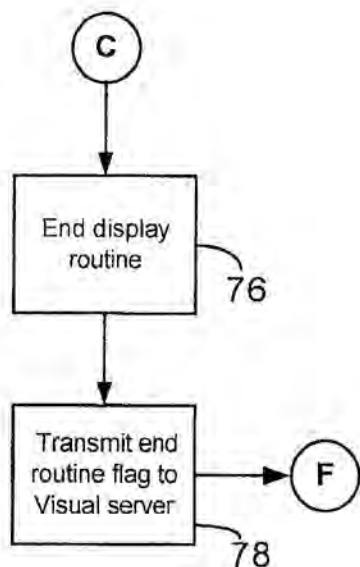


Fig. 2C

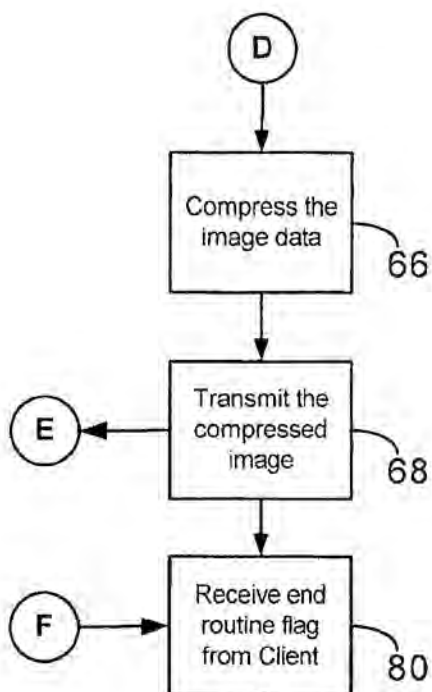


Fig. 2D

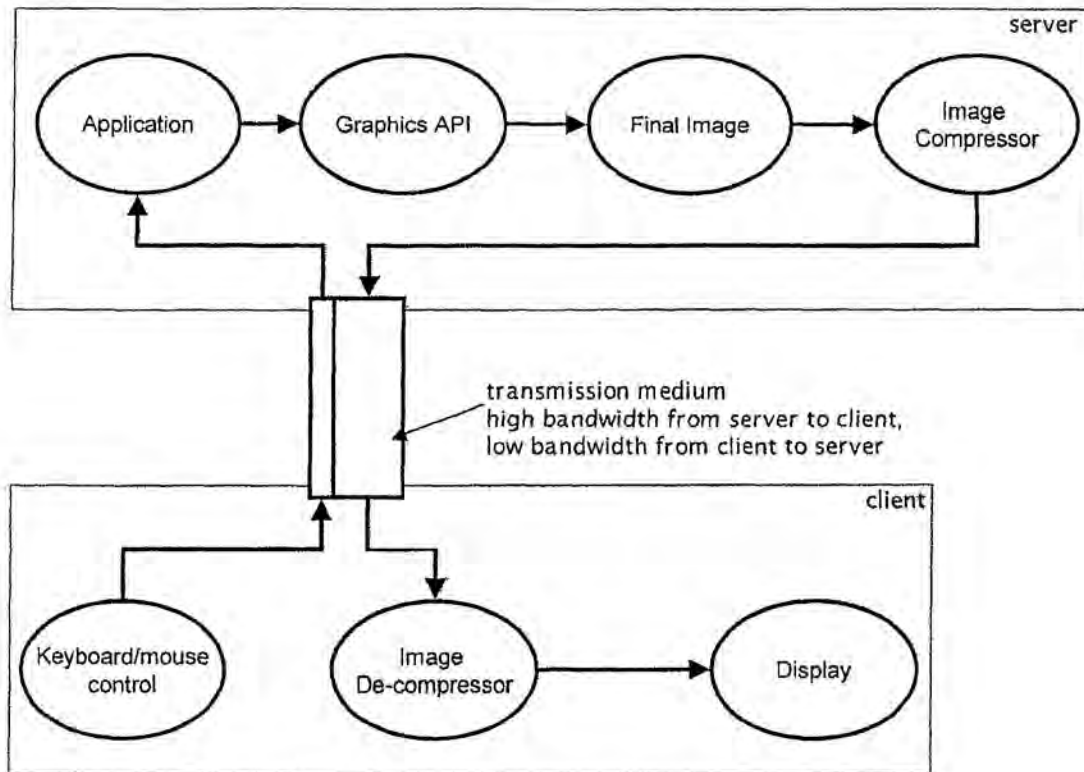


Fig. 3

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IMAGE DISPLAY SYSTEM WITH VISUAL SERVER**CROSS-REFERENCE TO RELATED APPLICATION**

This application is a continuation of U.S. application Ser. No. 14/192,789, filed Feb. 27, 2014, and titled "IMAGE DISPLAY SYSTEM WITH VISUAL SERVER", which is a continuation of U.S. application Ser. No. 13/296,776, filed Nov. 15, 2011, and titled "IMAGE DISPLAY SYSTEM WITH VISUAL SERVER", now issued as U.S. Pat. No. 8,667,093, which is a continuation of U.S. application Ser. No. 12/538,347, filed Aug. 10, 2009, and titled "IMAGE DISPLAY SYSTEM WITH VISUAL SERVER", now issued as U.S. Pat. No. 8,131,826, which is a continuation of U.S. application Ser. No. 10/037,688, filed Jan. 4, 2002, and titled "IMAGE DISPLAY SYSTEM WITH VISUAL SERVER", now issued as U.S. Pat. No. 7,587,520, which claims priority to U.S. Provisional Application No. 60/263,854, filed Jan. 24, 2001 and titled "VISUAL SERVER", all of which are incorporated by this reference in their entireties for all purposes.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The present invention generally relates to computer systems. More particularly, the present invention relates to computer graphics and a graphical image display system that use a visual server to generate and transmit images to a client.

2. Description of the Related Art

Computer generated images are created in a series of several steps: modeling, or describing the objects in mathematical terms; animation, or describing how the objects move over time; and rendering, or determining which of the images defined by the modeling and animation programs are visible on the screen for every frame, assigning color to those images, and drawing them. Of these, rendering is the most difficult as it is the most processing intensive action. Because the generation of images is both processing and memory intensive, a client computer often relies upon other processors and memories, such as a server, to assist in generating the data to render new images. In the existing network model, storage and caching of content and applications can occur on a centralized server, but the actual software applications execute on a system in the client user space. The network thus allows the server to supply image processing resources beyond the constraints of a remote terminal, while taking advantage of client resources for certain tasks. Several existing systems utilize the client-server model to process and render images at a client display with the assistance of server resources.

