Trials@uspto.gov
571.272.7822

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BUNGIE, INC.,
Petitioner,

v.

WORLDS INC.,
Patent Owner.

Case IPR2015-01264
Patent 7,945,856 B2

Before KARL D. EASTHOM, KERRY BEGLEY, and JASON J. CHUNG, *Administrative Patent Judges*.

BEGLEY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Bungie, Inc. ("Petitioner") filed a Petition requesting *inter partes* review of claim 1 of U.S. Patent No. 7,945,856 B2 (Ex. 1001, "the '856 patent"). Paper 3 ("Pet."). Pursuant to 35 U.S.C. § 314(a), we determined the Petition showed a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of the claim and instituted an *inter partes* review. Paper 13 ("Inst. Dec.").

After institution, Patent Owner Worlds Inc. ("Patent Owner") filed a Patent Owner Response (Paper 20 ("Resp.")) and a Supplement to the Response (Paper 22 ("Supp. Resp.")). Petitioner filed a Reply to Patent Owner's Response. Paper 31 ("Reply").

Patent Owner filed a Motion to Exclude. Paper 33 ("Mot."). Petitioner filed an Opposition to the Motion (Paper 36 ("Opp'n")), to which Patent Owner filed a Reply (Paper 38 ("Mot. Reply")).

An oral hearing was held before the Board. Paper 41 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Having considered the record before us, we determine Petitioner has shown by a preponderance of the evidence that claim 1 of the '856 patent is unpatentable. *See* 35 U.S.C. § 316(e).

I. BACKGROUND

A. RELATED PROCEEDINGS

The parties indicate that Patent Owner has asserted the '856 patent in a case before the U.S. District Court for the District of Massachusetts ("the District Court"), *Worlds, Inc. v. Activision Blizzard, Inc.*, Case No. 1:12-cv-10576-DJC (D. Mass.) ("District Court Case"). Pet. 10; Paper 6. In addition, patents related to the '856 patent are the subject of pending *inter partes* reviews, based on petitions filed by Petitioner: IPR2015-01268, challenging U.S. Patent No. 7,181,690 B1 ("'690 patent"); IPR2015-01269, challenging U.S. Patent No. 7,493,558 B2 ("'558 patent"); IPR2015-01319, challenging U.S. Patent No. 8,082,501 B2 ("'501 patent"); IPR2015-01321 and IPR2015-01325, challenging U.S. Patent No. 8,145,998 B2 ("'998 patent"). *See* Pet. 10; Paper 6.

B. THE '856 PATENT

The '856 patent discloses a highly-scalable "client-server architecture" for a "three-dimensional graphical, multi-user, interactive virtual world system." Ex. 1001, [57], 2:31–33, 3:1–3. In the preferred embodiment, each user chooses an avatar to "represent the user in the virtual world," *id.* at 3:20–22, and "interacts with a client system," which "is networked to a virtual world server," *id.* at 3:9–10. "[E]ach client . . . sends its current location, or changes in its current location, to the server." *Id.* at 3:36–39; *see id.* at 2:40–43.

In the preferred embodiment, the system implements a "crowd control" function, which determines "[w]hether another avatar is in range" and "is needed in some cases to ensure that neither client 60 nor user A get overwhelmed by the crowds of avatars likely to occur in a popular virtual world." *Id.* at 5:32–36; *see id.* at 2:62–64. "Server 61 maintains a variable, N, which sets the maximum number of other avatars [user] A will see," whereas client 60 "maintains a variable, N', which might be less than N," indicating "the maximum number of avatars client 60 wants to see and/or hear." *Id.* at 5:37–41; *see id.* at 13:18–21. These limits of N and N' avatars "[g]enerally" "control how many avatars [user] A sees." *Id.* at 5:55–58. Server 61 tracks the location and orientation of each user's avatar and maintains a list of the "N nearest neighboring remote avatars" for each user's avatar. *Id.* at 5:45–49, 13:21–23, 14:27–32. "[A]s part of crowd control," the server notifies client 60 for a user "regarding changes in the N closest remote avatars and their locations." *Id.* at 14:32–38. On the client-side, "[w]here N' is less than N, the client also uses position data to select N' avatars from the N provided by the server." *Id.* at 6:6–8.

The specification explains that in the preferred embodiment, client 60, used by user A, features remote avatar position table 112 and current avatar position register 114. *Id.* at 2:62–64, 4:52–65, Fig. 4. "Current avatar position register 114 contains the current position and orientation of [user] A's avatar in the virtual world." *Id.* at 5:22–23. Remote avatar position table 112, in turn, "contains the current positions of the 'in range' avatars near [user] A's avatar." *Id.* at 5:31–32; *see id.* at 5:53–54, 6:1–6.

The client executes a process to render a "view" of the virtual world "from the perspective of the avatar for that . . . user." *Id.* at [57], 2:35–37, 3:25–28, 4:45–51, 7:50–52. In the preferred embodiment, client system 60 executes a graphical rendering engine program to "generate[] the user's view of the virtual world." *Id.* at 2:62–64, 4:45–51. "In rendering a view, client 60 requests the locations, orientations and avatar image pointers of neighboring remote avatars from server 61 and the server's responses are stored in remote avatar position table 112." *Id.* at 7:40–43. "Rendering engine 120 then reads register 114 [and] remote avatar position table 112," as well as databases holding avatar images and the layout of the virtual world, and "renders a view of the virtual world from the view point (position and orientation) of [user] A's avatar." *Id.* at 7:48–56; *see id.* at 6:39–41, 7:34–39.

C. CHALLENGED CLAIM

Claim 1 of the '856 patent, the only challenged claim, is reproduced below.

> 1. A method for enabling a first user to interact with second users in a virtual space, wherein the first user is associated with at first avatar and a first client process, the first client process being configured for communication with a server process, and each second user is associated with a different second avatar

> and a second client process configured for communication with the server process, at least one second client process per second user, the method comprising:
>
> (a) receiving by the first client process from the server process received positions of selected second avatars; and
>
> (b) determining, from the received positions, a set of the second avatars that are to be displayed to the first user;
>
> wherein the first client process receives positions of fewer than all of the second avatars.

Id. at 21:7–22. Throughout this Decision, we refer to step (a) as the "receiving step," step (b) as the "determining step," and the claim language following steps (a) and (b), beginning with "wherein," as the "wherein limitation."

D. INSTITUTED GROUNDS OF UNPATENTABILITY

We instituted *inter partes* review of claim 1 of the '856 patent on the following grounds of unpatentability asserted in the Petition. Inst. Dec. 33.

Basis	Reference
§ 102[1]	Thomas A. Funkhouser, *RING: A Client-Server System for Multi-User Virtual Environments, in* 1995 SYMPOSIUM ON INTERACTIVE 3D GRAPHICS 85 (1995) (Ex. 1005, "Funkhouser")
§ 102	U.S. Patent No. 5,659,691 (filed Sept. 23, 1993) (issued Aug. 19, 1997) (Ex. 1008, "Durward")

Funkhouser and Durward were listed in an Information Disclosure Statement filed during prosecution of the '856 patent. Pet. 4; Ex. 1004, 243, 246.

Petitioner supports its challenge with a Declaration executed by Michael Zyda, D.Sc. on May 26, 2015 (Ex. 1002) and a Second Declaration

[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112–29 (2011), revised 35 U.S.C. § 102, effective March 16, 2013. Because the '856 patent has an effective filing date before this date, we refer to the pre-AIA version of § 102 throughout this Decision.

executed by Dr. Zyda on March 4, 2016 (Ex. 1038). Patent Owner relies on a Declaration executed by Mr. Mark D. Pesce on March 15, 2016 (Ex. 2017).

II. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

We begin our analysis by addressing the level of ordinary skill in the art. Petitioner argues, and Dr. Zyda opines, that a person of ordinary skill in the art relevant to the '856 patent would have had "through education or practical experience, the equivalent of a bachelor's degree in computer science or a related field and at least an additional two years of work experience developing or implementing networked virtual environments." Pet. 9; Ex. 1002 ¶ 53. Mr. Pesce similarly testifies that a person of ordinary skill in the art would have had "at least a bachelor's degree or equivalent in computer science, with two or more years of experience in coding related to both virtual environments and computer networking." Ex. 2017 ¶ 33.

The parties' proposals for the level of ordinary skill in the art have slight differences in wording, yet we do not find them to have meaningful distinctions (e.g., "at least" two years versus "two or more years," "networked virtual environments" versus "virtual environments and computer networking"). Neither party asserted that there is any such distinction. Based on the testimony of the parties' experts as well as our review of the '856 patent, the types of problems and solutions described therein, and the prior art involved in this proceeding, we adopt the following as the level of ordinary skill in the art: the equivalent, through education or practical experience, of a bachelor's degree in computer science or a related field, and at least two years of experience developing, coding, or

implementing networked virtual environments, or virtual environments and computer networking.

B. MR. PESCE'S QUALIFICATION AS AN EXPERT

Petitioner argues the testimony of Mr. Pesce, Patent Owner's declarant, should be given no weight because it "often is inconsistent, lacks objective support, and/or was incapable of being substantiated during . . . cross-examination," providing examples of these alleged deficiencies in Mr. Pesce's testimony regarding claim construction and the timing of the invention of the '856 patent. Reply 1–3. Petitioner further argues that "[i]t is not clear how Mr. Pesce qualifies as an expert in this field," citing Mr. Pesce's deposition testimony regarding the amount of experience he had in 1995[2] and his lack of an educational degree beyond high school. Reply 3 (citing Ex. 1046, 18:12–19:2, 21:8–15, 40:10–20; Ex. 2017 ¶ 35). Petitioner also asserts that "Mr. Pesce was unwilling to address his . . . use of psychedelic drugs during the 1990s (Ex. 1041) and whether that drug use

[2] The '856 patent claims priority to provisional application no. 60/020,296 ("'296 provisional"), filed on November 13, 1995. Ex. 1001, [60]. Petitioner uses the provisional filing date in its analysis in its briefing and Dr. Zyda's declaration, *see, e.g.*, Pet. 3, 9; Reply 6; Ex. 1002 ¶¶ 50–51, and represented at the hearing that it does not contest, for purposes of this proceeding, priority to the provisional, Tr. 195:1–7. Patent Owner also takes the position that the '856 patent is entitled to priority to the provisional and represented at the hearing that its specification is nearly identical to that of the '856 patent. *See, e.g., id.* at 90:5–91:3, 92:10–15; Ex. 2017 ¶ 34. Based on our review of the '296 provisional, we agree with Patent Owner's representations that its specification is nearly identical to the '856 patent specification, and we accept the parties' agreement that the '856 patent is entitled to priority to the '296 provisional. *See* Ex. 2020. None of our determinations in this Decision would change if the '856 patent were not entitled to this priority date.

affected his recollection of events during the period relevant to the ['856] patent[]. *See also*, Ex. 1046 at 46:11-47:21, 50:25-53." Reply 3.

Here, Petitioner has not moved to exclude Mr. Pesce's testimony. Nor has Petitioner taken an express and affirmative position that Mr. Pesce is not qualified as an expert. *See id.* ("It is *not clear* how Mr. Pesce qualifies as an expert in this field.") (emphasis added). To the extent Petitioner is suggesting as much, we disagree.

Federal Rule of Evidence ("Rule") 702 provides that a "witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion if (a) the expert's knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based upon sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the witness has applied the principles and methods reliably to the facts of the case." Fed. R. Evid. 702. Under this standard, testimony on the issue of unpatentability proffered by a witness who is not "qualified in the pertinent art" generally is not admissible. *Sundance Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1363–64 (Fed. Cir. 2008). Rule 702, however, does not "require[] a witness to possess something more than ordinary skill in the art to testify as an expert" and a "witness possessing merely ordinary skill will often be qualified to present expert testimony." *Id.* at 1363. Nor does the Rule require a perfect match or complete overlap between the witness's technical qualifications and the field of the invention. *See SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1372–73 (Fed. Cir. 2010).

In his declaration and attached curriculum vitae, Mr. Pesce details his relevant work experience from 1984 to the present as well as his teaching experience and numerous technical publications and presentations. *See*

Ex. 2017 ¶¶ 3–19, 35–42, pp. 67–82; *see also* Ex. 1046, 19:8–21:16, 39:11–40:20. Having reviewed this experience and Mr. Pesce's technical testimony, we find his knowledge, skill, and experience in the relevant field of networked virtual environments, as well as computer networking and virtual reality more generally, sufficient to render him qualified to offer expert testimony in this proceeding under Rule 702.

We do not find the evidence to which Petitioner points persuasive on this issue. First, Petitioner refers to Mr. Pesce's declaration testimony that "as of 1995, [he] possessed more than 5 years of experience in the computer graphics industry with an emphasis on virtual reality" and his admission during his deposition that he was working in the field "from 1991" so "five years" is accurate, rather than "more than five years" as he stated in his declaration. Ex. 2017 ¶ 33; Ex. 1046, 39:13–40:20; *see* Reply 3. We do not find this admitted minor misstatement of Mr. Pesce's experience to undermine his qualifications, or credibility, as an expert. Mr. Pesce worked on virtual reality environments beginning in 1991 and continuing through the relevant time of invention of the '856 patent, and for many years thereafter. *See, e.g.*, Ex. 2017 ¶¶ 5–19, 35–42, pp. 67–82; Ex. 1046, 39:13–40:20. Second, as to Mr. Pesce's lack of an educational degree beyond high school, Petitioner and Dr. Zyda, as well as Mr. Pesce, agree that experience can overcome a lack of a formal technical education in satisfying the standard for a person of ordinary skill in the art, and we have so determined in our finding in § II.A regarding the level of ordinary skill in the art. Pet. 9 (proffering definition of one of ordinary skill in the art as "someone who had, through education *or practical experience, the equivalent* of a bachelor's degree in computer science or a related field") (emphasis added); Ex. 1002 ¶ 53 (same); Ex. 2017 ¶ 33; *see id.* ¶¶ 3, 35; Reply 3; Opp'n 7. We

note that Mr. Pesce did attend the Massachusetts Institute Technology ("MIT") for four semesters. Ex. 2017 ¶ 3; Ex. 1046, 19:8–14; *see id.* at 19:15–21:16. As we explain above, we find Mr. Pesce's experience, skill, and knowledge in the relevant field sufficient to render him qualified to offer expert testimony in this proceeding.

Third, we turn to Petitioner's citation and reference to Exhibit 1041,[3] an excerpt from a 1999 interview of Mr. Pesce at the AllChemical Arts conference in which he discusses how his use of psychedelic drugs, beginning in college, has impacted and facilitated his career and work, and Mr. Pesce's related deposition testimony in which he states he does not recall the interview and the specific contents thereof. Reply 3 (citing Ex. 1041; Ex. 1046, "46:11-47:21, 50:25–53"); Ex. 1041; Ex. 1046, 46:11–47:21, 50:25–57:10. We have considered Exhibit 1041 in assessing Mr. Pesce's capacity to perceive and recall developments and details from the relevant art in the 1990s about which he testifies, as well as the reliability of his perception and recollection. *See infra* § II.H; *see, e.g.*, Ex. 2017 ¶¶ 36–44, 49.a.iv, 59; Ex. 1046, 85:4–21, 89:10–90:7, 204:12–205:20, 222:1–223:6. We do not find Exhibit 1041, which lacks detailed information regarding the extent and regularity of any drug use, to undermine Mr. Pesce's capacity to perceive and recall such events or the reliability of his relevant testimony. Nor do we find his inability to remember the specifics of this one particular interview given nearly twenty years ago to undermine his credibility, reliability, or qualifications as a witness. Having carefully reviewed his testimony in this proceeding, we

[3] Exhibit 1041 is a subject of Patent Owner's motion to exclude, which we address below in § II.H. We consider Exhibit 1041 here only for the limited purpose for which we find it relevant and admissible in § II.H.

find his technical testimony, and particularly his testimony on issues related to the development of the art in the early to mid-1990s, cogent. We consider Mr. Pesce's testimony throughout our analysis below and where we discount or disagree with his testimony, it is for reasons other than the contents of Exhibit 1041 and his deposition testimony regarding this exhibit.

Petitioner's remaining arguments regarding specific alleged deficiencies in Mr. Pesce's testimony on claim construction and the date of invention of claim 1 of the '856 patent go to the weight to be accorded to Mr. Pesce's testimony on these particular substantive issues. *See* Reply 1–3. We have considered these alleged deficiencies and address them, as appropriate, in our analysis below of the issues to which they pertain.

C. Claim Interpretation

We now consider the meaning of the claim language.

1. *Applicable Legal Standards*

In our Institution Decision, we raised the issue of the impending expiration of the '856 patent and its potential impact on the applicable claim construction standard, given that the Board construes unexpired patents under the broadest reasonable interpretation standard but expired patents under the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). *See* Inst. Dec. 4 n.1; 37 C.F.R. § 42.100(b) (2012)[4]; *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (holding that

[4] The Office amended rule 37 C.F.R. § 42.100(b) after the Institution Decision in this proceeding. The amended rule, however, does not apply to this proceeding, because it applies only to petitions filed on or after May 2, 2016. *See* Amendments to the Rules of Practice for Trials Before the Patent Trial and Appeal Board, 81 Fed. Reg. 18,750, 18,766 (Apr. 1, 2016). Moreover, we note that neither party requested permission to file a motion contemplated by the amended rule. *See* Reply 4.

37 C.F.R. § 42.100(b), under which the Board applies the broadest reasonable interpretation standard to unexpired patents, "represents a reasonable exercise of the rulemaking authority that Congress delegated to the . . . Office"); *Black & Decker, Inc. v. Positec USA, Inc., RW,* 646 Fed. App'x 1019, 1024 (Fed. Cir. 2016) (holding that in an *inter partes* review, "[c]laims of an expired patent are given their ordinary and customary meaning in accordance with our opinion in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed.Cir.2005) (en banc)"). Because neither party had addressed this issue, we stated that we "expect the parties to address, with particularity, in their future briefing the expiration date of claim 1 of the '856 patent." Inst. Dec. 4 n.1.

In its Response and the Supplement to its Response, Patent Owner represented that the '856 patent expires on November 12, 2016, with an explanation supporting the calculation of this expiration date. *See* Resp. 8–10; Supp. Resp. At the oral hearing, Patent Owner confirmed this expiration date and Petitioner indicated that it agrees with and does not challenge this date. *See* Tr. 14:1–16, 88:8–89:7. Based on the parties' agreement and our review of the record, we agree that the '856 patent expires on November 12, 2016 and, therefore, has not yet expired. *See, e.g.*, Ex. 1001, [22], [60], [63]; Ex. 1004, 277–289, 294–303, 347–48.

Because the '856 patent is unexpired, we interpret claim 1 using the "broadest reasonable construction in light of the specification of the patent."[5] 37 C.F.R. § 42.100(b) (2012); *Cuozzo*, 136 S. Ct. at 2144–46. The

[5] Although we apply the broadest reasonable interpretation standard in this Decision, our claim interpretations would not differ under the *Phillips* standard, applicable to expired patents. Rather, having considered the issue, we would reach the same claim interpretations under the *Phillips* standard.

broadest reasonable construction of a claim term cannot be so broad that the construction is "unreasonable under general claim construction principles." *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (emphasis omitted). Rather, the claims must be "read in light of the specification," and the prosecution history "should [be] consult[ed]," to reach a construction "consistent with the one that those skilled in the art would reach." *Id.* (internal citations and quotations omitted).

Under the broadest reasonable interpretation standard, we presume a claim term carries its "ordinary and customary meaning," which "is the meaning that the term would have to a person of ordinary skill in the art" at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A claim term will be interpreted more narrowly than its ordinary and customary meaning only under two circumstances: (1) the "patentee sets out a definition and acts as [its] own lexicographer," or (2) the "patentee disavows the full scope of a claim term either in the specification or during prosecution." *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012). To act as a lexicographer, the patentee "must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning," or in other words, "must clearly express an intent to redefine the term." *Id.* at 1330 (internal citations and quotations omitted). "This clear expression . . . may be inferred from clear limiting descriptions of the invention in the specification or prosecution history." *Id.*

Similarly, to disavow claim scope, "the specification or prosecution history [must] make clear that the invention does not include a particular feature." *GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) (internal citation, quotation, and alterations omitted). To do so, the patentee may "include[] in the specification expressions of manifest

exclusion or restriction, representing a clear disavowal of claim scope." *Aventis*, 675 F.3d at 1330 (internal quotations omitted). Ambiguous language does not constitute disavowal. *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323–26 (Fed. Cir. 2003). Nor is it sufficient "that the only embodiments, or all of the embodiments, contain a particular limitation." *Aventis*, 675 F.3d at 1330.

"A patent that discloses only one embodiment is not necessarily limited to that embodiment." *GE Lighting*, 750 F.3d at 1309. "It is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited." *Id.*

Here, both parties address the scope of the determining step and the construction of the term "avatar." Pet. 11–13; Resp. 7–25; Reply 4–12. Petitioner also proffers a construction for the recited "server process" and "client process." Pet. 13–14. Based on our review of the arguments and evidence of record, we determine that we must address only the issues of claim interpretation discussed below. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that only claim terms that "are in controversy" need to be construed and "only to the extent necessary to resolve the controversy").

2. *The Determining Step*

The determining step of claim 1 of the '856 patent, as noted above, recites "determining, from the received positions, a set of the second avatars that are to be displayed to the first user." Ex. 1001, 21:19–20. We consider two aspects of the scope of this step.

a.

In the Institution Decision, we explained that the parties' arguments in their pre-institution filings either assumed or represented that the recited "client process" performs the determining step of claim 1, yet neither party had analyzed whether claim 1 requires that the "client process" perform the step. Inst. Dec. 4–5. Based on our review and analysis of the claim language and written description, as well as differentiation of the language of the determining step from that of similar steps in independent claims of the related '690, '558, and '501 patents, we concluded that the determining step of claim 1 of the '856 patent "need not be performed by the 'first client process'" and, "[i]nstead, . . . is broad enough to encompass the 'determining' being performed by at least the 'first client process,' the 'server process,' or both." *Id.* at 4–8.

Patent Owner, in its Response, disputes this conclusion, arguing that the recited "server process" cannot "be interpreted as performing" the step. Resp. 7. Specifically, Patent Owner argues that the receiving step of claim 1 requires that the "first client process receives 'received positions.'" *Id.* Patent Owner contends that the "natural reading" of this language "indicates that the server process sends positions to the first client process, and those positions are received as 'received positions' by the first client process," citing as support Mr. Pesce's declaration testimony in which he opines that the claim language "suggest[s]" as much. *Id.* (citing Ex. 2017 ¶ 52.a); Ex. 2017 ¶ 52.a.iii. In other words, as Patent Owner explained at the hearing, Patent Owner's position is that "the received positions do[ ]n[o]t become received until they have been received by the client." Tr. 118:12–19. Patent Owner, however, acknowledged that the recited positions

becoming "received when they [are] received by the server" "may be a broadest reasonable interpretation." *Id.* at 118:12–119:8.

Petitioner, for its part, did not comment on this issue of claim scope in its Reply. *See generally* Reply. At the hearing, Petitioner characterized the Board's interpretation in the Institution Decision as "a good and astute observation" and "not an unreasonable construction," and noted that the Board is correct that the determining step "does[ ]n[o]t specifically require the client process to perform that step." Tr. 23:13–24:12. Nonetheless, Petitioner argued that this issue of claim scope is "not necessary" to Petitioner's analysis of the instituted grounds because Petitioner makes a showing that the prior art discloses the "client process" performing the determining step. *Id.* at 23:20–24:2, 24:10–17, 183:21–184:7.

As an initial matter, we agree with Petitioner that the outcome of this proceeding does not turn on this issue of claim scope—i.e., whether the determining step must be performed by the "first client process," as Patent Owner argues in its Response (Resp. 7), or instead can be performed by the "'first client process,' the 'server process' or both," as we determined in the Institution Decision (Inst. Dec. 4–8). *See* Tr. 23:20–24:2, 24:10–17, 183:21–184:7. Rather, as we explain in our analysis of the instituted grounds below, the preponderance of the evidence before us demonstrates that in both asserted prior art references, Funkhouser and Durward, the client performs the determining step. *See infra* §§ II.D.3.a, II.E.2.a.

Turning to the merits of the issue, having reconsidered the issue in light of the argument and evidence adduced during trial, we maintain our conclusion, as well as our reasoning and analysis, in the Institution Decision that the determining step "need not be performed by the 'first client process'" and "is broad enough to encompass the 'determining' being

performed by at least the 'first client process,' the 'server process,' or both." Inst. Dec. 4–8. We incorporate our full analysis and reasoning on this issue from the Institution Decision into this Decision. *Id.* (§ II.A). In addition, we address below the parties' arguments raised during the trial.

Beginning with the claim language, we stated in the Institution Decision that the language of claim 1, including the determining and receiving steps, "supports an interpretation that permits the 'first client process,' the 'server process,' or both to perform the determining step." *Id.* at 5 (citing and quoting Ex. 1001, 21:15–22). We reasoned that the language of the determining step, including its requirement that the "'determining' must be 'from the received positions,'" "does not identify or specify the performing entity" because, based on the language of the receiving step, "at least the 'first client process' and the 'server process' have access to the 'received positions.'" *Id.* Although Patent Owner now argues, and Mr. Pesce opines, that the "natural reading" or "suggest[ion]" from the receiving step is that the client must perform the determining because the recited positions are "received as 'received positions' by the first client process" or, in other words, the recited "received positions" do not become "received" until they are received by the client—we do not agree that the claim language is so limited.[6] Resp. 7; Tr. 118:13–19; Ex. 2019 ¶ 52.a. Rather, the language of the receiving step—"*receiving* by the first client process from the server process *received positions* of selected second avatars" (Ex. 1001, 21:15–18 (emphases added))—is broad enough to

[6] Nor do we find persuasive Dr. Zyda's deposition testimony on the issue, to which Patent Owner cites, as he provided no explanation other than reading the claim and his opinion switched from "assum[ing]" the client performed the step, to it "could be" either the client or server, and back to the client. Ex. 2016, 255:16–256:16; *see* Resp. 7; Tr. 115:17–20, 116:17–19.

encompass the "positions" of the second avatars becoming "received," and thus "received positions," upon receipt by the "server process," e.g., from the recited "second client process" or processes. *Id.* at 21:6–21. Even Patent Owner conceded, at oral hearing, that this "may be a broadest reasonable interpretation" (i.e., the applicable claim construction standard) of the language. Tr. 118:13–119:8; *see also* Ex. 2017 ¶ 50.d.x ("To the extent that the 'receiving' step of the Worlds patents . . . require a server to receive user position updates . . . .").

Moreover, the written description supports this understanding of the claim language, as the '856 patent specification repeatedly refers to the clients sending their positions to the server. *E.g.*, Ex. 1001, 3:34–39, 6:62–65, 11:31–55, 12:28–34, 12:43–52; *see also*, *e.g.*, *id.* at [57], 2:40–43. For example, the specification states "each client machine sends its current location, or changes in its current location, to the server." *Id.* at 3:34–39. The specification also discusses specific location commands that clients send the server when moving. *Id.* at 11:31–55, 12:28–34, 12:43–52.

As we explained in our analysis in the Institution Decision, the specification further explains that the server sends each client the position of the N^7 nearest remote avatars, where N, set by the server, is the maximum

[7] We note that Patent Owner, in addressing its argument regarding this issue of claim scope at oral hearing, referred to the specification's discussion of crowd control and specifically, that the "server doesn't necessarily have to know the value of N['']" (set by the client) and "can simply know N" (set by the server). Tr. 119:19–20, 119:24–25. Yet Patent Owner acknowledged that the specification discloses the "possibil[ity]" of "sending N['] back up to the server." *Id.* at 119:21–23. The specification expressly states that the "value of N' can be sent by client [6]0 to server 61." Ex. 1001, 5:41; *see* Inst. Dec. 7 (citing, *inter alia*, Ex. 1001, 5:38–41). For at least this reason, Patent Owner's reference to situations where the server is not informed of

number of other avatars a user will see. Ex. 1001, 5:37–38, 5:46–49, 6:7–8, 8:66–9:1, 13:18–23, 14:30–34; *see* Inst. Dec. 7–8. The specification states "server 61 determines which N avatars are closest to [user] A's avatar, based on which room of the world [user] A's avatar is in and the coordinates of the avatars." Ex. 1001, 5:46–49. N, the variable set and maintained by the server, can be less than or equal to N', the variable set by the client indicating how many avatars it wants to see. *Id.* at 5:37–6:8 (explaining that N' "*might be* less than N" and "*[w]here* N' is less than N, the client . . . selects N' avatars from the N avatars provided by the server") (emphases added); *see* Inst. Dec. 7–8; Ex. 2006, 12 ("The specification allows for the possibility that the number N' set by the client might be less than N or greater than N."); Ex. 1009, 7 (Patent Owner arguing before the District Court that "this embodiment only 'selects' in the specific instance '[w]here N' is less than N"). Also, the client can send the server the value of N'. Ex. 1001, 5:38–41. These passages of the specification reflect that the server sets N—which may be a small value and less than or equal to N' set by the client; determines the N avatars nearest each client, filtering out other avatars based on position; and sends the locations of only those N avatars to the client, which ultimately displays avatars to the user.

Accordingly, for the reasons given in § II.A of the Institution Decision in addition to those provided in this Decision addressing the parties' arguments after institution, we reaffirm our determination that the determining step of claim 1 of the '856 patent "need not be performed by the 'first client process'" and, "[i]nstead, the step is broad enough to encompass

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N' does not show any lack of support in the specification for the server performing or co-performing the determining step.

the ‘determining’ being performed by at least the ‘first client process,’ the ‘server process,’ or both” (Inst. Dec. 8).

b.

The parties dispute another aspect of the scope of the determining step of claim 1 of the ’856 patent. *See* Pet. 11–13; Resp. 13–24; Reply 4–10. Petitioner argues that, under either the broadest reasonable interpretation or *Phillips* standard, the step encompasses “executing a client process to determine, from user positions received from the server, other users’ avatar(s) located within a point of view or perspective (*e.g.*, field of view) of the first user.” *See* Pet. 12–13; Reply 4. Patent Owner does not proffer a construction of the determining step, *see* Resp. 13–24; Tr. 96:14–97:8, yet disputes Petitioner’s proposal regarding its scope. Patent Owner argues that Petitioner’s proposal is “not supported by” and is “inconsistent with the specification . . . , which does not correlate the ‘determining’ step with a field of view.” Resp. 13, 15. According to Patent Owner, the determining step, when read consistent with the ’856 patent specification, “is properly interpreted as a step separate from the ‘view point’ rendering/display process of the rendering engine.” *Id.* at 23–24; *see* Tr. 96:14–97:22.

As an initial matter, we note that in the District Court Case, Patent Owner argued that the determining step required no construction, because the claim language “was written in plain English,” with “common” and “simple” terms, and the presumption that the claim language carries its ordinary meaning had not been overcome by a showing of lexicography or relinquishment of claim scope. Ex. 1009, 6–7, 11 & n.3. The District Court agreed, concluding that “there is nothing in the patent record to suggest that” the determining step “was meant to carry anything but its ordinary meaning” and, thus, determined “no construction” was necessary. Ex. 2006, 9–10, 14.

For the reasons given below, we agree with the District Court that the '856 patent specification and prosecution history do not evidence any intent to stray from the ordinary meaning of the claim language. We further conclude that this ordinary meaning, in light of the specification, is broad enough to include a client performing a field of view determination using the positions of other users' avatars received from the server, as Petitioner argues in this proceeding.

We first consider the claim language. Petitioner argues that its proffered claim scope is consistent with the plain meaning of the claim language and Patent Owner's position to the contrary is "at odds" with this plain meaning, which Patent Owner argued was the proper understanding before the District Court. Pet. 12–13; Reply 5–6; Tr. 8:3–6, 17:6–25. Patent Owner contends that because the claim language recites that the "determining" is of avatars that are "*to be* displayed" to the user, the claimed determining is distinguished from, and must be performed in advance of, the display. Resp. 17–18. Petitioner responds that "this is a distinction of no moment because [Petitioner]'s proposed construction is consistent with" the determining being performed before the display—i.e., the client may determine the avatars in the field of view and then display those avatars. Reply 8; *see* Pet. 12; Tr. 20:14–23, 185:3–8.

We agree with Petitioner that the plain meaning of the determining step—"determining, from the received positions, a set of the second avatars that are to be displayed to the first user"—is, on its face, broad enough to include a client process determining, from the positions it received from the server (in the receiving step), other users' avatars that are within the user's field of view. Such a determination conforms with the plain meaning of the "to be displayed" claim language, given that the other users' avatars

determined to be within the user's field of view can then be displayed to the user, as Petitioner argues. Pet. 12; Reply 8; Tr. 20:14–23, 185:3–8.

In addition to the language of claim 1 of the '856 patent, the parties raise arguments regarding similar "determining" language in the related '501 and '690 patents, challenged in IPR2015-01319 and IPR2015-01268, respectively. *See, e.g.*, Resp. 19–24; Reply 5, 9–10; Tr. 111:5–7. These patents share a specification with the '856 patent and like the '856 patent, issued from a continuation application of U.S. Application No. 08/747,420 and claim priority to the '296 provisional. *See* Ex. 1001, [60], [63]; Ex. 2041, [63], Cert. of Corr.; Ex. 2043, [60], [63]; *see generally* Ex. 1001; Ex. 2041; Ex. 2043. Therefore, common claim language should be interpreted consistently across these patents, unless otherwise compelled and absent evidence to the contrary, and we consider the parties' arguments regarding similar claim limitations in these patents to ensure such consistency. *See NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005) (Where "patents all derive from the same parent application and share many common terms, we must interpret the claims consistently across [the] patents."); *Omega Eng'g*, 334 F.3d at 1334 ("[W]e presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning."); Reply 5 (citing *NTP*, 418 F.3d at 1293); Tr. 111:5–7.

Petitioner contends its proposed scope of the determining step is supported by claim 2 of the '501 patent, which it argues "claims a field of view determination as expressly falling within the scope of the 'determining' step of . . . independent claim" 1, from which the claim depends. Reply 4–5 (emphasis omitted); Tr. 19:22–20:17. In response, Patent Owner, at oral hearing, acknowledged that the determining steps of claims 1 and 2 of the

'501 patent refer to the specification's disclosure regarding the rendering engine's filtering of avatars and "this filtering of other avatars and rendering the view from the viewpoint of the user[] is part of the determining step." Tr. 105:24–106:13. Patent Owner, however, argues that differences in language between the determining steps of claim 1 of the '501 and '856 patents—including that the '501 patent recites "determining" a "displayable set" of avatars instead of avatars that are "to be displayed" like the '856 patent—indicate that "whatever [Patent Owner was] trying to reach in the '501 patent with claim 1, it was different than what [it was] trying to do with the '856 [patent]." *Id.* at 106:23–108:2; *see* Resp. 23 n.5.

Independent claim 1 of the '501 patent features a step similar to the determining step of claim 1 of the '856 patent as well as a displaying step: "determining, by the client device, a displayable set of the other user avatars associated with the client device display; and displaying, on the client device display, the displayable set of the other user avatars associated with the client device display." Ex. 2043, 19:34–38. Claim 2, which depends from claim 1, "further compris[es] the step of: monitoring an orientation of the first user avatar" and adds the limitation "*wherein the step of determining comprises filtering the other user avatars based on the monitored orientation of the first user avatar*." *Id.* at 19:41–44 (emphasis added).

We agree with Petitioner that the determining step in dependent claim 2 of the '501 patent features a client-side field of view determination and, therefore, makes clear that such a determination falls within the scope of the determining step of independent claim 1 of the '501 patent—as Patent Owner appears to likewise acknowledge. *See, e.g.*, Ex. 1001, 7:40–56; Reply 4–5 (emphasis omitted); Tr. 19:22–20:17, 105:24–106:13; Resp. 20; *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1242 (Fed. Cir. 2003) (recognizing

that independent claims are presumed to be "at least as broad as the claims that depend from them"). We recognize, as Patent Owner points out, that the language of the determining steps of claim 1 of the '501 and '856 patents is not identical, but we find the similarities in the claim language, along with the common specification of the patents, sufficient to lend support to Petitioner's position on the specific issue of whether the scope of the determining step of claim 1 of the '856 patent encompasses a client-side field of view determination. Patent Owner points out that there are differences in the claim language—but does not articulate clearly any means by which claim 1 of the '501 patent's alternative "displayable set" language and lack of language corresponding to "from the received positions" in claim 1 of the '856 patent impact the particular issue of claim scope before us, and we see no such impact. *See* Tr. 105:24–108:2; Ex. 1001, 7:40–56; *see generally* Resp. 13–24; *see also* Ex. 2017 ¶¶ 49.b.xvii–xix (Mr. Pesce's testimony, not cited or referenced in the Response, explaining that the determining step of claim 1 of the '501 patent is not recited to be based on positions and is not performed to determine avatars "to be displayed" but not explaining how these differences impact the meaning of the claim language).

Patent Owner, however, looks to the dependent claims of the '690 patent, arguing that claims 2 and 4 confirm that Petitioner's proposed interpretation of the determining step of claim 1 of the '856 patent cannot be correct. *See* Resp. 19–23. In particular, Patent Owner argues that claim 1 of the '690 patent includes a similar determining step and dependent claim 2 features additional steps regarding "monitoring an orientation" (step c) and "displaying" avatars "based on the [monitored] orientation" (step d), which make clear that monitoring orientation and displaying avatars based on orientation are separate from, not subsumed into, the determining step of

claim 1 of both the ’856 and ’690 patents. *Id.* at 19–20. Patent Owner contends that, in contrast to the displaying step of claim 2 of the ’690 patent, which is based on orientation, the determining steps of claim 1 of the ’856 and ’690 patents are performed based on “received positions.” *Id.* at 19. Yet, according to Patent Owner, Petitioner’s proposed interpretation incorrectly makes orientation a necessary pre-condition to the determining step, because, as Dr. Zyda confirmed at his deposition, orientation must be known for a field of view determination. *Id.* at 20. Petitioner responds that “monitoring the orientation of the user’s avatar is facially not the same thing as determining which remote users fall within a field of view, even if that field of view is based on orientation”; for example, the content for a field of view can be calculated or determined at a particular point in time but monitored for a period of time. Reply 9. Petitioner argues that its position is consistent with claim 2 of the ’501 patent, which features “monitoring” orientation as a separate step from determining, yet the “determining” is expressly based on the monitored orientation. *Id.*

Independent claim 1 of the ’690 patent includes a determining step with language nearly identical to that recited in claim 1 of the ’856 patent, and adds that the step is “performed by the client process associated with the first user.” Ex. 2041, 19:38–43. Claim 2 depends from claim 1 and “further compris[es] the steps of (c) monitoring an orientation of the first user’s avatar; and (d) displaying the set of the other users’ avatars from based on the orientation of the first user’s avatar as monitored is step (c),” both of which must be performed by the “client process.” *Id.* at 19:43–50.

We disagree with Patent Owner that the additional steps in dependent claim 2 of the ’690 patent undermine Petitioner’s proposed interpretation of the determining step. Step (c) of claim 2 of the ’690 patent (monitoring

step) requires that the client "monitor[]" the orientation of the user's avatar. Even if the orientation, as well as the position, of the user's avatar is used in a field of view determination, Petitioner's proposed interpretation of the determining step as encompassing such a field of view determination does not mandate that the client monitor that orientation, as the client would only need the orientation at the precise time of the field of view determination and also could obtain it from a source other than its monitoring. *See* Reply 9. In other words, we agree with Petitioner that the field of view determination can be made at a particular point in time whereas monitoring orientation can occur over a duration of time. We likewise agree with Petitioner that the separate "monitoring" and "determining" steps of claim 2 of the '501 patent demonstrate that monitoring the orientation of the user's avatar remains distinct from the determining step—even if the user's orientation is used in the determining process. *See* Ex. 2043, 19:34–44. In addition, step (d) of claim 2 of the '690 patent (displaying step) does not conflict with Petitioner's proposed interpretation of the determining step because even under Petitioner's proposed scope of the determining steps of claim 1 of the '856 and '690 patents as including a field of view determination, step (d) adds additional, distinct requirements that the avatars are actually "display[ed]" and that the display uses the orientation of the user's avatar that the client is monitoring. *See* Ex. 2041, 19:38–48. Accordingly, contrary to Patent Owner's arguments, Petitioner's proposed interpretation does not render steps (c) and (d) of claim 2 of the '690 patent sub-steps of, or otherwise indistinct from, the determining step.

Patent Owner also cites to dependent claim 4 of the '690 patent to dispute Petitioner's proposed interpretation, arguing claim 4 "clarifie[s]" the determining step of claim 1 of the '690 patent and "finds written description

support in the concept of 'crowd control' described in the specification." Resp. 20–22. Patent Owner contends claim 4 makes sense as a sub-step of claim 1's determining step "only when claim 1 is construed in a manner consistent with the specification." *Id.* at 22. Yet, according to Patent Owner, Dr. Zyda's deposition testimony demonstrates that Dr. Zyda and Petitioner have not done so. *Id.* at 21 (citing Ex. 2016, 206:13–24). Petitioner responds that Patent Owner's argument is misplaced, because that "claim 4 narrows the determining step to specifically recite aspects similar to the 'crowd control' embodiment in the specification does not mean that the 'determining' step in claim 1 is not so broad as to encompass field of view filtering *and* crowd control based on a maximum number of avatars." Reply 10. Petitioner also contends that Patent Owner mischaracterizes Dr. Zyda's testimony on this point. *Id.* (citing Ex. 2016, 207:13–21).

Claim 4 of the '690 patent depends from claim 1 and recites that the determining step of claim 1 "comprises" determining an "actual number" of other avatars, "determining a maximum number" of other avatars to be displayed, and comparing these numbers. Ex. 2041, 19:54–64. We agree with Petitioner that claim 4 of the '690 patent does not conflict with its proposed construction of the determining step of claim 1 of the '856 patent as well as the '690 patent. It is undisputed that the client-side crowd control function of the preferred embodiment disclosed in the specification provides written description support for claims 1 and 4 of the '690 patent and claim 1 of the '856 patent. *See, e.g.*, Pet. 12; Resp. 18 n.2, 22; Reply 7; Tr. 95:14–21. That dependent claim 4 of the '690 patent *narrows* the determining step of claim 1 to recite particular aspects of that disclosed crowd control function does not contradict Petitioner's position that the determining steps of independent claim 1 of the '690 and '856 patents are broader—and also

encompass a field of view determination (which, as discussed below, the specification describes as part of the rendering engine). *See AK Steel*, 344 F.3d at 1242 ("[D]ependent claims are presumed to be of narrower scope than the independent claims from which they depend . . . ."); 35 U.S.C. § 112 ¶ 4. Indeed, the recitations in claim 1 and claim 4 of the '690 patent that the method of claim 1 "*comprises*" and the determining step of claim 1 (step (1b)) "*further comprises*," respectively, indicate the open-ended nature of the determining step of claim 1 of the '690 patent. *See* Ex. 2041, 19:35–40, 19:51–52 (emphasis added). Also, we do not find the deposition testimony of Dr. Zyda cited by Patent Owner to support persuasively Patent Owner's position because, as Petitioner points out, Dr. Zyda immediately and expressly "change[d]" what he said and clarified that claim 4 "adds" certain aspects to the determining step of claim 1. *See* Ex. 2016, 206:13–207:21.

Turning to the written description of the '856 patent, we find that the description supports and is consistent with Petitioner's proffered scope of the determining step of claim 1 as encompassing executing a client process to determine, based on the positions of other avatars it receives from the server, other avatars within the client's "point of view or perspective (*e.g.*, field of view)." Pet. 12–13; Reply 6, 9. As Petitioner points out, the specification explains that "each user executes a client process to view a virtual world from the perspective of that user." Ex. 1001, [57], 2:35–37; *see* Pet. 12. More specifically, the specification discusses a graphical rendering engine, which is a "program executed by client system 60" that "generates the user's view of the virtual world." Ex. 1001, 4:45–51; *see* Reply 9. The specification further explains that in the preferred embodiment, the client's rendering engine 120 reads its current avatar

position register 114, which contains the "current position and orientation" of the user's avatar, and remote avatar position table 112, which contains the position and orientation—received from the server—of avatars near the user's avatar, "to render[] a view of the virtual world from the view point (position and orientation) of [the user]'s avatar." Ex. 1001, 5:22–23, 5:28–36, 6:1–11, 7:40–43, 7:48–52, Fig. 4; *see* Pet. 12.