In methods of client-server graphics that employ image transmission, the server unit requires a relatively high bandwidth connection even if real-time image compression and decompression is employed. Even in geometric replication methods, such as VRML, which generally have a lower bandwidth requirement, the image processing does not decrease the storage or processing requirements of the client. In these systems, the client must be capable of 30 rendering the complete replicated database in real time, and the server does not provide true image generation services. Rather, the

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server functions primarily as a database server. For example, in a client-server method based on a hybrid image transmission and geometry transmission approach, the server unit maintains a low level-of-detail database and a high level of detail database. For each frame of a real-time image stream, images are generated from both the low level-of-detail and high level-of-detail database. The difference between the two images is computed using known methods of image processing. The client unit contains only a low level-of-detail geometric database and renders this database for each frame, and the difference image computed on the sever is compressed and transmitted to the client in real-time which decompresses and composites it together with the image generated by the client from the low level-of-detail database. The result is a high level-of-detail, high quality image that requires a relatively low transmission bandwidth to transmit the relatively low information difference image. Such method also requires relatively limited client storage and processing capabilities. While this method can decrease the computational load of the client and reduce the communication costs, it requires both real-time image compression and decompression and further requires that special image compositing be added to the pipeline. In addition, the entire low level-of-detail database must be stored and processed by the client.