These disclosures indicate that the client's rendering engine 120 determines which avatars are displayed to the user based on the user's view point, which may include filtering or culling other users' avatars that, based on their positions received from the server, are not located within the user's view. *See* Ex. 1001, 5:22–23, 5:28–36, 6:1–11, 7:40–43, 7:48–52; *see also* Ex. 1046, 241:18–24 ("[T]he rendering engine . . . cull[s] objects that don't fall into the field of view."). For example, in the crowd control function of the preferred embodiment disclosed in the specification, if N, the server's variable for the "maximum number of other avatars [the user] will see," and N', the client's variable for the "maximum number of avatars [it] wants to see" are larger than the number of avatars in the user's view point, such that the client receives from the server positions of avatars that are outside the user's view point, the client's rendering engine 120 will determine, using the positions of the other avatars as well as the user's position and orientation, the subset of avatars that are within the user's view point and only those avatars are displayed to the user—as Patent Owner acknowledges. *See* Ex. 1001, 5:31–41, 6:1–11, 7:40–52; Tr. 102:5–20; *see id.* at 7:17–8:18, 113:19–24.

In addition, the specification demonstrates that the avatars the client's rendering engine 120 determines to be within the view point of the user's avatar are displayed on display 122. Specifically, Figure 4, a block diagram

of a client system, depicts rendering engine 120 separate from and with an arrow connecting to display 122, thereby indicating that rendering engine 120 sends its output to display 122. *See* Ex. 1001, 2:59–60, 4:52–54, Fig. 4; Tr. 103:14–19 (Patent Owner acknowledging that Figure 4 shows that field of view filtering is "the first stage of the rendering engine" and "the display is the output . . . of the rendering engine"), 184:14–186:14. The specification also explains that means for "displaying graphical results" of programs, such as the graphical rendering engine, were "well known in the art." Ex. 1001, 4:46–51; *see* Reply 9.

Based on the analysis above, we agree with Petitioner that the disclosures of the '856 patent specification regarding the rendering engine support Petitioner's proposed scope of the determining step of claim 1 as encompassing a client-side field of view determination. *See* Pet. 12; Reply 7–9. We again note that Patent Owner acknowledged that the determining steps of claims 1 and 2 of the '501 patent includes the rendering engine's "filtering of other avatars and rendering the view from the viewpoint of the user," as disclosed in the specification, Tr. 105:24–106:13, and we see no good reason to conclude to the contrary for the determining step of claim 1 of the '856 patent.

Patent Owner's assertions regarding the written description of the '856 patent are unpersuasive. Patent Owner conceded at oral hearing that Patent Owner did not act as a lexicographer with respect to the determining step. *See* Tr. 94:24–95:3; *see also id.* at 18:1–5; Ex. 1009, 6–7; Resp. 13–24. Patent Owner does not argue expressly that Patent Owner disavowed or disclaimed the broader meaning of the determining step to a narrower scope or that the claim language should be limited to particular aspects of the preferred embodiment, namely the client-side crowd control function—but

as we explain below, Patent Owner's arguments imply as much.[8] *See, e.g.*, Resp. 13, 15–18, 21–23; Reply 6–8. Patent Owner's arguments regarding the written description of the '856 patent divide into two categories, which we address in turn.

First, Patent Owner refers to the specification's disclosures regarding client-side crowd control, which, according to Patent Owner, "can further limit the avatars being displayed to the user" from the limit set by the server, i.e., "down from the server's N avatars to N' avatars." Resp. 15–17 (citing Ex. 1001, 5:32–49, 6:6–8, 7:40–43). From the cited disclosures of the specification, Patent Owner argues that this client-side crowd control "occurs prior to processing and rendering of the virtual world." *Id.* at 16–17, 22–23. Patent Owner further posits that the "claimed 'determining' must be performed in advance of the display, just as the ['856] patent clearly discloses that the client-side crowd control occurs prior to rendering." *Id.* at 18. According to Patent Owner, the specification never discloses client-side crowd control as "establishing and displaying the field of view during the rendering process." *Id.* at 23.

Petitioner replies that the disclosed crowd control function is distinct from a field of view determination and "[t]o the extent [Patent Owner] seeks to exclude field of view determinations" from the scope of the determining step of claim 1 of the '856 patent "based on an example of 'crowd control,' [Patent Owner] would be improperly reading an exemplary embodiment as limiting a claim." Reply 7–8; *see* Pet. 12; Tr. 18:1–14. Petitioner contends

[8] Accordingly, Patent Owner's implicit arguments appear to conflict with the position it took before the District Court, specifically that Patent Owner had not acted as a lexicographer or relinquished claim scope to depart from the "common," ordinary meaning of the determining step. Ex. 1009, 6–7, 11.

Patent Owner cites nothing in the specification that limits determining to "pre-rendering 'crowd control' filtering" or that "specifically excludes a field of view determination." Reply 8; *see* Tr. 18:1–14.

We find Patent Owner's arguments regarding client-side crowd control to lack clarity as to their proposed impact on the particular issue of claim scope before us, but we agree with Petitioner that Patent Owner appears to seek to improperly limit the determining step to the client-side crowd control function, particularly the client selecting N' avatars from the N avatars provided by the server, described in the preferred embodiment of the specification. *See* Reply 7–8. "[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited." *GE Lighting*, 750 F.3d at 1309 (internal citation omitted). Here, the specification does not include clear statements or indications that Patent Owner sought to limit the claims to the client-side crowd control function of the preferred embodiment that would support limiting the language of the determining step to this feature pursuant to disclaimer or disavowal. *See id.* (outlining exemplary circumstances where disavowal or disclaimer has been found to, e.g., limit a claim element to a feature of the preferred embodiment).

Instead, the specification indicates to the contrary. As Patent Owner notes, the specification states that "a 'crowd control' function . . . is needed *in some cases* to ensure that neither client 60 nor user A get overwhelmed by the crowds of avatars likely to occur in a popular virtual world." Ex. 1001, 5:31–36 (emphasis added); *see* Resp. 16; Pet. 12. The specification further explains that the server maintains N, a variable indicating the maximum number of other avatars [user] A will see, and client 60 maintains N', a

variable indicating the maximum number of avatars client 60 wants to see, "which *might be less than N*." Ex. 1001, 5:37–45 (emphasis added); *see* Resp. 16. Further, according to the specification, "[o]ne reason for setting N' less than N" is "*where* client 60 is executed by a computer with less computing power than an average machine and tracking N avatars would make processing and rendering of the virtual world too slow." Ex. 1001, 5:37–45 (emphasis added); *see* Resp. 16. The specification continues: "*Where N' is less than N*, the client also uses the position data to select N' avatars from the N avatars provided by the server." Ex. 1001, 6:6–8 (emphasis added); Resp. 17.

Thus, the specification makes clear that the crowd control function is not always necessary and that the client-side aspect of the disclosed function, in which the client selects avatars from the N sent by the server, occurs only when N' is less than N. Further, the specification's non-limiting references to N' being less than N (e.g., "might be," "where") allow for N' to be equal to or greater than N. *See* Ex. 1001, 5:32–6:8; Inst. Dec. 7–8; Ex. 2006, 12 ("The specification allows for the possibility that the number N' set by the client might be less than N or greater than N."); Ex. 1009, 7 (Patent Owner arguing before the District Court that "this embodiment only 'selects' in the specific instance '[w]here N' is less than N" and acknowledging, "[t]hus, when N' is equal to or greater than N, *no selection is needed*") (internal citations omitted). Accordingly, even within the disclosed crowd control function, the client does not always select N' avatars from the N provided by the server.

In light of these disclosures, we do not find the specification to support restricting the scope of the determining step of claim 1 of the '856 patent to the client-side crowd control function, and more particularly,

the selection of N' avatars from the N provided by the server. *See*, *e.g.*, Ex. 1001, 5:32–6:8; *see also id.* at 16:16–22 ("The above description is illustrative and not restrictive."). Even Patent Owner's Response supports the non-limiting nature of the client-side crowd control function, as it uses permissive language, such as "may," "can," and "[i]n this case," to describe the function. Resp. 15–16; *see id.* at 18 n.2 ("Patent Owner does not contend that selecting N' avatars is the sole disclosed mechanism of client-side crowd control in the challenged patent."); Tr. 18:10–25. Given the absence of clear evidence supporting such an intent as well as other aspects of the preferred embodiment that support the broader claim language (rendering engine 120), we will not limit the determining step of claim 1 to this particular feature of the preferred embodiment disclosed in the specification. *See, e.g.*, *Golight, Inc. v. Wal-Mart Stores, Inc.*, 355 F.3d 1327, 1330–32 (Fed. Cir. 2004) (refusing to import a requirement into claim, reasoning that "this particular advantage" described in the written description "is but one feature," among other disclosed significant features of the invention and each claim is not required to "include" or be "'limited to'" each such disclosed "advantage[] or feature[]").

Second, Patent Owner argues that Petitioner's proposed construction fails to differentiate between "determining" and the act of "displaying the view point of an avatar as described in the ['856] patent." Resp. 17–18; *see* Tr. 96:17–19, 97:1–3, 98:13–14. Patent Owner, implicitly in its Response and explicitly at oral argument, equates rendering with displaying—often making consolidated references to "rendering/displaying" or the "rendering/display process" in the Response, Resp. 18, 24, and arguing at the oral hearing that "display . . . is what is happening in the rendering engine," "displaying includes what is happening at the rendering engine,"

and "[r]endering is part of the display process," Tr. 97:14–22, 99:4–7, 99:19–24, 102:24–103:4. From this premise, Patent Owner then argues that the '856 patent specification discloses the "'view point (position and orientation) of A's avatar' solely as part of the process of rendering the view of the virtual world" or the "rendering/display process" at the rendering engine. Resp. 18 (quoting Ex. 1001, 7:50–52); *see id.* at 24. Therefore, according to Patent Owner, the field of view filtering at the rendering engine is "part of the display"—not "determining"—and Petitioner is "wrong and contradict[s] the specification" in arguing that the determining step can include a field of view determination. Resp. 18; Tr. 100:3–6, 102:24–103:3. Instead, Patent Owner argues that the determining step should be interpreted as "separate from" and before "the 'view point' rendering/display process of the rendering engine." Resp. 23–24; Tr. 97:1–3, 101:12–16.

Petitioner responds that Patent Owner improperly seeks to characterize the entire graphics pipeline or rendering process as a single component corresponding to the claimed "display," but the specification instead "supports interpreting the rendering process as separate from the act of displaying." Reply 8–9 (quoting Ex. 1001, 4:48–51); *see* Tr. 21:1–21, 184:11–186:14 (referring to Figure 4 of the '856 patent). According to Petitioner, Patent Owner "appears to improperly conflate data processing aspects of the rendering process," such as the activities at rendering engine 120 in the specification, "with the separate act of displaying." Reply 9; Tr. 184:11–186:14.

Patent Owner's arguments regarding the rendering engine again appear to be improperly attempting to limit the broader language of the determining step to the precise way the specification describes the preferred embodiment—without sufficient supporting evidence that the claim

language is intended to be so limited. *See, e.g.*, *GE Lighting*, 750 F.3d at 1309. Moreover, we agree with Petitioner that the specification does not support the fundamental premise of Patent Owner's arguments—that the entire rendering process at the rendering engine, including the field of view determination, must constitute "display," within the meaning of the claim language. *See* Reply 8–9; Resp. 18, 24; Tr. 21:1–21, 97:14–22, 99:4–7, 99:19–24, 102:24–103:4, 184:11–186:14. The specification instead supports understanding "display" as the output of the disclosed rendering engine and, at minimum, a step distinct from the field of view filtering determination.

For example, as Petitioner points out, the specification states that "methods and means for executing programs and displaying graphical results thereof" were "well known in the art" and "[o]ne such program executed by client system 60 is a graphical rendering engine which generates the user's view of the virtual world." Ex. 1001, 4:46–51; Reply 9. This passage refers to the rendering engine as an executed program and also distinctly refers to "displaying the graphical results" of such a program, which contradicts Patent Owner's attempt to classify all of the activities of the rendering engine as display. Also, Patent Owner acknowledged at the oral hearing that Figure 4 of the '856 patent shows that "field of view is the first stage of the rendering engine" and "the display is the output . . . of the rendering engine." Tr. 103:14–19; *see id.* at 184:14–186:14; Ex. 1001, Fig. 4. As Petitioner argues, these disclosures and Figure 4 contradict Patent Owner's attempts to classify all of the activities of the rendering engine as "display," within the meaning of the claim language and thus, exclude the field of view determination of the rendering engine from the scope of the determining step. *See* Reply 8–9; Tr. 184:14–186:14. Accordingly, we find Patent Owner's arguments to lack merit.

The parties do not rely on the prosecution history of the '856 patent, or related patents, to support their arguments regarding the scope of the determining step. *See* Pet. 11–13; Resp. 13–24; Reply 4–10. Having reviewed the '856 patent prosecution history, we do not see any amendments or arguments that would demonstrate an intent by Patent Owner to narrow the meaning of the claim language or otherwise inform the resolution of the parties' dispute regarding the scope of the step. *See generally* Ex. 1004.

In sum, the intrinsic evidence of record demonstrates that the determining step should be given its ordinary meaning and this meaning encompasses Petitioner's proposed claim scope.

As to the extrinsic evidence, we also agree with Petitioner that the portions of Mr. Pesce's testimony cited in the Reply support Petitioner's position that the determining step encompasses a field of view determination. *See* Reply 6–9; Tr. 21:1–21. First, Mr. Pesce testified that "determining" had "no special meaning" and was not a "term of art" in the relevant field in 1995 and described the term as "vague" and a "catchall." Ex. 1046, 240:17–24, 242:7–19, 243:11–244:9. He further explained that "the rendering engine . . . cull[s] objects that don't fall into the field of view" and characterized this culling as "a calculation." *Id.* at 241:14–24. And he agreed that "one of the purposes of the rendering pipeline is to calculate what will be displayed to the user." *Id.* at 242:1–6. He further agreed that a "calculation would fall under th[e] loose" or "vague" "use of determining," which he explained to be "you can do this to determine this result." *Id.* at 243:23–244:15. Together, this testimony of Mr. Pesce demonstrably supports understanding field of view filtering, including by the rendering engine, to fall under the plain meaning of the determining step, "determining" the avatars "to be displayed to the . . . user." *See* Reply 6–7.

Second, Mr. Pesce's testimony undermines Patent Owner's attempts to treat the entire rendering process, or graphics pipeline, as corresponding to "display"—and therefore, not "determining"—within the meaning of the claim language. *See id.* at 8–9. Mr. Pesce testified that *field of view filtering or culling* "is generally the *first stage* in a graphics pipeline." Ex. 1046, 215:19–216:2 (emphasis added); *see id.* at 311:17–312:6; Tr. 114:1–4. According to Mr. Pesce, however, "the *display* has always been the *last stage* in a rendering pipeline." Ex. 1046, 318:16–319:4 (emphasis added); *see id.* at 317:20–318:7. He further explained that the "display" is the "end-stage output device" of the graphics pipeline. *Id.* at 318:9–13. Thus, according to Mr. Pesce, the rendering pipeline is a multi-stage process, of which field of view filtering and display are distinct stages—field of view filtering is an initial stage, whereas the display is the last stage or output. We agree with Petitioner that this testimony supports Petitioner's position that the determining step can encompass a field of view determination (an initial stage of the rendering pipeline) without overlapping with or having the same meaning as display (the last stage or output of the rendering pipeline). Reply 8–9; Tr. 20:24–21:21.

Finally, Patent Owner argued at the oral hearing that Dr. Zyda's testimony supported its arguments regarding "rendering" and "display," contending that Dr. Zyda testified that "display" "means" or refers to the "whole concept" of "send[ing] geometry through the graphics pipeline," including "render[ing] into pixels and frame buffer" and "drawing something to a display." Tr. 98:3–100:2, 112:24–113:2. Petitioner asserts Patent Owner's argument takes Dr. Zyda's testimony out of context. *See id.* at 181:19–182:9.

Dr. Zyda testified that "display" is an "overloaded word" that "can mean many, many things," for example, "a graphics display just might be a screen to display something, might be showing you this picture." Ex. 2016, 114:2–10. He then stated, "In the technical computer graphics sense, display is not a word that people use that much. They would typically say we're going to send this geometry through the graphics pipeline where it would be rendered into pixels and frame buffer." *Id.* at 114:10–17. He also testified that "render" "means" "[s]end through the graphics pipeline so that you have finished pixels at the end." *Id.* at 113:7–11; *see id.* at 113:22–25; Resp. 17 (citing Ex. 2016, 113:9–11).

We do not find Dr. Zyda's testimony to support Patent Owner's arguments. Dr. Zyda refers to various meanings for "display." Yet we do not agree with Patent Owner's implication that Dr. Zyda defined "display" as referring to the entire rendering pipeline, and instead understand his testimony to offer alternative terminology related to the graphics pipeline and rendering that is more common in the art than "display." We find his testimony regarding "display" and "rendering" to be consistent with rendering being a multi-step process that ends with or outputs a display, as Mr. Pesce testified. *See* Reply 9. Moreover, even if Dr. Zyda's testimony were to lend support to Patent Owner's arguments, we do not find it to have sufficient clarity and weight to overcome the contrary intrinsic and extrinsic evidence on this issue.

In sum, for the reasons given above, we agree with Petitioner that the ordinary meaning of the determining step of claim 1 of the '856 patent—"determining, from the received positions, a set of the second avatars that are to be displayed to the first user"—read in light of the specification, encompasses executing a client process to determine, from user positions

received from the server, other user' avatar(s) located within a point of view or perspective (*e.g.*, field of view) of the first user.

3. *Avatar*

The parties' post-institution arguments require that we address the proper scope of the claim term "avatar." Pet. 11; Paper 12 ("Prelim. Resp."), 8 (explaining that Patent Owner used Petitioner's proposed construction of "avatar" in its Preliminary Response); Resp. 24–25, 33–35; Reply 10–12. In the Petition, Petitioner argues that "avatar" should be construed to mean "a graphical representation of a user," citing as support the '856 patent specification's explanation that "[t]he virtual world shows avatars representing the other users who are neighbors of the user viewing the virtual world." Pet. 11 (quoting Ex. 1001, 2:36–38). With supporting testimony from Dr. Zyda as well as a definition from the MICROSOFT PRESS COMPUTER DICTIONARY (3d. ed. 1997), Petitioner contends that its proposed construction is consistent with how one of ordinary skill would have understood the term. *Id.* (citing Ex. 1002 ¶ 57; Ex. 1010).

In its Response, Patent Owner argues that the proper construction of "avatar," under either the broadest reasonable interpretation or the *Phillips* standard, is "a *three-dimensional* graphical representation of a user." Resp. 25, 33 (emphasis added). Patent Owner directs our attention to the District Court's construction of "avatar" as "a graphical representation of the user in three-dimensional form." *Id.* at 24 (citing Ex. 2006, 20–24); Tr. 126:17–20. Patent Owner, with supporting testimony from Mr. Pesce, contends that a construction limiting an avatar to a "three-dimensional" form is "consistent with the ['856 patent] specification . . . and the interpretation that would be reached by a person of ordinary skill in the art." Resp. 24 (citing Ex. 2017 ¶ 49.a). Patent Owner asserts that the '856 patent is

"consistent in" its description of an avatar as "three-dimensional." *Id.* (citing Ex. 1001, 3:20–22, 6:8–11, 7:36–39). Moreover, at the hearing, Patent Owner argued that column 3, lines 20–22 of the '856 patent specification[9] comes "fairly close to" and is "practically lexicography," given the quotation marks around the term "avatar." Tr. 127:17–129:6, 130:14–15, 135:16–19, 140:7–12. In addition, Patent Owner argues that the District Court properly recognized that "the 'crowd control' issue at the heart of [the '856] patent is an issue implicated by the more complex three-dimensional system." Resp. 24–25 (quoting Ex. 2006, 21); *see* Tr. 130:15–21, 140:14–21.

Petitioner responds that its proposed construction of "avatar" is proper under both the broadest reasonable interpretation and the *Phillips* standards. Reply 4, 10–12. Petitioner contends Patent Owner's attempt to limit the term to "three-dimensional" representations "improperly import[s] a term" from the specification "that could have been recited in the claims, but was not." *Id.* at 10; Tr. 174:20–175:2, 180:16–18. Petitioner asserts that the '856 patent does not define an "avatar" to be three-dimensional and the specification is explicit that column 3, lines 20–22, to which Patent Owner cites, is referring to a specific "example" in Figure 1, which is "illustrative and not restrictive"—not a fundamental aspect of the invention. Reply 10–11 (quoting Ex. 1001, 3:1–8, 3:17–20, 16:16–22); *see* Tr. 39:11–15.

[9] We held a consolidated hearing on this and the other *inter partes* reviews listed in § I.A involving related patents with specifications nearly identical to the '856 patent. As a result, the hearing arguments sometimes refer to the specification of one of the related patents, rather than to the '856 patent. Throughout this Decision, we have adjusted relevant citations from the hearing to refer to the specification of the '856 patent.

Moreover, Petitioner contends that the specification, even when describing avatars that it refers to as "three-dimensional," does not describe "true-three dimensional renderings," which contradicts Patent Owner's attempt to limit the term to precisely three-dimensional figures. Reply 11; Tr. 43:8–45:10, 164:17–25. According to Petitioner, the specification's explanation that an avatar "comprises N two-dimensional panels, where the i-th panel is the view of the avatar from an angle of 360*i/N degrees" demonstrates that the avatars are "two-dimensional panels" and the panel displayed depends on the user's viewing angle, a technique similar to that which Mr. Pesce described as "quasi-3D." Reply 11 (quoting Ex. 1001, 7:34–39; Ex. 1046, 204:12–205:20); Tr. 43:8–45:10, 164:17–25.

Petitioner also proffers a claim differentiation argument, asserting that the related '501 patent includes a claim, for example, that expressly recites a "*three dimensional* avatar" and, thus, construing the term "avatar" alone to require "three-dimensional" would render meaningless the additional claim language in violation of governing precedent. Reply 12 (emphasis added); Tr. 37:20–25, 39:5–40:11, 41:3–5, 43:1–7, 178:4–7. According to Petitioner, Patent Owner's decision to include "three dimensional" before "avatar" in some claims reflects that the plain and ordinary meaning of "avatar" is not so limited. *See* Reply 10, 12; Tr. 39:16–40:11.