Another known method of client-server image processing is transmitting a transformed and compressed low level-of-detail representation of the geometric database in screen-space representation from the client to the server. The low level-of-detail geometric primitives are transmitted for every frame, and such action increases the required connection bandwidth. Only the primitives that are actually visible for each frame need to be transmitted in this approach. Moreover, since primitives visible in a current frame are likely to be visible in a subsequent frame, the repeated transmission of primitives that have been transformed to image-space representation is an inefficient use of available bandwidth. Any processing to identify repetitive primitives requires further client resources, which hampers the image displaying process.

A further approach to distributed client-server image generation is based on demand-driven geometry transmission to the client. In this method, the server determines and periodically updates a list of potentially visible primitives for each client using a spherical clipping volume around a viewpoint. The result is then compared to a list of primitives previously transmitted to the corresponding client and only those potentially visible primitives that have not been previously transmitted are sent to the client. However, this method reduces communication cost by limiting transmission to those primitives that have become potentially visible. The client replaces primitives in the client display list when they are no longer included in the spherical clipping volume, and thus, the storage and computing requirements of the client are limited to only those primitives in the potentially visible set. However, as this method uses a limited inclusion volume, a major disadvantage is that distant primitives can be arbitrarily excluded from the potentially visible data set. Further, the use of a spherical inclusion volume results in the inclusion and transmission of a large number of geometric primitives that are not visible in the current frame and are unlikely to be visible in upcoming frames, an example being primitives in the inclusion sphere behind the viewpoint. As a result, the demand-driven geometry transmission makes inefficient use of available transmission bandwidth and available client storage and computing resources, and the client resources are taxed because the client must compute

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removal of primitives by clipping to the inclusion volume, and implement display list replacement and compaction protocols.

Client graphic image display processing capabilities are even further taxed in the display of 3-dimensional images. In existing clients, the implementation of a system delivering 3D graphics requires graphics hardware at the client, which presents several problems. The additional hardware increases the cost of the client hardware as the graphics hardware must be incorporated and integrated therewith. Further, the software and hardware used to generate 3D images is in constant flux, and the system must be continually upgraded, creating an additional expense and a logistical burden for the client. Moreover, the remote hardware impedes the central maintenance and coordination of configurations of client software, which is an important capability and critical to the product viability of many applications.

Some clients use separate 3D hardware component to assist in processing the images, but with the constant change of graphics languages and protocols, the hardware becomes obsolete rather quickly, which adversely impacts the value of the client. Furthermore, the use of programmable graphics hardware within the client system is difficult because the client resources are inherently static and limited.

Therefore, for reasons of cost, size, and power consumption, sophisticated three dimensional graphics are not available on common consumer client devices such as personal digital assistants (PDAs) mobile telephones and set-top boxes used to decode cable and satellite television signals. Consequently, it would be advantageous to display complex three dimensional graphics, such as those used by games, on these consumer client devices.

Accordingly, it is to the provision of such an improved system and method of displaying images on a client consumer device utilizing the resources of a visual server that the present invention is primarily directed.

SUMMARY OF THE INVENTION

The present invention is an image display system and method of displaying images on a client through the use of the resources of a remote visual server. The Visual Server runs standard software, such as games, that are the same as versions running on standard personal computers. The Visual Server has certain support software modified to enable control of the application from the client and the delivery of the result of 3D drawing to the client. One or more clients can access the visual server, or an array of servers, wherein each of the clients includes an image display. The system includes a visual server having image data processing capabilities wherein the server selectively receives image-modifying data from one or more clients corresponding to a generated image, and the server generates a modified image based on the image-modifying data, and then transmits the modified image as compressed data back to the client.