In addition, Petitioner argues that Mr. Pesce's testimony in support of Patent Owner's attempt to limit "avatar" to be three-dimensional is "not credible," "unsubstantiated," "inconsistent," and in conflict with the record, including the MICROSOFT PRESS COMPUTER DICTIONARY's definition. Reply 2–3, 11–12; Tr. 45:13–46:9.

Here, both Petitioner and Patent Owner's proposed constructions represent that an "avatar" is a "graphical representation of a user." Pet. 11;

Resp. 25, 33. The parties dispute only whether that representation must be "three-dimensional," as Patent Owner urges. *See* Pet. 11; Resp. 24–25, 33–35; Reply 10–12; Tr. 127:6–11. We address each issue in turn.

First, as noted above, there is no dispute in the record that an "avatar" is a "graphical representation of a user," as the parties, their experts, and the construction adopted by the District Court are in agreement on this point. *See*, *e.g.*, Pet. 11; Resp. 25; Ex. 2006, 24; Tr. 127:6–11; *see also* Ex. 1002 ¶ 57; Ex. 2017 ¶ 49.a.ii–iii. Having reviewed the intrinsic record of the '856 patent, we agree that "avatar" refers to a "graphical representation of a user." Challenged claim 1 recites "[a] method for enabling" users to interact "in a virtual space, wherein the first user is associated with at first avatar" and "each second user is associated with a different second avatar," which involves "determining . . . a set of the second avatars that are to be displayed to the first user." Ex. 1001, 21:6–22. Independent claim 6, in turn, provides for a client device, with "each user being associated with an avatar representing said each user in the virtual space," which displays other users' avatars to a first user. *Id.* at 22:5–21. The written description explains that in the preferred embodiment, "[t]he virtual world shows avatars representing other users who are neighbors of the user viewing the virtual wor[l]d" and each avatar is a figure "chosen by the user to represent the user in the virtual world." *Id.* at [57], 2:33–38, 3:20–22, Fig. 1. This claim language and description demonstrate that an avatar represents a particular user in a graphical virtual space. Neither party points us to any relevant prosecution history, nor do we see any. *See generally* Pet.; Resp.; Reply; Ex. 1004. Accordingly, the intrinsic record demonstrably supports the parties' positions that an avatar is a "graphical representation of a user."

Considering the submitted extrinsic evidence, we find it to persuasively support that "avatar" refers to a "graphical representation of a user." MICROSOFT PRESS COMPUTER DICTIONARY (3d. ed. 1997),[10] proffered by Petitioner, defines "avatar" as: "In virtual-reality environments such as certain types of Internet chat rooms, *a graphical representation of a user*." Ex. 1010, 38 (emphasis added); *see* Pet. 11. Moreover, Dr. Zyda and Mr. Pesce testify in agreement on this issue. Ex. 1002 ¶ 57; Ex. 2017 ¶ 49.a.ii–iii.

Second, we consider the contested issue of whether the "graphical representation of a user" must be "three-dimensional" to come within the meaning of "avatar." We conclude the broadest reasonable interpretation of the term, in light of the '856 patent specification, is not so limited.

We acknowledge that the District Court, applying the *Phillips* standard, answered this disputed question in the affirmative, determining that the patent limits the meaning of "avatar" to three-dimensional graphical representations. Ex. 2006, 20–24; *see* Resp. 24–25. Although the District Court's interpretation is informative, we are not bound by that construction. *See Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 1326 (Fed. Cir. 2015) ("There is no dispute that the board is not generally bound by a prior judicial construction of a claim term."). We note that applicable legal standards differ; for example, a district court applies the *Phillips* claim construction

[10] The MICROSOFT PRESS COMPUTER DICTIONARY has a copyright date of 1997, which is after the filing of the '296 provisional, to which the parties agree, for purposes of this proceeding, the '856 patent is entitled to priority. *See* Ex. 1001, [60]; *supra* n.2. Neither party raised this issue. Nonetheless, we determine that the 1997 dictionary is sufficiently contemporaneous to the filing date of the '296 provisional, November 13, 1995, to inform the ordinary meaning of the term at the relevant time period.

standard and a presumption of validity, neither of which apply in an *inter partes* review of an unexpired patent. *See, e.g.*, Ex. 2006, 2–3, 5–6, 22–24. Moreover, Petitioner is not a named party in the District Court Case and the supporting arguments and evidence in the record before us are not identical to those proffered to the District Court. *See, e.g.*, *id.* at 1, 20–24; Pet. 11; Resp. 24–25, 33–35; Reply 10–12. We have considered carefully the District Court's claim construction, *see Power Integrations*, 797 F.3d at 1324–27, but for the reasons given below, we determine that "avatar," particularly the broadest reasonable interpretation thereof, is not restricted to "three-dimensional."

We begin our analysis with the language of the claims. We see nothing in challenged independent claim 1, as well as the other claims of the '856 patent, that would require or even suggest that a representation of a user must be three-dimensional to be an "avatar" within the meaning of the claim language. *See* Ex. 1001, 21:6–22:59. We note that in arguing that the meaning of "avatar" is so limited, Patent Owner does not cite or refer to any supporting claim language. *See, e.g.*, Resp. 24–25.

In light of Petitioner's claim differentiation argument, we also consider the claim language of other patents in the same family, including the '501 patent and the '998 patent. *See, e.g.*, Reply 5, 12. "[W]e presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning." *Omega Eng'g*, 334 F.3d at 1334. More specifically, where "patents all derive from the same parent application and share many common terms, we must interpret the claims consistently across" the patents. *NTP*, 418 F.3d at 1293.

The doctrine of claim differentiation applies across related patents but "is not as strong" as within the same patent. *Clare v. Chrysler Group LLC*,

819 F.3d 1323, 1330 (Fed. Cir. 2016); *see In re Rambus Inc.*, 694 F.3d 42, 48 (Fed. Cir. 2012) (applying claim differentiation across related patents). The doctrine creates a presumption that "two independent claims have different scope when different words or phrases are used in those claims." *Seachange Int'l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005) (citations omitted). The doctrine "takes on relevance in the context of a claim construction that would render additional, or different, language in another independent claim superfluous." *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) (internal citation and quotations omitted).

Here, the '856, '501, and '998 patents share a common specification and many claim terms, including "avatar," and each patent claims priority to the '296 provisional and issued from three common continuation applications. *See* Ex. 1001, [60], [63]; Ex. 2043, [60], [63]; Ex. 2044, [60], [63]; *see generally* Ex. 1001; Ex. 2043; Ex. 2044. Accordingly, in the absence of evidence compelling otherwise—of which, as explained below, we see none in the record—"avatar" has the same meaning in these patents.

In contrast to the '856 patent claims, which recite "avatar," independent claims 1, 12, and 14 of the '501 patent and independent claims 2, 18, and 19 of the '998 patent specifically recite a "*three dimensional* avatar." *See* Ex. 1001, 21:6–22:59; Ex. 2043, 19:19–38, 20:14–52 (emphasis added); Ex. 2044, 19:31–56, 20:45–22:13 (emphasis added); Reply 12. Like the '856 patent claims, however, independent claim 1 of the '998 patent recites the term "avatar" alone, without the "three dimensional" modifier. *See* Ex. 2044, 19:11–30.

We agree with Petitioner that adopting Patent Owner's proposed construction of "avatar"—which requires the graphical representation to be

three-dimensional—would render the additional modifying limitation "three dimensional" in claims 1, 12, and 14 of the '501 patent and claims 2, 18, and 19 of the '998 patent meaningless or superfluous. *See* Reply 2, 12; Tr. 37:20–25, 39:5–40:11, 41:3–5, 43:1–7, 178:4–7. Patent Owner acknowledged this at the oral hearing. Tr. 129:22–130:12 (Patent Owner responding to question regarding whether its proposed construction, when "plugged" into the '501 and other patent claims requiring a "three-dimensional" avatar would render "three-dimensional" superfluous with "I think it has to, Your Honor. I think it has to."); *see also* Ex. 1046, 100:1–19, 104:13–105:4. Such a result weighs against adopting Patent Owner's proffered "three-dimensional" requirement. *Arlington Indus.*, 632 F.3d at 1254–55 (reasoning that "[r]eading . . . limitation[s]," which are included in some claims but not others, into another claim term "would render these additional modifiers superfluous, which weighs against doing so"); *Cat Tech LLC v. TubeMaster, Inc.*, 528 F.3d 871, 885 (Fed. Cir. 2008) (refusing to adopt a construction that would render a claim limitation meaningless). If "avatar," alone, required a three-dimensional graphical representation, as Patent Owner argues, there would be no need for the additional "three dimensional" claim language in the '501 and '998 patents. *See Rambus*, 694 F.3d at 48 (rejecting argument that claim term "memory device" requires a single chip, where dependent claim of related patent added limitation requiring a single chip, because "if a memory device were always a single chip[,] there would be no need to use the word 'single'" in the dependent claim); *Phillips*, 415 F.3d at 1314, 1325 (explaining that claim language "steel baffles" "strongly implies that the term 'baffles' does not inherently mean objects made of steel" and similarly, claim language providing "baffles are placed 'projecting inwardly from the outer shell at

angles tending to deflect projectiles[’] . . . would be unnecessary if persons of skill in the art understood that the baffles inherently served such a function”).

Accordingly, we agree with Petitioner that the differentiation in the claim language—“avatar” versus “*three dimensional* avatar”—supports that the ordinary and customary meaning of the term “avatar” is not limited to “three-dimensional,” and neither is any potential more specific meaning of the term in the context of these patents (which we determine below there is not). *See* Reply 12; Tr. 39:24–40:2; *see also id.* at 37:20–25, 39:5–40:11, 41:3–5, 43:1–7, 178:4–7. Moreover, if the patentee intended to require that “avatar,” as recited in claim 1 of the ’856 patent, be limited to “three-dimensional,” it could have included such an express limitation in the claim as it did in the ’501 and ’998 patents—but notably did not. We are cognizant that the force of claim differentiation is less across related patents and the doctrine creates only a presumption, not a “hard and fast rule” of claim construction, *e.g.*, *Clare*, 819 F.3d at 1330; *Seachange*, 413 F.3d at 1368–69, but as we explain below, nothing in the remainder of the intrinsic record of the ’856 patent dictates to the contrary.

We next consider the written description of the ’856 patent. We agree with Patent Owner that the written description refers to avatars as three-dimensional figures—but we do not find these descriptions of the preferred embodiment, and specific examples thereof, to be limiting or restrictive. Patent Owner supports its position that an “avatar” must be three-dimensional with citations to column 3, lines 20–22 and column 6, lines 8–11 of the ’856 patent specification—which state, respectively, that Figure 1 shows “two ‘avatars’ 18. Each avatar 18 is a three-dimensional figure chosen by a user to represent the user in the virtual world” and that

"[t]he orientation is needed for rendering because the avatar images are three-dimensional and look different (in most cases) from different angles." *See* Ex. 1001, 3:17–22, 6:8–11; Resp. 24. Yet as Petitioner points out, the specification makes clear that these disclosures are describing the "preferred embodiment," "using the *example* of a client-server architecture for use in a virtual world 'chat' system." Ex. 1001, 2:62–3:3 (emphasis added); *see* Reply 10–11. In addition, regarding the discussion at column 3, lines 20–22 in particular, the specification further explains that it is discussing Figure 1 as an "*example*" and "*illustration*" of "what such a client might display." Ex. 1001, 3:8, 3:17–18 (emphases added); *see* Reply 10–11. Even Patent Owner acknowledges that Figure 1 is merely exemplary. *See* Tr. 129:1–21 ("I'm not saying that figure 1 is the invention . . . . I think [figure 1] has to be an example, yes."). Moreover, the specification expressly instructs that the disclosed preferred embodiment and examples are "*illustrative and not restrictive*." Ex. 1001, 16:16–22 (emphasis added); *see* Reply 11.[11] These references to avatars as three-dimensional in the preferred embodiment, including specific examples thereof, do not suffice to limit the claim term "avatar." *See Aventis*, 675 F.3d at 1330–31 ("[I]t is . . . not enough that the only embodiments, or all of the embodiments, contain a particular limitation to limit a claim term beyond its ordinary meaning.") (internal citations and quotations omitted).

[11] Neither party cites to the disclosure, but we note that the "Brief Description of the Drawings" refers to Figure 1 as "a client screen view in a virtual world system according to the present invention." Ex. 1001, 2:50–53. We do not find this statement in the overview of the drawings to overcome the express statements in the detailed description explaining that the figure is an "example" and "illustration" that is "not restrictive." *Id.* at 3:8–18, 16:16–22; *see* Tr. 41:16–42:25, 129:1–21.

With regard to Patent Owner's argument raised at oral hearing that column 3, lines 20–22 of the specification comes "awfully" and "fairly close to" and is "practically lexicography," we first note that Patent Owner repeatedly used hedging phrases—"awfully close," "fairly close," "fairly clear," and "practically"—and also offered modifications to the specification's language that might have clarified that the disclosure was intended to be definitional—suggesting that Patent Owner itself does not view the statement, as written, as sufficiently clear to constitute lexicography. Tr. 127:17–129:6 ("[I]f we didn't have 18 in the following sentence, if it just said each avatar, instead of each avatar 18, I think there would be very little question of whether it is definitional."); *id.* at 130:14–15, 135:16–19, 140:7–12. To the extent Patent Owner intended to argue that this statement constitutes lexicography, we disagree and find to the contrary. The quotation marks around avatar, on which Patent Owner focuses, are insufficient to clearly demonstrate an intent to limit or redefine the term "avatar," particularly given the express statements in the specification that this disclosure regarding Figure 1 is exemplary and illustrative, outlined above. *See* Ex. 1001, 2:62–3:3, 3:8, 3:17–22; Tr. 127:17–19, 128:8–11, 129:2–6. We also agree with Petitioner that the explanation that "[e]ach avatar 18 is a three-dimensional figure" relates to the two figures depicted in Figure 1. Ex. 1001, 3:20–21, Fig. 1; *see* Reply 10–11.

Moreover, turning to column 7, lines 34–39 of the specification, to which both parties cite in support of their positions, we agree with Petitioner that this disclosure undermines Patent Owner's position that "avatar" should be limited to three-dimensional representations. *See* Resp. 24; Reply 11. This portion of the specification explains that an avatar, stored in the relevant database, "comprises N *two-dimensional panels*, where the i-th

panel is the view of the avatar from an angle of 360*i/N degrees." Ex. 1001, 7:34–39 (emphasis added); *see id.* at 6:13–17. The arguments and evidence before us support Petitioner's assertion that this passage, describing avatars in the preferred embodiment that the specification refers to as three-dimensional, are not true three-dimensional renderings and instead can be created using shortcuts designed to create the illusion of three-dimensional renderings, which were known in the art. *See* Reply 11 (citing Ex. 1046, 204:12–205:20); Tr. 43:8–45:10, 50:9–13, 164:17–25 (Petitioner); *id.* at 132:25–133:23, 143:23–144:5 (Patent Owner); *see also* Ex. 2017 ¶ 40 (Mr. Pesce testifying that the 1992 game Wolfstein 3D "used a variety of mathematical cheats to produce the illusion of a full 3D environment"); Ex. 1046, 204:12–205:20 (Mr. Pesce testifying that Wolfstein 3D used "cheats in the art[] to produce the effect of 3-D" and the "appear[ance of] three-dimensional" figures but he believes the figures were "actually draw[n]" or "handled . . . mathematically as two-dimensional" in a "quasi-3D" technique).[12] At the hearing, Patent Owner similarly explained

[12] Neither party cites to the specification's references to a "three-dimensional . . . system" and "space" (Ex. 1001, [57], 2:31–35) on the issue of whether an "avatar" must be three-dimensional, but we note that the evidence before us shows that these references do not operate to limit "avatar" to be three-dimensional. As we explain, the record arguments and evidence demonstrate that there were known techniques to create the illusion of a three-dimensional graphical rendering in a three-dimensional environment, without the rendering being truly three-dimensional. Similarly, the evidence before us shows, and Patent Owner acknowledges, that there can be virtual beings in less than three-dimensions within a three-dimensional environment. *See, e.g.*, Resp. 33–34 (arguing that despite Durward's disclosure of a "three-dimensional virtual space," its virtual entities would have been understood to be two-dimensional); Tr. 134:8–135:6 (asserting the same); *see also, e.g.*, Ex. 2017 ¶¶ 40, 59 (opining the same); Ex. 1046,

that this passage involves a "shortcut" aimed to "try[] to achieve" that the "appearance of the[] panels to a user is a 3-D avatar." Tr. 132:2–133:23; *see id.* at 143:23–144:5; Resp. 24. In sum, this passage further supports concluding that "avatar," in light of the specification, cannot be limited exclusively to three-dimensional representations, as Patent Owner urges.

Finally, we do not find Patent Owner's assertion that "[t]he District Court . . . correctly stated that 'the "crowd control" issue at the heart of this patent is an issue implicated by the more complex-three dimensional system, as opposed to the two-dimensional systems that did not require as much strain on computing resources'" to support limiting the meaning of "avatar" to three-dimensional. Resp. 24–25 (quoting Ex. 2006, 21); Tr. 130:16–21, 140:14–21; *see* Ex. 2017 ¶ 49.a.v; Ex. 2006, 21. That the crowd control functionality discussed in the specification may be better suited to, or useful for, three-dimensional systems with three-dimensional virtual beings does not operate to limit the invention to virtual beings, or avatars, in three-dimensional form. *See, e.g.*, *Rambus*, 694 F.3d at 47 (determining that "preferred embodiments and goals of the invention that [patentee] argues are better met by single chip devices" did not "restrict the invention to single chip memory devices").

In conclusion, we agree with Petitioner that Patent Owner's attempt to limit "avatar" to three-dimensional representations improperly seeks to import a limitation—"three-dimensional"—from the specification, including the preferred embodiment and specific examples thereof, into the claims. *See* Reply 10–11; Tr. 174:20–175:2, 180:16–18; *GE Lighting*, 750 F.3d at 1309. We find that the specification's references to avatars as

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85:8–86:11 (explaining that it is possible to have entities that are "2-D representations in a 3-D world"); *id.* at 204:12–205:20.

three-dimensional in its preferred embodiment, and examples thereof, do not rise to the level of either lexicography or disavowal—whether express or implicit. There is not a clear indication of an intent to define "avatar" or to restrict the term to three-dimensional representations. Nor is there any language of manifest exclusion or restriction. Nothing in the specification indicates that an avatar being three-dimensional is an essential feature of, or a required limitation of, the claimed method or an advantage of the recited method over the prior art. *See, e.g.*, *GE Lighting*, 750 F.3d at 1309; *Aventis*, 675 F.3d at 1331; *Seachange*, 413 F.3d at 1370.

The prosecution history of the '856 patent likewise does not evidence a disavowal of claim scope or redefinition of "avatar." Neither party refers to prosecution history for the construction of "avatar," yet based on our review, we see no amendments or arguments that would show an intent to define or narrow the term. *See* Ex. 1004.

In sum, based on the intrinsic record of the '856 patent, as well as closely related patents sharing the same specification and common ancestors, we conclude that the ordinary and customary meaning of the term "avatar," as used in the specification, is not limited to three-dimensional graphical representations, and the patentee did not narrow this ordinary meaning by acting as a lexicographer or disavowing claim scope.

This conclusion is supported by the extrinsic evidence of record, which is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (internal citations and quotations omitted). As we explain above, the MICROSOFT PRESS COMPUTER DICTIONARY (3d. ed. 1997) defines "avatar" as "a graphical representation of a user." Ex. 1010, 38; *see* Pet. 11; Reply 12. Notably, this definition does not restrict the graphical representation to

three-dimensional—which supports Petitioner's position that the ordinary meaning of the term in November 1995, the effective filing date of the patent, was not so limited. *See* Tr. 46:10–17; Reply 12.

As to Mr. Pesce's testimony on the issue, Mr. Pesce provides, in his declaration, a general overview of the development of virtual environments from early 1991 through 1996, including challenges and advancements during an alleged transition from two-dimensional to three-dimensional techniques. *See* Ex. 2017 ¶¶ 36–44, 49.a.iv, 59. Mr. Pesce testifies that in September 1993, virtual entities, including those in a "three-dimensional virtual space[]," "would have been understood by a [person of ordinary skill in the art] to be two-dimensional given the limitations of available software to render a three-dimensional entity," even in "very high end computers and implementations." Ex. 2017 ¶ 59; *see* Ex. 1008 [22]; Ex. 1046, 85:4–86:11. He also testifies that 1994–1996 "represent a fulcrum," as "real-time computer graphics switched from 2D to 3D techniques" and that reading the '856 patent in this context makes clear that the term "avatar," as used in the patent, is "a three-dimensional graphical representation of a user." Ex. 2017 ¶¶ 44, 49.a.iv. At his deposition, Mr. Pesce further testified that, although he did not "know that [he] could be definitive," he is "fairly positive that by '95, late '95, sort of around the frame of these patents, that 'avatar' would have necessarily implied 3-D." Ex. 1046, 89:10–90:1.

We find Mr. Pesce's testimony, outlined above, that from late 1993—when an "avatar" referred to a two-dimensional virtual entity and such a representation was used even in high end technology—to 1995, the effective filing date of the '856 patent, virtual reality changed so rapidly that the ordinary meaning of "avatar" no longer encompassed two-dimensional entities and instead required three-dimensionality to be unsupported and

internally inconsistent. This testimony is contradicted by Mr. Pesce's own testimony that "[t]hree-dimensional user representations" were only "*starting to become known in the art by 1995*." *Id.* at 222:1–4 (emphasis added). Mr. Pesce also testified that the "first time" he saw an avatar in Virtual Reality Modeling Language ("VRML")—which he worked on beginning in December 1993 and describes as a "standard for the presentation of three-dimensional worlds"—was "[s]omewhere between late 1995 and early 1996." *Id.* at 41:18–42:15, 222:9–223:6; Ex. 2017 ¶¶ 41–42.

Moreover, as Petitioner points out and Patent Owner explicitly acknowledged at the hearing, Mr. Pesce's testimony on this issue wholly lacks supporting or corroborating evidence. *See* Reply 2–3, 11–12; Ex. 2017 ¶¶ 36–44, 49.a.iv, 59; Tr. 45:13–46:9, 138:9–11, 138:19–139:7. In addition, it conflicts with the definition from the MICROSOFT PRESS COMPUTER DICTIONARY, which, despite being published in 1997—well after the alleged shift in the art, according to Mr. Pesce, that restricted an "avatar" to three-dimensional form—does not require three-dimensionality. *See* Ex. 1010, 38; Tr. 46:12–17.

We find Mr. Pesce's inconsistent and unsupported testimony, which contradicts other record evidence, unpersuasive. Accordingly, we accord minimal probative weight to his opinion that in late 1995, the effective filing date of the '856 patent, the ordinary meaning of the term "avatar" to one of ordinary skill was restricted to three-dimensional representations. *See* 37 C.F.R. § 42.65(a); *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (explaining that "the Board has broad discretion" to weigh declarations and to "conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations"); *Rohm & Haas Co.*

v. Brotech Corp., 127 F.3d 1089, 1092 (Fed. Cir. 1997) ("Nothing in the [federal] rules [of evidence] or in our jurisprudence requires the fact finder to credit the unsupported assertions of an expert witness.").

Accordingly, based on the record before us, we agree with both parties that "avatar," as recited in claim 1 of the '856 patent, refers to "a graphical representation of a user," and further determine that its broadest reasonable interpretation, in light of the specification, is not limited to three-dimensional graphical representations.

D. ANTICIPATION BY FUNKHOUSER

We turn to the instituted grounds. We first address Petitioner's assertion that Funkhouser anticipates claim 1 of the '856 patent and Patent Owner's responsive arguments.

1. *Funkhouser's Status as Prior Art*

In this *inter partes* review, Petitioner has the burden of persuasion to establish unpatentability—including "all issues relating to the status of [Funkhouser] as prior art," *Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1576–78 (Fed. Cir. 1996)—by a "preponderance of the evidence," *see* 35 U.S.C. § 316(e); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378–79 (Fed. Cir. 2015). This burden of persuasion remains with and never shifts from Petitioner, while the burden of production—the burden of going forward with evidence, which "may entail producing additional evidence and presenting persuasive argument based on new evidence or evidence already of record"—shifts between the parties. *Dynamic Drinkware*, 800 F.3d at 1378–80 (internal quotations and citation omitted); *see Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327–29 (Fed. Cir. 2008); *Mahurkar*, 79 F.3d at 1576–77.

Here, the parties dispute whether Funkhouser qualifies as prior art to claim 1 of the '856 patent under 35 U.S.C. § 102(a). Pet. 6–7, 14–15; Resp. 30 n.6, 44–47; Reply 15–19. Section 102(a) provides, in relevant part, "[a] person shall be entitled to a patent unless . . . the invention was . . . described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent." 35 U.S.C. § 102(a). In the Petition, Petitioner argues that Funkhouser constitutes prior art under § 102(a), because Funkhouser was published no later than April 12, 1995—before the earliest possible effective filing date of the '856 patent, the November 13, 1995 filing date of the '296 provisional. *See* Pet. 6–7, 14–15; Ex. 1001, [60]. In Response, Patent Owner does not dispute Petitioner's position that Funkhouser constituted a printed publication by April 12, 1995 but instead argues that under Petitioner's proposed interpretation of the determining step of claim 1 of the '856 patent—which we have adopted above—the subject matter of claim 1 was invented before Funkhouser's publication. *See* Resp. 30 n.6, 44–47. Specifically, Patent Owner contends, with documentary and testimonial evidence proffered in support of its assertions, that (1) the inventors actually reduced to practice the subject matter recited in claim 1 of the '856 patent "no later than April 11, 1995," or alternatively, (2) the inventors "conceived of [the recited subject matter] no later than April 11, 1995 and th[r]ough reasonable diligence, actually reduced them to practice no later than April 25, 1995." *Id.* at 44–47. In Reply, Petitioner contests Patent Owner's proffered arguments and evidence of prior conception and reduction to practice. *See* Reply 15–19.

As we explain below, based on the argument and evidence before us, we determine that Petitioner has met its ultimate burden of persuasion to establish by a preponderance of the evidence that Funkhouser is prior art to

claim 1 of the '856 patent under § 102(a). *See Dynamic Drinkware*, 800 F.3d at 1378–80; *Mahurkar*, 79 F.3d at 1578.

a. Publication of Funkhouser

First, Petitioner argues Funkhouser constitutes a "printed publication" under § 102(a) and was published "no later than April 12, 1995." Pet. 6–7, 14–15. Patent Owner does not contest, and appears to accept, Petitioner's position. *See* Resp. 44–47 (referring to April 12, 1995 as "the effective publication date of Funkhouser"); *see generally id.*

In determining whether a reference is a "printed publication," "the key inquiry is whether or not [the] reference has been made 'publicly accessible.'" *In re Klopfenstein*, 380 F.3d 1345, 1348 (Fed. Cir. 2004). A reference is "publicly accessible" if the reference "has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter . . . exercising reasonable diligence, can locate it and recognize and comprehend therefrom the essentials of the claimed invention without need of further research or experimentation." *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006) (internal citations omitted).

Funkhouser (Ex. 1005) is an article that appears in a collection of articles, titled 1995 SYMPOSIUM ON INTERACTIVE 3D GRAPHICS (Ex. 1006) ("1995 Symposium Book"). Ex. 1005; Ex. 1006, cover, 1–3, 85; Ex. 1002 ¶ 40. The 1995 Symposium Book was compiled for a symposium sponsored by the Association for Computing Machinery ("ACM"), held on April 9–12, 1995 ("1995 Symposium"). Ex. 1006, cover, 1–3, 85; Ex. 1002 ¶¶ 40–41. The 1995 Symposium Book indicates that Funkhouser was scheduled to be presented on April 11, 1995. Ex. 1006, 2. Dr. Zyda—who was the chairperson of the 1995 Symposium—testifies that Funkhouser's author,

Thomas Funkhouser, "was a well-known researcher" at the time and that the symposium gathered "many of the top researchers in the fields of virtual reality systems, computer graphics, and real-time interactive 3D." Ex. 1002 ¶¶ 40–41; Ex. 1006, cover. According to Dr. Zyda, "[o]ver 250 participants attended the 1995 [S]ymposium and each was provided with a copy of the 1995 [Symposium Book]." Ex. 1002 ¶ 41. In addition, Dr. Zyda testifies that copies of the book were available from the ACM. *Id.*; *see* Ex. 1006, copyright page ("A limited number of copies are available at the ACM member discount."); *see also id.* at 4. The 1995 Symposium Book and Funkhouser feature a 1995 copyright date and permit copying, generally without a fee and with "a fee and/or specific permission" if for "direct commercial advantage." Ex. 1006, copyright page, 85; Ex. 1005, 85.

In light of this evidence of Funkhouser's distribution and accessibility, Petitioner has demonstrated that an interested ordinarily skilled artisan, "exercising reasonable diligence," could have obtained Funkhouser "no later than April 12, 1995"—the last day of the 1995 Symposium. *See, e.g.*, *Mass. Inst. of Tech. v. Ab Fortia*, 774 F.2d 1104, 1109 (Fed. Cir. 1985) (holding a paper to be a prior art printed publication where the paper was "disseminated without restriction to at least six persons" and "between 50 and 500" ordinary artisans were "informed of its contents by [an] oral presentation" before the critical date). Accordingly, Petitioner has shown that Funkhouser was a printed publication no later than April 12, 1995.

b. Alleged Invention Before Funkhouser's Publication

Patent Owner argues that under Petitioner's interpretation of the determining step of claim 1 of the '856 patent—which we have adopted in § II.C.2.b—claim 1 was invented before Funkhouser's publication. Resp. 44–47. In support of this argument, Patent Owner asserts two

alternative theories: (1) the inventors actually reduced to practice the subject matter of claim "no later than April 11, 1995," or (2) the inventors "conceived of [the recited subject matter] no later than April 11, 1995 and th[r]ough reasonable diligence, actually reduced them to practice no later than April 25, 1995." *Id.* Under the first theory, Patent Owner contends that the inventors, who were employed by Patent Owner, developed a program called Worlds Chat, which implemented the elements of claim 1 by no later than April 11, 1995. *Id.* at 44. With regard to the determining step of claim 1, Patent Owner asserts that Worlds Chat implemented pre-existing "client-side software that allowed a client to establish a field of view, and to display those elements that were within the field of view of an avatar." *Id.* at 44–46. With respect to the receiving step and wherein limitation of claim 1, Patent Owner argues that "[t]he Worlds Chat code included server-side code, which was modified on April 11, 1995 to implement the crowd control concept developed by the inventors prior to that date" and this code "caused the server to select a set number of closest avatars, and to send positions of only those closest avatars to a client." *Id.* at 45. Alternatively, in its second theory, Patent Owner asserts that even if there is insufficient evidence of the code being implemented (i.e., actual reduction to practice) by April 11, 1995, Funkhouser is still antedated through conception of claim 1 by no later than April 11, 1995, combined with reasonable diligence leading to actual reduction to practice by April 25, 1995—when Patent Owner publicly released Worlds Chat. *Id.* at 46–47.

Petitioner argues Patent Owner's attempt to antedate Funkhouser fails because Patent Owner proffers "no testimony from any named inventor" and instead "relies entirely on secondhand accounts and hearsay from financially interested witnesses," whose testimony should be treated with skepticism.

Reply 15–17; Tr. 25:1–27:14. Petitioner contends that inventor testimony is critical to conception and the absence of such testimony in this case is particularly pertinent given that one of the inventors, S. Mitra Ardon, refused to sign the inventor's oath and notified Patent Owner as to his belief that the claims in a parent application to the '856 patent did not recite patentable subject matter. Reply 15–16 (citing Ex. 1048); Tr. 25:14–26:18. Petitioner also questions Patent Owner's diligence in contacting Mr. Ardon and another inventor, Judith Challinger. *See* Reply 16. According to Petitioner, in light of these circumstances, it is fair to infer that Patent Owner would be unable to obtain useful testimony from the inventors. *See id.*; Tr. 26:21–27:2, 35:10–13.

Petitioner also contends that the general assertions of Patent Owner and its declarants, which fail to provide any claim mapping, are insufficient to demonstrate prior conception and reduction to practice. Reply 18; Tr. 27:14–25, 28:1–5. Moreover, Petitioner argues that the source code proffered by Patent Owner does not support its assertions because the claim elements are not embodied in the submitted source code. Reply 17–18; Tr. 28:1–4. According to Petitioner, Mr. Pesce, during cross-examination, "admitted that none of the code he identifies in his declaration sends positional updates from the server to the client, nor does he point to any code that shows what the client receives from a server." Reply 18 (citing Ex. 1046, 283:16–24, 288:2–290:14). In addition, Petitioner argues that the RSRoom.cc code (Exhibit 2035) that Patent Owner proffered is post-critical date code, which includes "numerous modifications to the 'crowd control' feature" subsequent to April 1995, and therefore, cannot support Patent Owner's antedating argument. Reply 19; Tr. 28:16–19, 34:17–22, 35:20–23, 158:5–159:12. As support for this assertion, Petitioner argues that the

proffered CHANGELOG file (Exhibit 2036) demonstrates that the RSRoom.cc file uses a "RS" naming convention that was not implemented until 1996 and, thus, "did not exist until 1996." Reply 19; Tr. 35:14–23. Further, Petitioner contends that the CHANGELOG also indicates that any crowd-control related code implemented on April 11, 1995 was later changed and ultimately "replaced with something else"—as Mr. Pesce conceded. Reply 3, 18–19; Tr. 28:20–29:25, 31:21–32:23.

Prior invention can be established either by (1) prior reduction to practice of the invention, or (2) prior conception of the invention and "reasonable diligence in reducing that invention to practice." *Teva Pharm. Indus. Ltd. v. AstraZeneca Pharms. LP*, 661 F.3d 1378, 1383 (Fed. Cir. 2011); *see Mahurkar*, 79 F.3d at 1577. Conception is "the formation in the mind of the inventor[] of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice." *Dawson v. Dawson*, 710 F.3d 1347, 1352 (Fed. Cir. 2013) (internal citations and quotations omitted). An idea is "definite and permanent when the inventor has a specific, settled idea, a particular solution to the problem at hand." *Id.* (internal citations and quotations omitted). "A conception must encompass all limitations of the claimed invention." *Brown v. Barbacid*, 276 F.3d 1327, 1336 (Fed. Cir. 2002).

"Reduction to practice follows conception." *Mahurkar*, 79 F.3d at 1578. To establish actual reduction to practice, an inventor must have "(1) constructed an embodiment or performed a process that met all the claim limitations and (2) determined that the invention would work for its intended purpose." *Teva*, 661 F.3d at 1383; *see Mahurkar*, 79 F.3d at 1578. Documentation of prior reduction to practice need not be "in the exact

language given in the claims." *Teva*, 661 F.3d at 1384 (quoting *Mycogen Plant Science, Inc. v. Monsanto Co.*, 243 F.3d 1316, 1336 (Fed. Cir. 2001)).

Here, as an initial matter, we note that there is no inventor testimony proffered in support of Patent Owner's prior invention arguments. As explanation, Patent Owner offers the testimony of Mr. Thom Kidrin, President and CEO of Patent Owner since 1997, who testifies that Patent Owner no longer employs the four inventors of the '856 patent and he "attempted to contact each," yet was "unable to contact Mitra Ardon and Judith Challinger" and "was able to contact David Leahy and Bo Adler, but they were unwilling or unable to assist in this defense due to their current employment situations." Ex. 2018 ¶¶ 1, 4, 13; *see* Ex. 1047, 38:19–42:18. In his deposition, Mr. Kidrin testified that his effort to contact Mr. Ardon was limited to one call and voicemail and his attempt to contact Ms. Challinger was restricted to a single e-mail. *See* Ex. 1047, 38:19–40:22. Although we are not persuaded that Patent Owner's explanation reflects reasonably diligent efforts to obtain testimony from the inventors, we do not draw any negative inference against Patent Owner from the lack of inventor testimony before us—as Petitioner has urged us to do. *See* Reply 15–16 (citing *Borror v. Hertz*, 666 F.2d 569, 573–74 (CCPA 1981)); Tr. 26:21–27:2, 35:10–13; *see also id.* at 148:1–23.

Moreover, we acknowledge the attorney declaration regarding Mr. Ardon's refusal to sign the inventor's oath in a parent application to the '856 patent based on his "belief that the claims did not recite patentable subject matter." Ex. 1048 ¶ 3; Reply 15–16 (citing Ex. 1048); Tr. 25:14–26:18. Yet we do not find this declaration directed to Mr. Ardon's beliefs as to the patentability of different patent claims of much, if any, value on the specific issue of conception and reduction to practice, and the timing thereof,

of claim 1 of the '856 patent. *See, e.g.*, Ex. 1048 ¶ 7. Also, as Patent Owner noted at the hearing, the declaration explains that Mr. Ardon was employed by a competitor of Patent Owner, thus giving a potential motivation for his statements. *See* Ex. 1048 ¶¶ 4–7; Tr. 145:21–146:17.

In the absence of inventor testimony, Patent Owner submits documentary evidence, such as Worlds Chat source code, and testimony from Mr. Pesce—who has no personal knowledge of the inventors' work and testifies based on his review of documentary evidence—as well as current and former employees of Patent Owner, including Mr. Kidrin, Mr. Ron Britvich, Mr. Conor Laffan, Mr. Ken Locker, and Mr. David Marvit—none of whom actually worked on the Worlds Chat program with the inventors and several of whom joined Patent Owner after the alleged invention in April 1995. *See* Exs. 2034–36; Ex. 2017 ¶ 50; Ex. 2018 ¶¶ 1, 3; Ex. 2019 ¶ 5; Ex. 2025 ¶¶ 3–6; Ex. 2027 ¶¶ 3–4; Ex. 2038 ¶ 3. Mr. Britvich[13] does testify that, though "he did not personally work on Worlds Chat," he "occasionally" "collaborate[d]" with "the team developing the Worlds Chat program." Ex. 2019 ¶¶ 5–9, 14. Of the proffered declarants, only Mr. Britvich and Mr. Pesce offer testimony substantively related to the content of the Worlds Chat source code relevant to the limitations of claim 1 of the '856 patent. *See* Ex. 2017 ¶ 50; Ex. 2019 ¶¶ 18–19; Resp. 44–46; Reply 17. As we explain below, we agree with Petitioner that this argument and evidence offered in support of Patent Owner's antedating arguments has gaps and suffers from a number of

[13] As Petitioner points out, Mr. Britvich is a paid consultant, who received 1 million shares of Patent Owner stock for his work in connection with this proceeding and the District Court Case. *See* Ex. 2019 ¶ 3; Ex. 1047, 18:2–19:3; Reply 17; Tr. 152:14–153:3. Again, however, we draw no negative inference therefrom.

deficiencies. *See, e.g.*, *Borror*, 666 F.2d at 573 ("A party's case may have gaps or lack persuasiveness without the inventor's testimony . . . .").

With this background, we address Patent Owner's first theory of alleged actual reduction to practice by April 11, 1995. Beginning with the receiving step and the wherein limitation of claim 1 of the '856 patent, Patent Owner proffers two documentary exhibits regarding the Worlds Chat code relevant to these limitations—the CHANGELOG (Exhibit 2036) and the RSRoom.cc (Exhibit 2035)—and the two witnesses who address these claim limitations, Mr. Pesce and Mr. Britvich, rely upon these documents in reaching their conclusions. *See* Ex. 2035; Ex. 2036; Ex. 2019 ¶ 19; Ex. 2017 ¶ 50.d. Each of these exhibits, however, suffers from deficiencies that limit its probative value as evidence of conception and reduction to practice in April 1995. First, Patent Owner submits a CHANGELOG for the Worlds Chat code (Exhibit 2036), which includes dated entries with brief descriptions of alleged modifications and additions to the code. *See* Ex. 2036. We note that the brief snippets describing changes to the Worlds Chat code in the CHANGELOG often lack adequate detail regarding the change to allow for sufficient understanding of what was purportedly added or modified. *See generally id.* Mr. Britvich and Mr. Pesce testify that it is "consistent with the business habits" (Mr. Britvich) and "common practice among coders" (Mr. Pesce) "that a programmer who has written code and recorded it in a CHANGELOG has already compiled the code and tested its function." Ex. 2017 ¶ 50.d.viii; Ex. 2019 ¶ 19.e; *see* Resp. 46 (citing Ex. 2019 ¶ 19); *see* Tr. 150:14–18. Accepted practices and habits, however, are not always followed. And neither Mr. Pesce nor Mr. Britvich nor any other declarant purports to have personal knowledge of the preparation of this CHANGELOG or such practice specific to this CHANGELOG and its

author(s). *See, e.g.*, Ex. 2017 ¶ 50.d.viii; Ex. 2019 ¶¶ 5–6, 19.e. Rather, the author(s) of the CHANGELOG are unidentified and have not provided testimony. Accordingly, we do not find the CHANGELOG (Exhibit 2036) to be persuasive evidence of what was actually implemented in the code and functioning for purposes of reduction to practice.

Second, Patent Owner proffers the RSRoom.cc file (Exhibit 2035), which it alleges is Worlds Chat code that implements the server-side filtering of the receiving step and wherein limitation of claim 1 of the '856 patent. *See, e.g.*, Resp. 45–46; Ex. 2019 ¶¶ 15–17, 19; Ex. 2018 ¶¶ 6–10. The code itself is undated. *See* Ex. 2035; Ex. 1046, 296:5–7; Reply 19. Moreover, no declarant in this case identified the RSRoom.cc file as the version of the code that existed in April 1995 and Mr. Pesce, during his deposition, admitted that he did not know whether the RSRoom.cc file existed in the form he reviewed prior to 1996. Ex. 1046, 295:15–20; *see* Reply 19; Tr. 28:11–15. In addition, as Petitioner points out, the CHANGELOG indicates that the "RS" naming convention of the RSRoom.cc file was not implemented until 1996. *See* Ex. 2036, 7–9 (describing changes "put online for WC x/xx/96 – v8.10," after entries listed for multiple dates from February 1–17, 1996, as "[b]reak server class into a base class and two derived classes – one for the RoomServer (RServer) and one for the user server (UServer)" and "[r]enamed some room server specific files to begin with RS"); Reply 19. Even Patent Owner conceded at oral hearing that the RSRoom.cc file is a "later version of code," given the CHANGELOG's reference to the change in code nomenclature that appears to have been made in 1996. Tr. 151:3–14. In light of the evidence before us and the parties' agreement on the issue, the RSRoom.cc file (Exhibit 2035), which uses the "RS" naming convention that the CHANGELOG indicates

was not implemented until 1996, is not the version of the code that existed in April 1995—the critical time period for Patent Owner's alleged conception and reduction to practice. Rather, based on the CHANGELOG, the RSRoom.cc file (Exhibit 2035) appears to be from 1996 at the earliest. *See* Ex. 2036, 7–9; Reply 19; Tr. 151:3–14; *see also id.* at 28:16–19, 34:17–22, 35:20–23, 158:5–24.

Moreover, we agree with Petitioner that the later date of the RSRoom.cc file is particularly significant for Patent Owner's conception and reduction to practice arguments, because, as Mr. Pesce acknowledged at his deposition, the CHANGELOG reflects several changes relevant to the RSRoom.cc and server-side crowd control code between April 11, 1995 and the creation of the "RS" naming convention in 1996. *See* Reply 18–19; Tr. 158:5–159:12. For example, the April 24, 1995 entry indicates processing was added to "User.cc" that "will absolutely limit the number of updates that get sent to a Client." Ex. 2036, 2; *see* Reply 18. Mr. Pesce acknowledged that this entry appears to implicate, and indicate a modification of, server-side filtering and the updates a client receives from the server. *See* Ex. 1046, 299:7–301:11. In addition, the April 28, 1995 entry provides: "Implemented a *modified crowd control algorithm* that is room-based." Ex. 2036, 2–3 (emphasis added); *see* Reply 18. Mr. Pesce acknowledged that this entry indicates a modification of the Worlds Chat crowd control feature and also that the described modification is consistent with his understanding of the modules of the RSRoom.cc file that he discusses in his declaration regarding the receiving step of claim 1, thereby "indicat[ing] the functionality of those modules was changed after April 11, 1995." Ex. 1046, 302:15–303:3; Ex. 2017 ¶ 50.d; *see* Reply 18. Moreover, the October 18, 1995 entry states: "*Replaced brute-force search* for nearest

neighbors with a cell-based algorithm (*Room.cc*)." Ex. 2036, 4 (emphases added); *see id.* at 1; Reply 18–19. Mr. Pesce acknowledged that this entry appears to indicate that by October 1995, the crowd control implemented in April 11, 1995 "had been taken out and replaced . . . with different code." Ex. 1046, 303:5–22.