The clients are in selective communication with the visual server, and each client selectively generates image-modifying data corresponding to the image resident on the image display of that specific client. The client selectively transmits the image-modifying data to the visual server, and the client then receives, as compressed data from the visual server, an image, or data representing an image, which is a modification of the previous image on the client altered in accord with the previously transmitted image-modifying data. The client includes the processing ability to uncom-

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press the compressed image data from the visual server, and display the image defined by the decompressed data on the client image display.

The visual server and the one or more clients are in selective digital or analog communication preferably across a network, such as an Ethernet, WAN, LAN, or the Internet. Alternately, the visual server and one or more clients are in selective wireless communication, either point-to-point or relayed.

In generating the image-modifying data at the client and processing the image-modifying data at the visual server, the typical data processing segment is a frame. Alternately, the image-modifying data can be generated and transmitted from the client, and the modified image data sent from the visual server to the client after predetermined duration has elapsed.

The present invention further includes a method of displaying an image on a client in selective communication with a visual server wherein the method includes the steps of generating image-modifying data at the client wherein the image-modifying data corresponds to a generated image, transmitting the image-modifying data from the client to the visual server, receiving at the visual server image-modifying data from the client, generating at the visual server a modified image based upon the image-modifying data received from the client, transmitting the modified image from the visual server to the client as compressed data, receiving at the client as compressed data from the visual server an image modified by the transmitted image-modifying data, uncompressing the compressed image data at the client, and displaying the decompressed image on the client image display. The method alternately further includes the step of transmitting a link or other flag to the visual server from the client prior to the step of transmitting the image-modifying data from the client to the visual server in order to notify the visual server that image-modifying data is about to be transmitted from the client.

In the preferred embodiment, the steps of transmitting the image-modifying data from the client to the visual server and transmitting the modified image from the visual server to the client as compressed data are performed across a network, such as the Internet or other WAN, LAN, or Ethernet. Alternately, the steps of transmitting the image-modifying data from the client to the visual server and transmitting the modified image from the visual server to the client as compressed data are performed through wireless communication.

In one embodiment of the system, the step of transmitting the modified image from the visual server to the client as compressed data is transmitting the modified image from the visual server to the client as a compressed data comprising a frame, and accordingly, the step of transmitting the image-modifying data from the client to the visual server is transmitting the image-modifying data from the client to the visual server as data sufficient to generate an image frame. In another embodiment, the step of transmitting the modified image from the visual server to the client as compressed data is transmitting the modified image to the client after predetermined duration of generating an image based upon the transmitted image-modifying data has occurred, and accordingly, the step of transmitting the image-modifying data from the client to the visual server is transmitting the image-modifying data from the client to the visual server after a predetermined duration of generating image-modifying data.

The present invention therefore provides a commercial advantage in that the client can interactively generate con-

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plex graphical images to a user without the need for significant client resources. The system can be implemented with existing networking and communication technology between the client and the visual server, and the image data can be transmitted with known data compression protocols. Further, the visual server and its associated components are readily updateable and maintainable without having to directly access the individual client applications utilizing the image generating capabilities of the visual server.

Other objects, features, and advantages of the present invention will become apparent after review of the herein-after set forth Brief Description of the Drawings, Detailed Description of the Invention, and the Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a representational diagram of the image display system with a visual server and associated components in selective communication with a plurality of clients across a network.

FIG. 2A is a flowchart illustrating the preferred process executed on the client in selective communication with the visual server to facilitate image generation.

FIG. 2B is a flowchart illustrating the preferred process executed on the visual server in receiving image-modifying data from the client, and then generating and transmitting a modified image to the client.

FIG. 2C is a continuation of the flowchart of FIG. 2A.

FIG. 2D is a continuation of the flowchart of FIG. 2B.

FIG. 3 shows a schematic of data and procedural flow in an inventive embodiment.