These entries in the CHANGELOG—after April 11, 1995 but before 1996—reflect modifications to and even replacement of code regarding server-side crowd control filtering in or at least related to the RSRoom.cc code. Given that the proffered version of the RSRoom.cc code (Exhibit 2035) did not exist in its submitted form until after April 1995 in 1996, the CHANGELOG's indications of alterations to the Worlds Chat code implemented in or at least related to the RSRoom.cc code (and its apparent predecessor, Room.cc) between April 11, 1995 and 1996, and the lack of evidence or testimony laying out, with precision and detail, all changes specific to the Room.cc or RSRoom.cc code from April 1995 until the version of the RSRoom.cc code submitted as Exhibit 2035, we find the submitted RSRoom.cc code (Exhibit 2035) to be unreliable and unpersuasive evidence as to what was implemented in the Worlds Chat code in April 1995 for purposes of reduction to practice as well as what was in the inventors' minds in April 1995 for purposes of conception.

This documentary evidence—together with the relevant declaration and deposition testimony—is insufficient to show actual reduction to practice of the receiving step and the wherein limitation of claim 1 by April 11, 1995. In arguing that Worlds Chat implemented the receiving step by April 11, 1995, Patent Owner cites to the testimony of Mr. Pesce and

Mr. Britvich,[14] who, in turn, rely on an April 11, 1995 entry of the CHANGELOG. *See* Resp. 45–46 (citing Ex. 2019 ¶ 19; Ex. 2017 ¶ 50.d; Ex. 2018 ¶¶ 6, 8, 9, 10). This April 11, 1995 entry of the CHANGELOG states: "Added brute force crowd control. In Room.cc, compute a list of users proximate to a given location by estimating the distance to every user in the room." Ex. 2036, 1. This description only explicitly refers to "comput[ing]" a list of users near a given location—it does not reflect that these locations actually are sent to a client or that these locations reflect the positions of less than all of the other avatars, as claim 1 requires. *See, e.g.*, *Mahurkar*, 79 F.3d at 1577–78 ("The trier of fact can conclude for itself what documents show, aided by testimony as to what the exhibit would mean to one skilled in the art.").

Moreover, on the record before us, the reference to "brute force crowd control" is insufficient to fill in these gaps. Specifically, the record lacks adequate evidence of what the inventors meant by the term "crowd control," and more specifically, "brute force crowd control," in April 1995. Submitted declarations from Mr. Marvit and Mr. Britvich, individuals who worked with the inventors at this time period and, therefore, might have knowledge of the inventors' usage of this terminology at the time refer to "crowd control," but provide only vague, general descriptions of the concept. *See* Ex. 2019 ¶¶ 7, 14, 19.c; Ex. 2027 ¶ 5. Mr. Marvit testifies that "[d]uring January 1995, the Worlds Chat team was working on the *problem of crowd control* in the virtual world experience," explaining that limited processing power and memory of servers and clients at the time meant that

[14] The relevant portion of the Response also cites Mr. Kidrin's declaration but the cited paragraphs refer only to the handling and possession of the Worlds Chat code. *See* Resp. 45 (citing Ex. 2018 ¶¶ 6, 8, 9, 10).

"too many avatars on a screen could bog down the system, either in the transmission of position/orientation updates from the server to the clients, or in graphics processing by the clients." Ex. 2027 ¶ 5 (emphasis added). This testimony merely states, in general terms, the problem—not the solution which the inventors allegedly conceived and reduced to practice in April 1995. In addition, Mr. Britvich makes a brief, unexplained, reference to him "learning how the [inventors] implemented certain solutions including their 'crowd control' feature." Ex. 2019 ¶ 14. He also testifies regarding a concept that appears to relate to crowd control, though not using that precise terminology, explaining that "[d]uring his meetings with th[e] Worlds Chat team," he "learned that this team developed a solution to the potential crowding problem that can occur in a virtual world," which involved "limiting" or "reducing" the "data transmitted from the server down to a particular client," with the benefit of reducing the processing burden on the client and the time required to transmit the updates. *Id.* ¶ 7. This testimony, however, is not specific regarding the timing of these meetings. *See id.*; *see also id.* ¶¶ 4–5. Moreover, the testimony is vague in describing the alleged solution, for example, lacking specifics regarding the type of "data" whose transmittal is limited or reduced and how the transmitted data are limited or reduced. Thus, these general testimonial descriptions lack specifics regarding the "crowd control" concept, particularly as it relates to the receiving step and wherein limitation of claim 1, which require that a client receive "received positions" from the server and that these positions be of "fewer than all of the second avatars."

Patent Owner, at oral hearing, argued that the '856 patent specification uses the "crowd control" terminology consistent with the CHANGELOG and, therefore, the specification can be used to inform the

meaning of "brute force crowd control" as used in the CHANGELOG and as evidence that Worlds Chat performed the receiving step and wherein limitation of claim 1 in April 1995. *See* Tr. 153:8–155:21. We disagree. The later-filed specification does not use the terminology "brute force crowd control," nor does its usage of "crowd control" necessarily reflect the meaning the inventors ascribed to the term in April 1995. The record before us lacks evidence to show that there was no development in meaning of the terminology from April 1995 until the specification was drafted. If anything, there is evidence suggesting to the contrary, given that the CHANGELOG reflects modifications to and replacement of the crowd control code after April 11, 1995, as explained above. *See* Ex. 2036, 2–4. Even if we were to consider the usage of "crowd control" in the specification, this term is used to refer to a variety of concepts on the server side, including maintaining a variable N, determining and maintaining a list of the N nearest avatars for a client, and notifying the client of changes in the location of the N closest remote avatars. *See* Ex. 1001, 5:22–6:10, 13:14–14:38. The CHANGELOG's reference to "brute force crowd control" and "comput[ing]" a list of proximate users may be consistent with some of these aspects (e.g., determining a list of the N nearest avatars), but there is insufficient evidence, on the record before us, that the reference to "brute-force crowd control" means that the particular requirements of the receiving step and wherein limitation that a client receive "received positions" from the server and that these positions be of "fewer than all of the second avatars" had been implemented by April 11, 1995. Accordingly, we find the CHANGELOG entry from April 11, 1995 inadequate to demonstrate that the inventors had performed the receiving step and wherein limitation of claim 1 in Worlds Chat by April 11, 1995. *See* Ex. 2036, 1.

Moreover, we find Mr. Pesce and Mr. Britvich's testimony relying on this CHANGELOG entry, as well as the RSRoom.cc file, unpersuasive on this issue. In addressing the receiving step and wherein limitation of claim 1, both Mr. Pesce and Mr. Britvich refer to the April 11, 1995 note in the CHANGELOG (Exhibit 2036) and to the RSRoom.cc file (Exhibit 2035) and testify to their conclusion that "the appearance of this note in the CHANGELOG indicates that the server sending selected positional updates," "rather than all positional updates," "to a client was implemented in Worlds Chat no later than April 11, 1995." Ex. 2017 ¶ 50.d; Ex. 2019 ¶ 19. Yet, as we explain above, both the CHANGELOG and the RSRoom.cc file are unreliable evidence of what was in the Worlds Chat code at the relevant time in April 1995. Moreover, as also explained above, the CHANGELOG entry from April 11, 1995 omits key details regarding the receiving step and wherein limitation of claim 1. Therefore, we find Mr. Pesce's and Mr. Britvich's testimony based on these documents—rather than personal knowledge of the alleged reduction to practice by April 11, 1995—to be unpersuasive on the issue of whether the Worlds Chat code included and performed the full receiving step and wherein limitation on or before April 11, 1995.

In sum, the record before us lacks adequate and persuasive evidence that the inventors had implemented or performed the full receiving step and wherein limitation of claim 1 of the '856 patent—as required for actual reduction to practice—by April 11, 1995.

To address the determining step of claim 1 of the '856 patent, Patent Owner proffers client-side source code allegedly implemented in Worlds Chat before April 1995, titled FROBVPLA.CPP (Exhibit 2034). *See* Resp. 44–45 (citing Ex. 2017 ¶ 18, Ex. 2019 ¶ 50.c); Ex. 2034. Patent

Owner argues that this code allows a client to "establish a field of view, and to display those other elements that were within the field of view of an avatar" and, therefore, meets the determining step of claim 1 of the '856 patent under Petitioner's proposed claim scope—which we have addressed and agreed with in § II.C.2.b. Resp. 44–45 (citing Ex. 2017 ¶ 18, Ex. 2019 ¶ 50.c); *see* Ex. 2019 ¶ 18. FROBVPLA.CPP (Exhibit 2034) appears, on its face, to involve a field of view determination. *See, e.g.*, Ex. 2034, 2. From our review of the code, however, it is not clear that this determination is made based on the "received positions," as claim 1 requires (or as featured in Petitioner's proposed claim scope, with which we have agreed, "from user positions received from the server"). Neither Mr. Pesce nor Mr. Britvich—the only declarants who address the determining step—fill this gap. *See* Ex. 2017 ¶ 50.c; Ex. 2019 ¶ 18. Rather, they testify only that the code allows a "client to establish a field of view of an avatar" and "to display the virtual world from that field of view"—without specifying or addressing what information the client uses to make this determination, i.e., whether it is based on the recited "received positions." Ex. 2017 ¶ 50.c.ii; Ex. 2019 ¶ 18.b; *see* Ex. 2017 ¶ 50.c.iv. Moreover, at his deposition, Mr. Pesce acknowledged that his declaration testimony does not "identify any file that shows what the client receives from a server" or "any file that shows what the client does with that information after receiving it from a server"—further demonstrating the absence of evidence showing that the client-side field of view determination in the FROBVPLA.CPP code (Exhibit 2034) is based on "received positions," as claim 1 requires. Ex. 1046, 290:1–14; *see also id.* at 282:20–289:24; Reply 18.

In addition, Mr. Britvich testifies that he observed demos of Worlds Chat, "before the official public release of the Worlds Chat program" on

April 25, 1995, that "was run on personal computers, acting as clients" and "the view displayed on each personal computer was a perspective or point of view of an avatar associated with that particular personal computer." Ex. 2019 ¶¶ 8–10; *see* Resp. 44. Like his testimony regarding the client-side FROBVLA.CPP code, this description of the Worlds Chat demo does not indicate whether the clients were determining the field of view based on "received positions." In addition, the timing of the demo "before the official public release" on April 25, 1995 does not demonstrate actual reduction to practice before April 11, 1995. *See* Ex. 2019 ¶¶ 4–10.

Accordingly, there is insufficient evidence in the record to show that proffered client-side code of Worlds Chat implemented the determining step of claim 1 of the '856 patent by April 11, 1995. For the reasons given, we determine that the record lacks evidence adequate to demonstrate actual reduction to practice of claim 1 by April 11, 1995. *See Brown*, 276 F.3d at 1336 (holding that physical and testimonial evidence of experiment, which did not show that the experiment satisfied "every limitation of the count," failed to show conception or reduction to practice).

We turn to Patent Owner's alternative theory that the inventors conceived of the subject matter of claim 1 by April 11, 1995 and reasonable diligence led to actual reduction to practice by April 25, 1995, when Words Chat was officially released. *See* Resp. 46–47. The only additional evidence that Patent Owner cites for this theory is documentary and testimonial evidence regarding Worlds Chat's public release on April 25, 1995 and testimony of Mr. Locker and Mr. Marvit regarding the alleged diligence of the inventors, who worked on Worlds Chat daily leading up to this release on April 25, 1995. *See id.* (citing Ex. 2021; Ex. 2025 ¶¶ 6, 8–9; Ex. 2027 ¶¶ 9, 11–12; Ex. 2019 ¶¶ 10–12).

For substantially the same reasons given above, with only minor exceptions, that the evidence before us does not demonstrate sufficiently that the inventors implemented the limitations recited in claim 1—and thus, show actual reduction to practice—by April 11, 1995, that same evidence likewise does not show actual reduction to practice of each limitation of claim 1 by April 25, 1995, when Worlds Chat was publicly released. Such minor exceptions include, for example, that the lack of specificity in Mr. Britvich's testimony regarding the timing of the Worlds Chat demo before the public release on April 25, 1995 renders the testimony of little probative value for reduction to practice by April 11, 1995, but not for reduction to practice by April 25, 1995. *See* Ex. 2019 ¶¶ 8–10.

The additional testimonial and documentary evidence that Patent Owner offers regarding the public release of Worlds Chat on April 25, 1995 does not specify or indicate that Worlds Chat implemented the recited limitations of claim 1. *See*, *e.g.*, Ex. 2021; Ex. 2025 ¶¶ 6, 8–9; Ex. 2027 ¶¶ 9, 11–12; Ex. 2019 ¶¶ 10–12. In addition, we note that the only CHANGELOG entry between April 11 and April 25, 1995 that is potentially relevant to the implementation of claim 1 in Worlds Chat is the April 24, 1995 entry indicating processing was added to "User.cc" that "will absolutely limit the number of updates that get sent to a Client." Ex. 2036, 2. Not only is the CHANGELOG itself unpersuasive evidence, as explained above, but also this entry, alone, is insufficient to address the specific limitations (e.g., "receiving . . . received positions" of "fewer than all of the second avatars") of claim 1 and show that the code implemented these limitations. Neither Mr. Pesce nor Mr. Britvich addressed this CHANGELOG entry or the "User.cc" code in their declarations. *See, e.g.*, Ex. 1046, 299:7–301:11. And the User.cc code is not in the record before

us. Without the relevant code or supporting testimony, we cannot conclude from this intervening CHANGELOG entry that Worlds Chat implemented the limitations of claim 1 before April 25, 1995.

Moreover, as to conception before April 11, 1995, we agree with Petitioner that the absence of inventor testimony in this case presents a larger hurdle for conception because we must consider what was in the mind of the inventors of the '856 patent, and specifically whether they had a definite and permanent idea of the method recited in claim 1—but without the testimony of any inventor. *See Dawson*, 710 F.3d at 1353–54; *see also* Reply 15–16; Tr. 25:1–13, 36:5–18. For substantially the same reasons explained above that the documentary evidence, including the CHANGELOG (Exhibit 2036), RSRoom.cc (Exhibit 2035), and FROBVPLA.CPP (Exhibit 2034), and testimonial evidence from non-inventors fails to demonstrate actual reduction to practice of the full method recited in claim 1 by April 11, 1995, it also is inadequate to show that the inventors had a definite and permanent idea of each limitation—as required for conception.

The only sentence of Patent Owner's Response that appears to address conception refers to "the crowd control concept developed by the inventors prior to [April 11, 1995]," citing as support paragraphs of Mr. Kidrin's and Mr. Britvich's declarations. Resp. 45 (citing Ex. 2018 ¶¶ 6, 8, 9, 10; Ex. 2019 ¶ 19); *see* Reply 18–19. But, as we note above, cited paragraphs 6, 8, 9, and 10 of Mr. Kidrin's declaration refer only to possession and handling of the Worlds Chat code. *See* Ex. 2018 ¶¶ 6, 8, 9, 10. Moreover, cited paragraph 19 of Mr. Britvich's declaration relies on the CHANGELOG entry of April 11, 1995 and RSRoom.cc file to conclude that the server sending selected positional updates to a client had been implemented in the

code by that date. *See* Ex. 2019 ¶ 19. As we explain above, this testimony and the evidence upon which it relies is not persuasive in showing actual reduction to practice by April 11, 1995, and it fares no better in showing conception by that date.

Based on our review of the record, the only declaration testimony potentially more relevant to conception than reduction to practice that we see are paragraph 5 of Mr. Marvit's declaration and paragraph 7 of Mr. Britvich's declaration. *See* Ex. 2019 ¶ 7; Ex. 2027 ¶ 5. The deficiencies we explain above regarding this testimony in the context of reduction to practice, including its generality and vagueness regarding the alleged crowd control concept of the inventors, applies equally to conception. Thus, the testimonial evidence before us is insufficient to show that by April 11, 1995, the inventors had a definite and permanent idea of the subject matter of claim 1, with a specific solution, as required for conception.

Accordingly, the evidence before us is insufficient to demonstrate conception of each limitation of claim 1 of the '856 patent by April 11, 1995 as well as actual reduction to practice by April 25, 1995—as Patent Owner argues in its second theory for antedating Funkhouser. Therefore, as Petitioner argues, the record evidence and argument lacks adequate support for both theories of Patent Owner's assertion that claim 1 of the '856 patent was invented before Funkhouser was published on April 12, 1995.

c. Conclusion

For the reasons given, Petitioner has shown by a preponderance of the evidence that Funkhouser is prior art to claim 1 of the '856 patent under 35 U.S.C. § 102(a).

2. *Funkhouser*

Funkhouser discloses a system, with a "client-server design," that "supports real-time visual interaction between a large number of users in a shared 3D virtual environment." Ex. 1005, 85. In the system, each user is represented "by an entity," and each entity is managed by a client workstation. *Id.* at 85, 87. Servers manage the communication between clients. *Id.* at 87. Specifically, "[c]lients do not send messages directly to other clients, but instead send [messages] to servers[,] which forward them to other client and server workstations." *Id.* These update messages include changes in entity position. *Id.* at 89 ("Clients sent update messages only for changes in derivatives of entity position and/or orientation . . . ."); *id.* at 87 (referring to exchanging "update messages when entities cross cell boundaries").

"The key feature of [Funkhouser's] system" is its "[s]erver-based message culling," which is based on "precomputed" "[c]ell-to-cell visibility." *Id.* at 85, 87. Before the simulation, the virtual environment "is partitioned into a spatial subdivision of cells" and "[a] visibility precomputation is performed in which the set of cells potentially visible to each cell is determined." *Id.* at 87 (emphasis omitted). Figure 6 of Funkhouser is reproduced below.

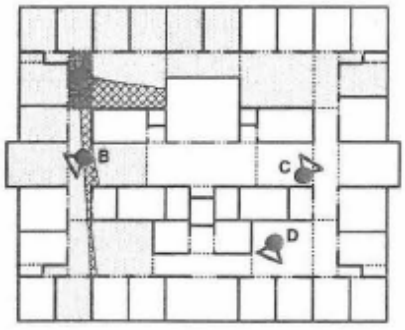

Figure 6 depicts a source cell, in a dark box, and shows, in stipple,[15] the "[c]ell-to-cell visibility" of the source cell, i.e., the "set of cells reached by some sight-line from anywhere in the source cell." *Id.* As shown in Figure 6, this cell-to-cell visibility "overestimate[s] . . . the visibility of any entity resident in the source cell." *Id.* In other words, an entity's visibility is "conservatively over-estimated by the precomputed visibility of its containing cell." *Id.*

Then, during the simulation, servers use the precomputed cell-to-cell visibility to process update messages, using "cell visibility 'look-ups,' rather than more exact real-time entity visibility computations which would be too expensive on currently available workstations." *Id.* The servers "forward" update messages "only to servers and clients containing entities inside some cell visible to the [cell] containing the updated entity." *Id.*

Clients, in turn, use the update messages to maintain updated surrogates for "remote entities visible to at least one entity local to the client." *Id.* at 87–88; *see id.* at 92. "Surrogates contain (often simplified) representations for the entity's geometry and behavior." *Id.* at 87. "When a client receives an update message for an entity managed by another client, it updates the geometric and behavioral models for the entity's local surrogate." *Id.* "Between update[]" messages, each client "simulate[s]" the behavior of its surrogates. *Id.*

In addition, "[c]lients execute the programs necessary to generate behavior for their entities" and "[t]hey may . . . include viewing capabilities

[15] We have reproduced Figure 6 from Exhibit 1006, the 1995 Symposium Book. In Exhibit 1005, Funkhouser, the stipple is not visible. To the extent it remains difficult to see, page 16 of the Petition includes an annotated version of Figure 6 in which the stipple is defined with blue annotations.

in which the virtual environment is displayed on the client workstation screen from the point of view of one or more of its entities." *Id.*; *see id.* at 85, 209 (Plate II).

Figures 4 and 7 of Funkhouser are reproduced below.

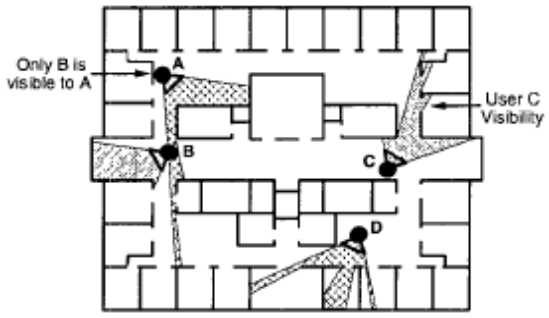

Figure 4

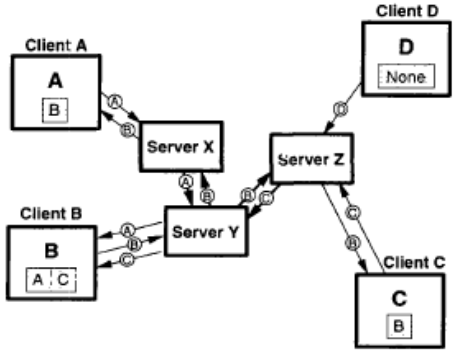

Figure 7

Figure 4 shows the visual interactions of entities A, B, C, and D in a virtual environment. *Id.* at 86, Fig. 4. Figure 7 depicts clients A, B, C, and D for these entities, as arranged in Figure 4, with arrows to show the "flow of update messages" and "small squares" to depict surrogates of these clients. *Id.* at 87, Fig. 7. As Figure 4 depicts, "only one visual interaction is possible – entity A can see entity B." *Id.* at 86. Figure 7 shows that the forwarding of update messages to clients is not limited by the visibility of the entities managed by the clients. *See id.* at 86–88, Figs. 4, 7. As shown in Figure 7, "[i]f entity A is modified," the servers forward the update message to client B; "[i]f entity B is modified," the servers forward the update message to clients A and C; "[i]f entity C is modified," the servers forward the update message to client B; and "[i]f entity D is modified," server Z does not forward the message to any other server or client "because no other entity can potentially see entity D." *Id.* at 88, Fig. 7 (emphases omitted).

3. *Discussion*

Anticipation under 35 U.S.C. § 102 requires "the presence in a single prior art disclosure of all elements of a claimed invention arranged as in the claim." *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010). Specifically, "[f]or a claim to be anticipated, each claim element must be disclosed, either expressly or inherently, in a single prior art reference, and the claimed arrangement or combination of those elements must also be disclosed, either expressly or inherently, in that same prior art reference." *Id.* at 1332–33. Inherent disclosure is established where the reference "must necessarily include the unstated limitation." *Id.* (emphasis omitted); *see Cont'l Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) (holding that inherency can be established by extrinsic evidence that "make[s] clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill").

a. The Determining Step

Petitioner and Patent Owner dispute whether Funkhouser discloses the determining step of claim 1 of the '856 patent. *See* Pet. 21–25; Resp. 25–32; Reply 12–14. According to Petitioner, Funkhouser's clients perform the determining step. *See* Pet. 15–17, 21–25. As support for this assertion, Petitioner points to Funkhouser's disclosures that its clients receive from the server update messages with positional information based on a cell-based precomputed visibility determination that "conservatively over-estimate[s]" what is within the view of entities managed by the client. Pet. 23–24 (quoting Ex. 1005, 87); *see id.* at 15, 21–22. Petitioner further asserts that Funkhouser's client, upon receiving this updated positional information, processes the information, including performing calculations to "update[]

geometric and behavioral models" to maintain and update its surrogates of remote entities. *Id.* at 24 (quoting Ex. 1005, 87); *see id.* at 15–16, 21–22. In addition, Petitioner refers to Funkhouser's disclosures that clients contain programs to "display[] "the virtual environment . . . on the client workstation screen from the point of view of one or more of its entities." *Id.* at 24–25 (quoting Ex. 1005, 87); *see id.* at 15–16, 21–22. Thus, according to Petitioner and Dr. Zyda, Funkhouser's disclosures make clear that upon "receiving the filtered positional updates from the server, the client performs its own calculations . . . in order to determine which of the remote entities to display within the client's field of view." *Id.* at 24–25; Ex. 1002 ¶ 81; *see* Pet. 16–17. As we explain below, we agree with Petitioner that Funkhouser's client performs the determining step.

As Petitioner points out, in Funkhouser's "[s]erver-based message culling," servers cull update messages based on precomputed "*[c]ell-to-cell* visibility," which determines the "set of *cells potentially visible to each cell*" or, in other words, the "set of cells reached by some sight-line from anywhere in the source cell." Ex. 1005, 87 (emphases added). Thus, servers forward an update message regarding an entity's change in position, received from another client, to a client if that client contains an entity "inside some *cell visible to the [cell]* containing the updated entity." *Id.* (emphasis added); *see id.* (referring to exchanging "update messages when entities cross cell boundaries"); *id.* at 89 ("Clients sent update messages only for changes in derivatives of entity position and/or orientation . . . ."). Because this culling is based on the "precomputed visibility of [an entity's] containing *cell*"—rather than more "exact real-time entity visibility computations"—it "*conservatively over-estimate[s]*" the "*visibility of any entity* resident in the . . . cell." *Id.* at 87, Fig. 6 (emphases added).

As Petitioner argues and Dr. Zyda testifies, these disclosures of Funkhouser make clear that servers send update messages to clients for more entities than are presently visible to, and within the field of view of, any entity managed by the client. Pet. 23; Ex. 1002 ¶ 78. For example, entity B in Funkhouser's Figures 4 and 6 is not visible to entity C, because entity C is facing away from entity B. *See* Ex. 1005, 86, Figs. 4, 6; Ex. 1002 ¶ 78. Thus, at the point in time depicted in these figures, entity C will not actually see any change in position of entity B or, in other words, entity B will not be displayed to entity C. *See* Ex. 1005, 86, Figs. 4, 6; Ex. 1002 ¶ 78. Nonetheless, Funkhouser explains that when "entity B is modified," the server "forward[s]" an "update message" to client C, because entity C is in a *cell* "potentially visible" to the *cell* where entity B is located. Ex. 1005, 87–88, Fig. 7 (emphasis omitted). As a further example, as illustrated in Figure 6, the client managing entity A, in the "source cell" represented by the "dark box" in Figure 6, receives updates on entities within the "[c]ell-to-cell visibility" of this source cell, represented by the "stipple" in Figure 6. *Id.* at 87, Figs. 4, 6. But as Figures 4 and 6 illustrate, entity A's visibility, represented by the cross-hatch emerging from entity A, is significantly narrower than the cell-to-cell visibility (stipple) of its source cell shown in Figure 6. *See id.*; *see also* Ex. 1002 ¶ 69. Accordingly, the client managing entity A will receive updates from the server for any change in position of any entity within the wider cell-to-cell visibility (stipple) of the cell where entity A is located, even though only positional changes for entities within entity A's narrower visibility (cross-hatch) are visible to, and will be displayed to, entity A's user. *See* Ex. 1005, 87–88; Ex. 1002 ¶ 69.

In addition, Funkhouser's client—after receiving positional update messages that may relate to entities outside the field of view of any entity it

manages—processes the messages to maintain updated surrogates of remote entities visible to any of the client's entities and executes programs to display the environment from a particular entity's viewpoint. In particular, Funkhouser discloses that the client "maintain[s]" surrogates for "remote entities visible to at least one entity local to the client" (Ex. 1005, 88; *see id.* at 87) and upon "receiv[ing] an update message for an entity managed by another client" (i.e., a remote entity), uses the message to "update[] the geometric and behavioral models for the entity's local surrogate" (*id.* at 87). Moreover, Funkhouser discloses that "[b]etween updates," the client "simulate[s]" "surrogate behavior." *Id.*

Funkhouser also explains that its clients "execute . . . programs necessary to generate behavior for their entities" and that "[t]hey . . . may include viewing capabilities in which the virtual environment is displayed on the client workstation screen from the point of view of one or more of its entities." *Id.*; *see id.* at 85 ("[U]sers run an interactive interface program . . . [that] simulates the experience of immersion in a virtual environment by rendering images of the environment as perceived from the user's . . . viewpoint."). Funkhouser includes Plate II, which shows an "environment rendered from [the] viewpoint of one entity," omitting many other entities in the environment.[16] Ex. 1005, 209.

[16] We note, as we did in the Institution Decision, that the Petition and Dr. Zyda's testimony refer to an alleged number of remote entities for which the client managing the entity from whose viewpoint Plate II depicts the environment received and processed updates, but these numbers are not supported by Funkhouser. *See* Pet. 8, 22–23, 25; Ex. 1002 ¶ 81; Inst. Dec. 15 n.4; Ex. 1005, 209. Again, as in the Institution Decision, we do not rely on these numbers. The parties agree that these numbers have no impact on their positions or the proper determination as to whether Funkhouser discloses the determining step. For example, Dr. Zyda testifies that the

Based on these disclosures of Funkhouser, we determine Petitioner has demonstrated that Funkhouser discloses that its client performs the determining step of claim 1 of the '856 patent by determining, based on filtered positional update messages received from the server, the other entities ("avatars") to be displayed to a particular user—i.e., the other entities that are within the viewpoint of the user's entity. Such a field of view determination falls within the scope of the ordinary meaning of the determining step, as we determined above in § II.C.2.b.

As additional support for our finding, we credit and find persuasive Dr. Zyda's testimony that Funkhouser's disclosures demonstrate that "[a]fter receiving the filtered positional updates from the server" based on what is "potentially visible" to a particular entity, "the client responsible for [that entity] will determine which, if any, remote [entities] fall within [the entity]'s field of view in order to display the perspective from" that entity. Ex. 1002 ¶ 69; *see id.* ¶ 78; Ex. 2016, 243:8–17. As Dr. Zyda more specifically explains, upon receiving such filtered positional updates, Funkhouser's "client processes the information" and "performs its own calculations" to "identify[] which of the received positions falls within the [entity]'s field of view to determine a set of the other [entities] to display to the user." Ex. 1002 ¶¶ 79–81.

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erroneous numbers are not "material" and "do[] not change [his] opinions with respect to unpatentability." Ex. 1038 ¶ 4. Patent Owner asserts and Mr. Pesce opines similarly. *See* Resp. 31 (noting that the numbers are not supported and representing that "even assuming that Funkhouser[] did support these numbers, it would not change the outcome here."); Ex. 2017 ¶ 54 (opining that Funkhouser does not support Petitioner's statement regarding the numbers, but "it would not change my opinion even if true").

We disagree with Patent Owner's arguments to the contrary. Patent Owner's arguments focus on an assertion that Funkhouser fails to disclose the determining step, as "properly construed to be separate from (and prior to) the rendering/display process." Resp. 26; *see id.* at 29–32. In other words, according to Patent Owner, "no pre-rendering 'determining'" occurs in Funkhouser. *Id.* at 31. Patent Owner similarly asserts that Funkhouser lacks any "crowd control" that is "separate from the perspective/point-of-view determination." *Id.* at 30. Patent Owner faults Petitioner and Dr. Zyda for allegedly not "advanc[ing] any theory that Funkhouser . . . discloses such a 'crowd control' function," and more specifically, "filtering other users' avatars separately from the rendering process," and instead looking to Funkhouser's "graphics pipeline, or visibility algorithm" as disclosing the determining step. *Id.* at 26, 28–29, 31–32.

These arguments are premised on Patent Owner's claim construction arguments disputing Petitioner's proposed claim interpretation, including Patent Owner's attempt to narrow the recited "determining" to be distinct from and before what it refers to as the "rendering/display process" and to limit the step to the client-side crowd control feature of the preferred embodiment in the '856 patent specification—which we have not adopted. *See supra* § II.C.2.b; Reply 13 (asserting that Patent Owner's contention that Funkhouser does not disclose the determining step "is entirely based on its claim construction"); Tr. 21:23–22:6. These arguments are misplaced, and without merit, under the claim scope proposed by Petitioner, with which we agree, as explained above in § II.C.2.b. Although we need not reach these arguments, we note that we agree with Petitioner that Patent Owner's arguments that Funkhouser allegedly lacks "pre-rendering determining" and "determining" separate from, and prior to, the "rendering/display process"

overlook, and fail to address persuasively, Funkhouser's disclosures, detailed above as well as in the Institution Decision and the Petition, regarding its clients processing positional update messages from the server to maintain updated surrogates of remote entities—which Funkhouser describes distinctly from the client's "display[]" of the virtual environment from the "point of view" of a particular entity. *E.g.*, Ex. 1005, 87 ("When a client receives an update message for an entity managed by another client, it updates the geometric and behavioral models for the entity's local surrogate. Between updates, surrogate behavior is simulated by every client."), 87–88, 209; Inst. Dec. 12, 15; Pet. 22, 24; Ex. 1002 ¶¶ 79–81; Reply 13–14; Tr. 22:7–23:2; *see e.g.*, Ex. 1005, 86–87, Figs. 5, 7 (illustrating and discussing a system in which each client (A, B, C, D) manages one entity); Ex. 1002 ¶ 71.

In addition, Patent Owner, after acknowledging Funkhouser's disclosure that a client receives update messages if it "contain[s] entities inside some *cell* visible to the one containing the updated entity"—i.e., Funkhouser's server-based message culling based on precomputed cell-to-cell visibility (*see* Ex. 1005, 87)—asserts that Funkhouser is "silent regarding how the client workstation generates the resulting image displayed on the workstation." Resp. 26 (quoting Ex. 1005, 87) (emphasis added). This argument is undeveloped and lacks clarity. And we disagree that Funkhouser is silent regarding the client-side processing that results in the display. As detailed above, Funkhouser discloses client-side processing, including using update messages to maintain updated surrogates as well as executing programs to display the environment from a particular entity's point of view. *See, e.g.*, Ex. 1005, 87–88; Pet. 21–24; Inst. Dec. 12, 14–15.

This argument of Patent Owner does not address or respond to these disclosures regarding Funkhouser's client.

Accordingly, based on our review of the record arguments and evidence as well as our analysis above, Petitioner has shown by a preponderance of the evidence that Funkhouser discloses the determining step of claim 1 of the '856 patent and in particular, that Funkhouser's client performs this step.

Moreover, we note that under the interpretation of the determining step that we adopted in the Institution Decision and maintain in this Decision, the "first client process" recited in claim 1 need not perform the determining step; rather, the step is broad enough to encompass the "determining" being performed by the recited "first client process," the "server process," or both. *See supra* § II.C.2.a. As we explained in the Institution Decision, there was no dispute before institution that Funkhouser discloses the determining step under this interpretation. Inst. Dec. 13. Nor does Patent Owner clearly articulate such a dispute in the Response, because, as we explain above, Patent Owner contests this interpretation of the claim language (*see supra* § II.C.2.a) and its arguments disputing that Funkhouser discloses the determining step are repeatedly premised on the step as allegedly "properly construed." Resp. 7, 25–32; Ex. 2017 ¶ 52.a (explaining that, in addressing Funkhouser, Mr. Pesce interpreted claim 1 of the '856 patent as requiring the "first client process" to perform the determining step); Reply 13. The preponderance of the evidence before us likewise demonstrates that Funkhouser discloses the determining step under this broader interpretation, in which the client need not perform the step alone, for the reasons given above in support of our determination that the record evidence supports Petitioner's showing that Funkhouser's client

performs the step. In addition, even if Funkhouser's server were considered to play a role in determining which entities are to be displayed to a user, based on positional update messages it receives that originate from other clients, Funkhouser would still fall within the scope of the determining step under this broader interpretation. *E.g.*, Ex. 1005, 87–89; Pet. 20–25; Resp. 26, 31–32; Inst. Dec. 10–17.

In conclusion, for the reasons given above, the preponderance of the evidence before us demonstrates that Funkhouser discloses the determining step of claim 1 of the '856 patent.

b. Undisputed Limitations

We have reviewed the arguments and evidence presented in the Petition as to Funkhouser's disclosure of the remaining limitations of claim 1. Pet. 8, 14–21, 25–26. Patent Owner does not contest that Funkhouser discloses these limitations. *See* Resp. 25–32; *see also* Ex. 2017 ¶¶ 53–54; Reply 13. Based on our review of the Petition, we find persuasive Petitioner's arguments and evidence, including citations to Funkhouser's disclosures and Dr. Zyda's supporting testimony, and we adopt them as the basis for our determination that Funkhouser discloses these limitations of claim 1. Pet. 8, 14–21, 25–26.

For example, we agree with Petitioner's showing for claim 1's receiving step and wherein limitation. *See id.* at 14–21, 25–26. Funkhouser discloses that its clients send messages, including positional information, to servers, "which forward them to other client and server workstations." Ex. 1005, 87, 89. Further, Funkhouser implements "[s]erver-based message culling" such that the servers do not send the positional updates to all clients, but only to clients "with entities that can potentially perceive" "the effects of the update." *Id.* at 85, 87. For example, in Figures 4 and 7 of Funkhouser,

there are four clients A, B, C, and D, yet client A only receives updates on entity B, client B only receives updates on entities A and C, and client C only receives updates on entity B. *Id.* at 87–88, Figs. 4, 7.

In addition, we agree with Petitioner that Funkhouser's entities constitute "avatars," within the meaning of the '856 patent—a graphical representation of a user—and that each user is "associated with" such an "avatar" or entity, as claim 1 requires. Ex. 1001, 21:8–21. As Petitioner points out, Funkhouser explains that in its "shared 3D virtual environment," "each user is represented . . . by an entity rendered on every other user's workstation." Ex. 1005, 85; *see id.* at 209 (Plates I & II); Pet. 17–18; Ex. 1002 ¶ 71. Moreover, we note that Patent Owner does not dispute that Funkhouser discloses an "avatar" even under its proposed narrower construction, which would require the graphical representation to be "three-dimensional." Tr. 67:12–68:2; Resp. 26–32; *see supra* § II.C.3; *cf.* Resp. 32–33 (contesting that Durward discloses an "avatar" under the "proper construction" as "a three-dimensional graphic[al] representation of a user"). The record before us supports that Funkhouser discloses an "avatar" even under this narrower proposed construction, which we have not adopted, because Funkhouser depicts its entities as three-dimensional graphical representations. *See* Ex. 1005, 209 (Plates I & II); *see also id.* at 89 (explaining that "Plates I & II contain images captured during tests"); Pet. 8, 23, 25 (citing Ex. 1005, 209 (Plate II)).

4. *Conclusion*

Based on our review of the record arguments and evidence and our analysis above, Petitioner has demonstrated by a preponderance of the evidence that Funkhouser anticipates claim 1 of the '856 patent.

E. ANTICIPATION BY DURWARD

We now consider the instituted ground in which Petitioner asserts that Durward anticipates claim 1 of the '856 patent and Patent Owner's arguments contesting Petitioner's assertion.

We first assess Durward's prior art status. Petitioner argues Durward is prior art under 35 U.S.C. § 102(e), and Patent Owner has not disputed Petitioner's position. Pet. 26; *see generally* Resp. We agree with Petitioner that Durward, a U.S. patent that was filed on September 23, 1993—before the earliest possible effective filing date of the '856 patent, November 13, 1995, as well as Patent Owner's alleged date of invention in April 1995 (*see supra* § II.D.1.b)—and issued on August 19, 1997 constitutes § 102(e) prior art. *See* 35 U.S.C. § 102(e); Ex. 1001, [60], [63]; Ex. 1008, [22], [45].

1. *Durward*

Durward describes a virtual reality network in which "multiple users . . . may communicate" with the network and "participate in a virtual reality experience." Ex. 1008, 1:6–11, 1:45–51. The disclosed network includes central control unit 14 for communicating with a plurality of users, which, in a particular embodiment, includes processor 100 as well as perspective monitor 132 for monitoring the visual perspectives, or fields of view, of virtual beings. *See id.* at 2:50–52, 3:58–4:4, 6:53–55, Fig. 2.

Durward explains that "[t]ypically," each user is equipped with computer 42, head-mounted display 46, and head position sensor 53. *Id.* at 2:66–3:2. The user communicates its "positional data to computer 42 which, in turn, communicates the data to central control unit 14." *Id.* at 3:15–26; *see id.* at 1:59–61. Central control unit 14 uses this data "to define a virtual being within the virtual space" for the user, which may "emulate" the user's "position, orientation, and/or flexure." *Id.* at 3:27–36; *see* 1:59–

64, 2:1–3, 7:29–34. "The virtual being may take the form of another human being, an animal, machine, tool, inanimate object, etc." *Id.* at 3:30–32.

In the preferred embodiment, "each user's computer has a copy of the entire virtual space (e.g., background, objects and primitives)." *Id.* at 4:19–21; *see id.* at 6:55–57. Central control unit 14 communicates "only position, motion, control, and sound data" to users. *Id.* at 3:58–63, 4:12–23, 5:5–10. "After initial position, motion, control[,] and sound data is communicated to the users, only changes" in this data are communicated. *Id.* at 4:23–26; *see id.* at 6:55–62. According to Durward, "[t]his dramatically reduces bandwidth requirements and allows the system to operate with many concurrent users without sacrificing real-time realism." *Id.* at 4:26–29.

Durward explains that "each virtual being, and hence each user, is assigned a visual relevant space." *Id.* at 4:50–54. "In the context of the preferred embodiment, visual relevant spaces determine which state changes are communicated to (or perceivable by) the users." *Id.* at 4:54–56. Figure 5, a diagram illustrating the concepts of visual relevant spaces, is reproduced below. *Id.* at 2:39–40.

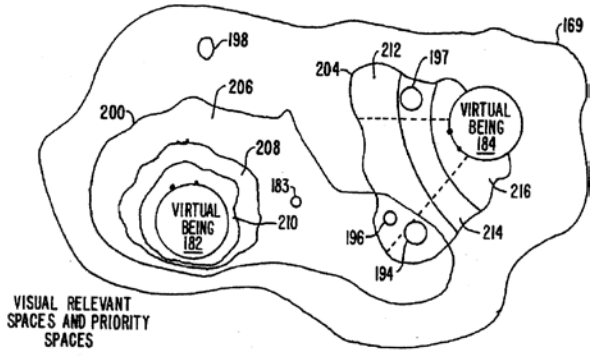

FIG. 5.

Figure 5 depicts virtual space 169, with virtual beings 182, 183, and 184. *Id.* at 4:44–45, 4:59–61. Virtual being 182 is assigned visual relevant space 200; virtual being 184 is assigned visual relevant space 204. *Id.* at

4:61–63. As shown in Figure 5 for virtual being 182, "[t]he visual relevant space may be fixed." *Id.* at 5:12–13. "Alternatively," as depicted for virtual being 184, "the user's visual relevant space may be defined by the field of view of the virtual being and areas in close proximity to it," such that "the visual relevant space may move about the virtual space as the perspective or position of the virtual being changes." *Id.* at 5:13–18. Durward also discloses that "[v]isual relevant spaces need not be contiguous and need not have a direct spatial relationship to the virtual space." *Id.* at 5:18–20.

Durward explains that in its preferred embodiment, the "positional and sound data . . . within the user's visual relevant space or field of view" that central control unit 14 periodically sends to the user allow "the user's computer [to] update the images viewed and sounds heard with the new positional and sound data." *Id.* at 6:55–62. The user's "head[-]mounted display 46," in turn, "displays the portion of the virtual space viewed from the perspective of the virtual being defined for [the] user . . . together with all other defined virtual beings and objects within its field of vision." *Id.* at 3:50–54; *see id.* at [57], 1:57–59 ("[T]he user's computer may display a portion of a selected virtual space on the user's head mounted display.").