DETAILED DESCRIPTION OF THE INVENTION

With reference to the figures in which like numerals represent like elements throughout, FIG. 1 is representational diagram of the image display system 10 with a visual server 12 and associated components in selective communication with a plurality of clients across a network 14, such as the Internet. The client components are shown as a television 16 having a set-top box 22 in communication with the network 14, and the set-top box 22 can selectively provide image data to the display 24 of the television 16. Set-top box 22 is similar to the type of boxes generally extant, except that the set-top box 22 in the present system must be able to receive and decompress compressed image data from the visual server 12. The same capability must be present in any client device in order to have the advantages of using the present system 10 for image data processing. Another exemplary clients are PDA 18, such as a Palm Pilot or a Handspring Visor, which has a display screen 26, and cellular telephone 20, which includes a display screen 28. The PDA 18 and cellular telephone 20 are shown here as communicating with the network 14 via a wireless connection, such as an infrared, radio frequency, or microwave transmission. However, PDA 18 and cellular telephone 20 can be in direct wireless communication with the visual server 12 solely through wireless communication.

The visual server 12 is shown here as a cluster of devices, including a server 32, which are in communication through an Ethernet 34, and a hub 36 links the Ethernet 34 to the Internet or other network 14. Thus, while the present inventive system 10 can be implemented with only a server, such as server 32, in communication with the network 14, the visual server 12 here includes additional components that can facilitate the image processing at the visual server 12.

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An additional server 38 can support the visual server, as well as a database 40 for storing the image related information such as the specific graphical application programming interface that the client 16,18,20 requires for the modified image, such as Open GL or Direct3D. Additional computers, such as computer 42, can be connected to the server 32 or to the Ethernet 34 to support the image processing, and provide server maintenance and upgrades. Accordingly, the visual server 12 configuration is readily scalable as would be apparent to one of skill in the art.

The communication between the visual server 12 and client preferably occur over a high bandwidth connection such that 1 Mbps or greater data can be sent across the network. However, the client bandwidth can be asymmetric, with the high-bandwidth reserved for visual server 12 to client 16,18,20 communication, an example being a DSL. With the use of an asymmetric connection, the lesser volume of image-modifying data can be transmitted on the lower bandwidth link from the client 16,18,20 to the visual server 12, and the more significant compressed image data can travel across the high bandwidth portion of the connection from the visual server 12 to the client 16,18,20 for decompression and display. Through the use of adequate bandwidth, substantial image data can be transmitted from the visual server 12 to the client 16,18,20, approaching real-time speeds which can allow multimedia applications to be displayed on the clients 16,18,20, such as games and other graphic-intensive applications.

In operation of the image display system 10, the visual server 12 selectively receives image-modifying data from the client 16,18,20 corresponding to a generated image, such as that generated by a game being played on the client, or a multimedia application being executed on the client. The visual server 12 then generates a modified image based upon the image-modifying data, compresses the image or image data with a specific "codec" (compression/decompression) algorithm, and transmits the modified image as compressed data back to the client 16, 18,20. The visual server 12 can either generate a full image modified with the image-modifying data from the client and then compress the generated image, or the visual server 12 can solely generate the data in a specified format for the modified image and have that data compressed and transmitted. Thus, in the system 10, the visual server 12 can generate only the data necessary to render an image at the client, and does not need to fully produce an image at the visual server prior to compression.

The client 16,18,20 selectively generates image-modifying data and transmits the image-modifying data to the visual server 12 and awaits the image data from the visual server 12 for the next requested image. Once the client receives the modified image as compressed data from the visual server 12, the client 16,18,20 then decompresses the compressed image data and displays the decompressed image on the client image display 24,26,28. The modified image data can be compressed at the visual server 12 in any compression standard, such as MPEG, JPEG, H.261, or other industry standard codecs, and streaming formats such as Windows Media .ASF standard, Real .RM standard, Apple .MOV standard. The client 16,18,20 includes the requisite hardware and software to decompress the modified image.

If the system 10 is displaying a series of images on the client 16, 18,20, such as in multimedia animation, the visual server 12 transmits the modified image to the client 16,18,20 as a frame, and preferably but not necessarily, the client 16,18,20 transmits the image-modifying data to the visual

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server 12 as data sufficient to generate an image frame. Otherwise, the visual server 12 can transmit the modified image to the client 16,18,20 in an arbitrary predetermined manner, such as after predetermined duration of generating an image based upon the transmitted image-modifying data has occurred, or after a predetermined amount of data has been received from the client 16, 18,20. The client 16,18,20 can likewise transmits the image-modifying data to the visual server 12 in an arbitrary manner, such as after a predetermined duration of generating image-modifying data has occurred, or a specific amount of image-modifying data is ready to be sent.

In the art currently, when the client 16,18,20 is active, the client 16,18,20 is in communication with networks and can be supported by a one or more servers. Consequently, the visual server 12 is able to utilize existing architectures with the higher bandwidth, asymmetric or other, to handle complex visual processing for the client 16, 18,2, or the ultimate recipient of the processed data. The visual server 12 can also run standard software application, such as games, that are the same as versions running on standard personal computers, with the visual server 12 providing the computing power of the PC to the data generated at the client 16,18,20 for purposes of image modification.

It can be seen that the visual server 12 has, either in software or hardware, an image processor that selectively receives image-modifying data corresponding to a generated image from the client 16,18,20, and the image processor generates a modified image based upon the image-modifying data and then transmits the modified image as compressed data to the client 16,18,20. Further, each client 16,18,20 can have, either embodied in hardware or software, in addition to the image display 24,26,28 for displaying an image to a user of the client 16, 18,20, an image-modifying data generator that generates image-modifying data, and image-modifying data transmitter for transmitting the image-modifying data to the visual server 12, and a modified image data receiver for receiving as compressed data from the visual server 12 an image modified based the transmitted image-modifying data from the client 16,18,20, and the modified image data receiver decompresses the compressed image data.

FIGS. 2A-2D illustrate the process thread of the image display system 10, with FIGS. 2A and 2C representing the client platform, and FIGS. 2B and 2D representing the visual server 12 platform. The thread preferably begins with the step of sending a link to the visual server, step 50, which indicates that the client 16,18,20 is about to send image-modifying data to the visual server. The link can be a flag at the beginning of a frame or packet, or can be separate from the frame or packet. The visual server 12 receives the link from the client, as shown at step 52, and then can make any necessary resource allocations for use in the image-modification process. The step of sending a link is not necessary if the visual server 12 is able to have sufficient turn around processing on frames and packets send without advanced warning from the client 16,18,20. Then the client 16,18,20 generates image-modifying data, as shown at step 54, and transmits the image-modifying data to the visual server 12, as shown at step 56.

The thread then continues at the visual server 12 which receives the image-modifying data from the client 16, 18,20, as shown at step 58, where the image-modifying data corresponds to an image in a graphics API recognizable to the visual server 12. Thus, if a link was sent to the visual server 12 from the client 16,18,20 (steps 50 and 52), the visual server can determine the appropriate graphics API in

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anticipation of receipt of the image-modifying data. The visual server 12 otherwise determines the graphic API, as shown at step 60, based upon the image-modifying data receiving, and then generates the corresponding modified image based upon the image-modifying data received from the client 16, 18,20, as shown at step 62. If the image data requires aggregation to complete the image, then the visual server 12 aggregates the data, as shown at step 64, and if not, once the modified image, or data comprising the modified image is generated, the visual server 12 compresses the image data in a predetermined format, such as MPEG, as shown at step 66, and then transmits the modified image from the visual server 12 to the client 16,18,20 as compressed data, as shown at step 68.

The thread then continues at the client 16,18,20, with the client receiving the compressed data from the visual server 12, as shown at step 70, where the compressed data is an image modified based the transmitted image-modifying data, and the client 16,18,20 decompresses the compressed image data, as shown at step 72. The client 16,18,20 then displays the decompressed image on the client image display, such as displays 24,26,28. The client then ends the particular display routine of the thread, as shown at step 76, and can begin to generate new image modifying data. The client 16,18,20 alternately process new image-modifying data while the current image is being displayed. Further, as embodied here, the client 16,18,20 transmits an end routine flag to the visual server, as shown at step 78, to indicate that the client successfully received and displayed the frame. The visual server 12 then receives the end routine flag, as shown at step 80, which allows the visual server 12 to deallocate the resources set aside for the specific image processing requested initially by the client 16,18,20 at step 50. The step of transmitting an end routine flag from the client (step 78) and the receipt of the flag at the visual server 12 (step 80) are not required, but do assist in the visual server 12 management of resources. Other methods of client-server interaction through packet and frame-relay networks as would be known to those of skill in the art can be used to control interaction between the clients 16,18,20 and visual server 12 in the present system 10.

If the client 16,18,20 and visual server 12 data transfers occur through the use of frames, the step of transmitting the modified image from the visual server 12 to the client 16,18,20 as compressed data is transmitting the modified image from the visual server 12 to the client 16,18,20 as a compressed data comprising a frame. Likewise, the step of transmitting the image-modifying data from the client 16,18, 20 to the visual server 12 is preferably transmitting the image-modifying data from the client 16, 18,20 to the visual server 12 as data sufficient to generate an image frame. Alternately, if the client and visual server 12 transfer data based upon an arbitrary method such as elapse of a predetermined duration, then the step of transmitting the modified image from the visual server 12 to the client 16,18,20 as compressed data is transmitting the modified image to the client 16,18,20 after predetermined duration of generating an image based upon the transmitted image-modifying data has occurred at the visual server 12. In such embodiment, the step of transmitting the image-modifying data from the client 16,18,20 to the visual server 12 is transmitting the image-modifying data from the client 16,18,20 to the visual server 12 after a predetermined duration of the client generating image-modifying data.

While there has been shown a preferred and alternate embodiments of the present invention, it is to be understood that certain changes may be made in the forms and arrangements

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ment of the elements and steps of the method without departing from the underlying spirit and scope of the invention as is set forth in the claims.

For reasons of cost, size, and power consumption, sophisticated three dimensional graphics are not available on devices such as mobile telephones and the set-top boxes used to decode cable and satellite television signals. There is, however, a need to display complex three dimensional graphics, specifically those used by games, on these devices.

We have solved this problem by recognizing that another common element of these devices is connectivity; when the device is active it is connected to a service provider and hence already follows the model of a client device supported by a server device. Extending this analogy we have developed the concept of a Visual Server that handles all complex visual processing, and a client (the telephone or set-top box) that receives the processed data.

The Visual Server runs standard software, such as games, that are the same as versions running on standard personal computers. The Visual Server has certain support software modified to enable control of the application from the client and the delivery of the result of 3D drawing to the client.

The application running on the Visual Server sends drawing commands to one of the industry standard application programming interfaces such as Direct3D or OpenGL. When the drawing is complete the resulting image is compressed and transmitted to the client using a protocol such as MPEG4. The transmission of the compressed image usually occurs on completion of a frame; in the event that there is no distinct end to a frame the transmission occurs after a specified elapsed time.

The use of an industry standard image compression protocol such as MPEG allows us to make use of facilities that are already present in most clients. Set-top boxes already need to decode MPEG data in order to display digital television; mobile telephones will soon need to support MPEG protocols for video conferencing or television display.

The main advantages of this invention are:

1. The ability to display complex 3D graphics on a device lacking necessary hardware.
2. The avoidance of costly components in the client device and taking advantage of necessary functions already present in it.
3. The ability to provide access to industry standard software on a device which is unable to execute that software.
4. The ability to upgrade performance and features needed by applications at the server without modifying the more numerous clients.
5. The avoidance of installing numerous applications on each client with the consequential support problems; the client software can be installed when shipped from the factory.

The invention claimed is:

1. A method of hosting an interactive software application comprising:

running at a server the interactive software application; receiving at the server user input signals from a client device, wherein the user input signals are used to control updating of the state of the interactive software application;

generating at least one updated image at the server in response to updating the state of the interactive software application; and

compressing the at least one updated image and transmitting the compressed updated image to the client device, wherein the server transmits the updated image as a

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compressed frame that can be decompressed and displayed as an updated image at the client device.

2. The method as recited in claim 1 wherein a first bandwidth for transmitting the user input data between the client device and the server and a second bandwidth for transmitting the compressed updated image from the server to the client device are asymmetric.

3. The method as recited in claim 1 wherein the server is configured for bidirectional communications with a plurality of client devices, the bidirectional communication including receiving at the server user input signals and transmitting the compressed updated image.

4. The method as recited in claim 1 wherein the server is configured to receive user input data and transmit compressed updated images with a plurality of client devices.

5. The method as recited in claim 1 wherein at least two of the plurality of client devices include different device platforms.

6. The method as recited in claim 1 wherein the client device is a mobile device.

7. The method as recited in claim 1 wherein the interactive software application is an interactive game that is configured to run at the server, which is in bidirectional communication with a plurality of client devices, and wherein said updating the state of the software application includes updating the game state of the interactive game.

8. An image display system, comprising:

a server having a processor and memory configured to execute an interactive software application and further configured for:

receiving at the server user input signals from a client device, wherein the user input signals are used to control updating the state of the interactive software application;

generating at least one updated image at the server in response to updating the state of the interactive software application running on the server by the user input signals; and

compressing the at least one updated image and transmitting the compressed updated image to the client device, wherein the server transmits the updated image as a frame and wherein the client device is configured for decompressing of the compressed updated image and displaying the updated image on a display coupled to the client device.

9. The image display system of claim 8, wherein the user input signals are generated at the client device to update the state of the interactive software application from the state that initiated the current image displayed on the display coupled to the client device.

10. The image display system of claim 8 wherein the server is configured to exchange user input data and compressed updated images with a plurality of client devices.

11. The image display system of claim 8 wherein the interactive software application is a game and wherein the client device is a mobile device.

12. The image display system of claim 10 wherein the interactive software application is a game and wherein at least one of the plurality of client devices is a mobile device.

13. A method of displaying interactive video, comprising: receiving at a server user input control signals from a client device, wherein the user input control signals are used to control at least one image in a sequence of images generated from the running of a software gaming application on the server; generating a modified image at the server in response to the user input control signals; and

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transmitting the modified image to the client device for display as compressed data, wherein the transmitting step comprises compressing the at least one modified image and sending the compressed modified image to the client device once the modified image is generated, and wherein the client device is configured for decompressing of the compressed modified image and displaying the modified image on a display coupled to the client device.

14. The method as recited in claim 13 wherein a first bandwidth available for receiving user input control signals at the server and a second bandwidth available for transmitting the modified image to the client device is asymmetric with the second bandwidth available for transmitting the modified image from the server being greater than the first bandwidth.

15. The method as recited in claim 13 wherein the server is configured to exchange user input data and compressed modified images with a plurality of client devices.

16. The method as recited in claim 15 wherein at least two of the plurality of client devices include different platforms.

17. The method as recited in claim 1 wherein the interactive software application is a game running on the server and wherein updating of the state of the interactive software application includes changing the game state.

18. The method as recited in claim 13 wherein the user input control signals are used to control a plurality of images in the sequence of images generated from the running of a software gaming application on the server.

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The foregoing filing complies with the relevant type-volume limitation of the Federal Rules of Appellate Procedure and Federal Circuit Rules because:

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