2. *Discussion*

a. The Determining Step

Petitioner and Patent Owner dispute whether Durward discloses the determining step of claim 1 of the '856 patent. *See* Pet. 8–9, 26–36; Resp. 32–36; Reply 14–15. According to Petitioner, Durward discloses that its client performs this step. Pet. 8–9, 27–28, 33–35. Petitioner refers to Durward's disclosures regarding assigning users visual relevant spaces, "'which determine which state changes are communicated to'" users by the server. *Id.* at 8, 27 (quoting Ex. 1008, 4:54–56); *see id.* at 34. Petitioner

points out that Durward explains, and illustrates in Figure 5, that visual relevant spaces may include the "'field of view of the [user's] virtual being *and areas in close proximity to it,*'" and thus, according to Petitioner, the visual relevant space "may be broader than the client's field of view" such that the "client would receive information regarding more remote users than would actually be displayed to the user." *Id.* at 8–9, 28, 34 (quoting and citing, *inter alia*, Ex. 1008, 4:43–5:22, 5:12–27, Fig. 5). Petitioner asserts that Durward further discloses that the client workstation uses the positional data from the server to "'update the images viewed and sounds heard'" and that this update includes a client-side determination of the "set of other users' avatars to be displayed to the first user, by identifying which of the received positions of the 'other defined virtual beings' are within the [user's] 'field of vision'" "in order to display 'the portion of the virtual space viewed from the perspective of the [user's] virtual being . . . with all other defined virtual beings and objects within its field of vision.'" *Id.* at 27, 34 (quoting Ex. 1008, 3:50–54, 6:60–62). As we explain below, we agree with Petitioner's showing that Durward discloses that its client performs the determining step recited in claim 1.

As Petitioner argues, in Durward's preferred embodiment, "each user's computer has a copy of the entire virtual space." Ex. 1008, 4:19–21; *see id.* at 6:55–57 ("[I]n the preferred embodiment, each user has a copy of the selected virtual space in his or her computer."); Pet. 34. Central control unit 14 ("server process"), after sending initial "position" data, sends the user updated "positional" data based on the assigned visual relevant space of the user's virtual being ("avatar"). Ex. 1008, 4:18–26, 4:50–56 ("In the . . . preferred embodiment, visual relevant spaces determine which state changes are communicated to . . . the users."), 6:56–62; *see id.* at 3:59–63.

Durward explains that the visual relevant space of a virtual being, and its corresponding user, need not equate to the virtual being's field of view. *Id.* at 4:50–56, 5:5–20, Fig. 5. Rather, for example, Durward discloses that "the user's visual relevant space may be defined by the *field of view* of the virtual being *and areas in close proximity to it*." *Id.* at 5:13–18 (emphases added). Durward explains that this is illustrated by its Figure 5, in which visual relevant space 204 assigned to virtual being 184 is depicted as wider than virtual being 184's field of view, represented by the dashed lines emerging from virtual being 184. *Id.* at 5:13–18, Fig. 5; *see id.* at 4:44–46, 4:59–64; Ex. 1002 ¶¶ 90, 107. Thus, we agree with Petitioner's argument and Dr. Zyda's supporting testimony that Durward makes clear that a virtual being's visual relevant space "may be broader than the client's field of view." Pet. 34; *see id.* at 8–9, 28; *see* Ex. 1002 ¶¶ 90, 105, 107; Ex. 1008, 5:11–20, Fig. 5. In addition, Durward explains that visual relevant space 200 of virtual being 182 is "fixed" and Figure 5 illustrates that this visual relevant space 200 does not correspond to a field of view for virtual being 182. Ex. 1008, 4:59–63, 5:10–20 ("The visual relevant space may be fixed as shown for virtual being 182."), Fig. 5; *see* Ex. 1002 ¶ 107.

Durward discloses that—regardless of the breadth of the assigned visual relevant space (and thus, for example, whether the user receives positional updates for virtual beings outside the user's field of view)—the user's computer uses the positional data received from central control unit 14 to update the images displayed to the user and displays only the virtual beings and objects within the user's field of view. Ex. 1008, 3:50–54, 4:54–56, 5:12–20, 6:55–62, Fig. 5; *see id.* at [57], 1:57–59. In particular, Durward explains that "the user's computer" uses the "new positional . . . data" sent by central control unit 14 to "update the images viewed." *Id.*

at 6:55–62; *see id.* at 3:59–60. Further, Durward discloses that the user's "head[-]mounted display 46 displays the portion of the virtual space viewed from the perspective of the virtual being defined for user 18 together with all other defined virtual beings and objects within its field of vision." *Id.* at 3:50–54; *see id.* at [57], 1:57–59 ("[T]he user's computer may display a portion of a selected virtual space on the user's head mounted display.").

These disclosures of Durward make clear that where the visual relevant space of a virtual being, and its corresponding user, is wider than its field of view, the user receives positional updates from central control unit 14 for virtual beings (and other objects) that are within the virtual being's assigned visual relevant space—but that may not be within its field of view. *Id.* at 4:54–56, 5:5–18, Fig. 5. The user's computer, however, displays only those virtual beings (and objects) within the virtual being's "field of vision." *Id.* at 3:50–54; *see id.* at [57], 1:57–59. Durward's Figure 5 illustrates this because, based on Durward's disclosures, the user corresponding to virtual being 184 receives updated positional data for all virtual beings (and objects) in its assigned visual relevant space 204—but the user's computer displays only those virtual beings (and objects) within its narrower field of vision. *Id.* at 3:50–54, 4:54–56, 5:5–18; *see id.* at [57], 1:57–59; Ex. 1002 ¶¶ 89–90, 106–07.

Based on these disclosures of Durward, we determine that Petitioner has shown that Durward's user computer determines, from the positional data received from central control unit 14 ("server process"), which virtual beings ("avatars") to display to the user, i.e., which virtual beings are within its virtual being's field of view. More specifically, in using the updated "positional . . . data" from central control unit 14 to "update" the "images viewed" in the display, the user's computer determines which virtual beings

are within the user's field of view and, thus, to be displayed to the user, such that the head-mounted display depicts "the portion of the virtual space viewed from the perspective of [its] virtual being . . . together with all other defined virtual beings and objects within its field of vision." Ex. 1008, 3:50–54, 6:55–62, Fig. 5; *see id.* at [57], 1:57–59. This client-side field of view determination falls within the scope of the ordinary meaning of the determining step of claim 1, as we have determined above in § II.C.2.b. Accordingly, we agree with Petitioner's showing that Durward's client performs the determining step of claim 1 of the '856 patent.

In further support of this finding, we credit and find persuasive Dr. Zyda's testimony that the client workstation's "'update [of] images viewed'" with the "'new positional . . . data'" from the server "includes a determination of which user avatars are within the user's field of vision to display 'the portion of the virtual space viewed from the perspective of the virtual being defined for user 18 together with all other defined virtual beings and objects within its field of vision.'" Ex. 1002 ¶ 89 (quoting Ex. 1008, 3:50–54, 6:60–62). As Dr. Zyda further testifies, "[u]pon receipt of the position information from the server, the client determines a set of other users' avatars to be displayed to the first user, by identifying which of the received positions fall within the user's field of view." *Id.* ¶ 106; *see id.* ¶ 103. Dr. Zyda explains that virtual beings 182 and 184 in Figure 5 demonstrate this client-side determining, as "virtual being 184's visual relevant space 204 follows but is broader than virtual being 184's field of vision (represented by dashed lines)" and "virtual being 182's visual relevant space 200 is not connected to virtual being 182's field of vision," yet the clients for these beings "determine[] which avatars are within their

respective fields of vision to display the avatars to their respective users." *Id.* ¶ 107; *see id.* ¶¶ 89–90; Ex. 1008, Fig. 5.

We disagree with Patent Owner's arguments asserting that Durward does not disclose the determining step of claim 1. Patent Owner contends that Durward "fails to disclose the claimed 'determining' step as properly construed" to require "determining" "separate from (and prior to) the graphics pipeline." Resp. 32, 35–36. As support, Patent Owner points to Durward's disclosures regarding central control unit 14, particularly the explanation that its perspective monitor 132 "monitors the defined field of view of each virtual being" and that this information allows processor 100, another component of central control unit 14, to send "positional and sound data assigned to points within the user's relevant space or field of view to the user so that the user's computer may update the images viewed . . . with the new positional . . . data." *Id.* at 35 (quoting Ex. 1008, 6:53–62). Patent Owner further argues that "in one embodiment, the '[p]erspective monitor . . . instructs update communication control unit 148 [of central control unit 14] to communicate the graphical data for the update[d] field of view to the user.'" *Id.* (quoting Ex. 1008, 7:15–18 (alterations other than last in Patent Owner Response)). Patent Owner also refers to deposition testimony from Dr. Zyda in which he agrees that Durward's perspective monitor 132 of central control unit 14 will "know what [is] inside of the field of view" and "can be seen" by the virtual being. *Id.* at 35–36 (citing and quoting Ex. 2016, 84:24–85:17); Ex. 2016, 84:24–85:10.

Patent Owner's dispute as to whether Durward discloses the determining step is premised on its proffered claim construction arguments disputing Petitioner's proposed claim scope, which we have addressed above and found unpersuasive. *See supra* § II.C.2.b; *see* Reply 14; Tr. 23:2–9.

Patent Owner's arguments are misplaced under the ordinary meaning of the claim language and Petitioner's proposed claim scope, with which we agree, as explained above in § II.C.2.b.

Moreover, the passages of Durward regarding perspective monitor 132 of central control unit 14 and Dr. Zyda's related deposition testimony, to which Patent Owner directs our attention, do not contradict Petitioner's position or our analysis above. As explained above, Petitioner's argument and our analysis regarding Durward's disclosure of the determining step recognize that Durward's central control unit 14 sends the updated positional data for a virtual being's visual relevant space to its user and this visual relevant space can correlate to the field of view of the virtual being. *See*, *e.g.*, Ex. 1008, 3:58–63, 4:18–26, 4:50–56, 5:13–18 ("[T]he user's visual relevant space may be defined by the *field of view of the virtual being and areas in close proximity to it . . . in which case the visual relevant space may move about the virtual space as the perspective or position of the virtual being changes*.") (emphasis added), 6:56–62, Fig. 5; Pet. 34. Thus, Durward's disclosures that central control unit 14 monitors virtual beings' field of view to determine which updated positional data to transmit to each user, as well as Dr. Zyda's related testimony acknowledging that this unit will know what is in a virtual being's field of view, are fully consistent with and do not contravene Petitioner's position or our analysis above. *See* Ex. 1008, 6:52–62; Ex. 2016, 84:24–85:14.

In addition, column 7, lines 15–18 of Durward, to which Patent Owner cites, refers to an "example" of an embodiment distinct from that on which Petitioner's anticipation argument relies. Ex. 1008, 7:3–24 ("In *another embodiment* of the invention . . . *For example*") (emphases added); Resp. 35 ("in one embodiment" followed by quotation of Ex. 1008, 7:15–

18). Therefore, this passage does not negate Petitioner's showing regarding Durward's disclosure of the determining step. In addition, Durward explains that in this embodiment, processor 100 of central control unit 14 "may communicate all graphical data associated with the relevant space *or field of view* of the virtual being to the corresponding user and then instruct update communication control unit 148 to send updated data as appropriate," e.g., upon the occurrence of a specified triggering event. Ex. 1008, 7:3–25 (emphasis added). Durward also provides an "example" in which the components of central control unit 14 determine the position of the virtual being's head, send "graphical data for that portion of the relevant space to the user," and when a selected event is detected, communicate "the graphical data for the updated field of view to the user." *Id.* Thus, Durward's disclosure that in this particular example provided of this embodiment, central control unit 14 communicates the "graphical data for the updated field of view" does not contradict Petitioner's position and our analysis above that, particularly in light of Durward's disclosures that the user's computer displays only the virtual beings in the user's field of view even though its assigned visual relevant space and, therefore, the positional updates it receives need not equate to the user's field of view, Durward's client performs the determining step.

Accordingly, Petitioner has shown by a preponderance of the evidence that Durward discloses the determining step of claim 1 of the '856 patent and in particular, that Durward's client performs this step.

Moreover, we note that under the claim interpretation we adopted in the Institution Decision and maintain in this Decision, the recited "first client process" need not perform the determining step and, instead, the step can be performed by the "first client process," the "server process," or both. *See*

supra § II.C.2.a. As we explained in the Institution Decision, there was no dispute at that stage of the proceeding that Durward discloses the determining step under this broader interpretation. Inst. Dec. 20. There remains no such dispute in the record, because, as explained above, Patent Owner contests this interpretation of the claim language (*see supra* § II.C.2.a), and argues only that Durward does not disclose the determining step as allegedly "properly construed." Resp. 7, 25, 32, 35–36; Ex. 2017 ¶¶ 52.a.ii–iv, 56.a (explaining that, in addressing Durward, Mr. Pesce interpreted claim 1 of the '856 patent as requiring the "first client process" to perform the determining step). The preponderance of the evidence before us likewise demonstrates that Durward discloses the determining step under this broader interpretation, in which the client alone need not perform the step, for the reasons given above in support of our determination that the record evidence supports Petitioner's showing that the client performs the step. In addition, even if central control unit 14 ("server process"), including processor 100 and perspective monitor 132—to which Patent Owner directs our attention in its arguments in the Response—were considered to play a role in determining which virtual beings are to be displayed to the user, using the positions it receives from other clients, Durward would still meet the determining step under this broader interpretation. *E.g.*, Ex. 1008, 1:59–61, 2:1–3, 4:21–26, 4:54–56, 6:52–62; *see, e.g.*, *id.* at 3:15–20, 3:58–4:5; Pet. 28–33; Resp. 32, 35–36; Inst. Dec. 18–25.

In conclusion, the preponderance of the evidence before us shows that Durward discloses the determining step of claim 1 of the '856 patent.

b. Avatar

Patent Owner also contests Petitioner's showing that Durward discloses an "avatar," as recited in claim 1 of the '856 patent. *See* Resp. 32–

35. Petitioner argues, and Dr. Zyda opines, that Durward discloses an "avatar" based on its disclosures regarding defining a "virtual being" for each user within a virtual space using position, orientation, and movement data received from each user. *See* Pet. 11–12 (citing, *inter alia*, Ex. 1008, 1:59–64, 2:1–3, 3:30–32; Ex. 1002 ¶¶ 91–93); Ex. 1002 ¶ 92.

Patent Owner disputes that Durward discloses an "avatar" under its proposed construction of the term, requiring a "three-dimensional graphical representation of a user." Resp. 32–35. In particular, Patent Owner, with supporting testimony from Mr. Pesce, asserts that Durward, despite disclosing "three-dimensional virtual spaces," does not disclose or suggest that the virtual entities within those spaces are three-dimensional and a person of ordinary skill in the art instead would have understood the entities to be two-dimensional. *Id.* at 32–34 (citing Ex. 2017 ¶ 59); Ex. 2017 ¶ 59; *see* Tr. 134:10–135:6, 145:5–16. Patent Owner points out that "Petitioner presents no argument or theory that Durward discloses, either inherently or expressly, three-dimensional virtual entities." Resp. 33. In addition, Patent Owner argues that Dr. Zyda's testimony offered in IPR2015-01319, which challenges the '501 patent, opining that Durward's virtual beings are three-dimensional is conclusory and contradicted by Mr. Pesce's testimony. *Id.* at 34 (citing IPR2015-01319, Ex. 1002 ¶ 167); Tr. 135:8–15, 145:5–16.

In Reply, Petitioner notes that Patent Owner does not "present any arguments regarding whether Durward discloses an 'avatar' under [Petitioner]'s proposed construction" and, thus, Patent Owner's dispute is "entirely dependent" on its proposed construction of the term. Reply 14. Moreover, Petitioner asserts that Durward discloses an "avatar" even under Patent Owner's proposed construction limiting the term to "three-dimensional" representations, in light of Durward's disclosures that

its virtual beings are in a "three-dimensional virtual space" and "emulate the gestures of the user" based on "data designating flexure and position of the user's legs, arms, fingers, etc." *Id.* at 14–15 (quoting Ex. 1008, 1:52–64, 7:29–34); Tr. 47:9–17, 166:10–23, 169:3–7, 170:16–171:7. According to Petitioner, Patent Owner does not explain how such a correlation "between a user's three dimensional-movement in the real world and a virtual being in a three-dimensional virtual world would be restricted to two-dimensions" and Mr. Pesce's testimony on the issue is unsubstantiated and not credible. Reply 15; *see* Tr. 47:9–17, 166:10–23, 169:3–7, 169:19–22, 170:16–171:7.

Here, Patent Owner's dispute regarding whether Durward discloses an "avatar," as recited in claim 1 of the '856 patent, expressly relies and rests on its proposed construction limiting the term to "three-dimensional" graphical representations of a user, as Patent Owner contests Petitioner's showing only as to whether Durward's virtual entities are three-dimensional. Resp. 32–35 (arguing that Durward fails to disclose "avatar" under the "proper construction" requiring "three-dimensional"); Ex. 2017 ¶ 59; Tr. 127:6–11 (Patent Owner agreeing that the only dispute that must be resolved on the construction of "avatar" is whether an avatar is required to be three-dimensional); Reply 14 (asserting that Patent Owner's dispute is "entirely dependent on its . . . flawed claim construction[]" and Patent Owner does not "present any argument regarding whether Durward discloses an 'avatar' under [Petitioner]'s proposed construction"). We have determined above, however, that "avatar" is not limited to three-dimensional graphical representations, as Patent Owner urges in its proposed claim construction. *See supra* § II.C.3. Accordingly, in the absence of a "three-

dimensional" requirement for the term "avatar," there is no dispute in the record that Durward discloses an "avatar."[17]

On the record before us, Petitioner has demonstrated that Durward discloses an "avatar," within the meaning of the '856 patent. As Petitioner points out and as outlined above, Durward discloses that within a virtual space, the communications unit, or central control unit 14, "define[s] a virtual being" for a particular user and "defines other virtual beings" for other users based on the "position, orientation, and/or movement" data received for each user. Ex. 1008, 1:54, 1:59–64, 2:1–3; *see id.* at 2:66–3:1, 3:15–20, 3:27–35, 7:29–34; Pet. 28–29; Ex. 1002 ¶ 92; Reply 14–15; Inst. Dec. 18. Durward further explains that these virtual beings may be visible

[17] We note that if an "avatar" were required to be three-dimensional, as Patent Owner argues, we would agree with Patent Owner that Petitioner fails to show by a preponderance of the evidence that Durward discloses an avatar. Durward's disclosures of a "three-dimensional virtual space[]" and that virtual beings therein may "emulate the gestures of the user" based on the user's "flexure and position"—to which Petitioner refers in response to Patent Owner's arguments—are insufficient to demonstrate that Durward's virtual beings are three-dimensional. *See* Ex. 1008, 1:52–64, 7:29–34; Reply 14–15; Tr. 47:9–17, 166:10–23, 169:3–22, 170:16–171:7. Petitioner has not explained or argued persuasively, or proffered evidence sufficient to show, that such descriptions disclose or necessarily require the virtual beings to be three-dimensional, rather than, for example, two-dimensional. Mr. Pesce testifies that these disclosures do not recite three-dimensional virtual entities and are "entirely consistent with two-dimensional" entities. Ex. 2017 ¶ 59. Dr. Zyda has not offered testimony to the contrary in this case. *See* Tr. 47:18–48:12; Ex. 1002. We do not find it appropriate to consider in this case Dr. Zyda's testimony in IPR2015-01319 opining that Durward's virtual beings are three-dimensional. *See* IPR2015-01319, Ex. 1002 ¶ 167. Even if we were to consider the testimony, we find it wholly conclusory and lacking explanation and, thus, entitled to little weight and insufficient to overcome Patent Owner's arguments and showing to the contrary, including Mr. Pesce's testimony on the issue. *See id.*; 37 C.F.R. § 42.65(a); Ex. 2017 ¶ 59.

within the virtual space and "may take the form of another human being, an animal, machine, tool, inanimate object, etc." Ex. 1008, 3:30–32; Pet. 29; Ex. 1002 ¶ 92. We agree with Petitioner that these passages evidence that each of Durward's virtual beings is a "graphical representation of a user" and that each user is "associated with" a virtual being, or "avatar," as claim 1 requires. *See* Ex. 1001, 21:8–14.

c. Undisputed Limitations

We have reviewed the evidence and arguments presented in the Petition as to Durward's disclosure of the remaining limitations of claim 1 of the '856 patent. Pet. 8–9, 26–36. Patent Owner does not contest that Durward discloses these limitations. *See* Resp. 32–36; *see also* Ex. 2017 ¶¶ 56–59; Reply 14–15. Based on our review of the Petition, we find persuasive Petitioner's arguments and evidence, including citations to Durward's disclosures and Dr. Zyda's supporting testimony, and we adopt them as the basis for our determination that Durward discloses these limitations of claim 1. Pet. 8–9, 26–36.

For example, we agree with Petitioner's showing that Durward discloses the receiving step and wherein limitation of claim 1. In Durward, users communicate their positions to the communications unit, or central control unit 14, and central control unit 14 periodically communicates changes in "position . . . data" to the users based on their assigned visual relevant space. Ex. 1008, 1:59–61, 2:1–3, 2:5–9, 4:12–26, 4:50–56; 6:55–62; *see id.* at 3:15–20, 3:58–64. Moreover, Durward makes clear that in the preferred embodiment, users do not receive positional updates on virtual beings outside their visual relevant space, because the visual relevant space "determine[s] which state changes are communicated to" users. *Id.* at 4:50–56; *see* Ex. 1002 ¶¶ 101–02. For example, in Durward's Figure 5, virtual

being 184 does not receive a positional update on virtual being 183, because virtual being 183 is not within visual relevant space 204 of virtual being 184. *See* Ex. 1008, 4:43–45, 4:54–56, 4:61–63, 5:12–13, Fig. 5; Ex. 1002 ¶ 102.

3. *Conclusion*

Based on our review of the arguments and evidence of record and for the reasons given above, Petitioner has shown by a preponderance of the evidence that Durward anticipates claim 1 of the ’856 patent.

F. REAL PARTY IN INTEREST

Patent Owner argues Activision Publishing, Inc. (“Activision”) is an unnamed real party in interest, who was served with a complaint in the District Court Case more than one year before the Petition was filed. Resp. 36–42. Thus, according to Patent Owner, the Petition fails to comply with 35 U.S.C. § 312(a)(2) and 37 C.F.R. § 42.8 and institution of review was barred under 35 U.S.C. § 315(b). Resp. 36–42. Patent Owner argues the Board erred in denying its Motion for Routine or Additional Discovery related to this issue (Paper 9) and in instituting review despite Patent Owner’s assertions of Activision’s status as a real party in interest. Resp. 36–42.

The Response repeats largely the same arguments Patent Owner raised in its discovery motion and Preliminary Response, for example, relying on the same provisions of the Software Publishing and Development Agreement between Activision and Petitioner to support its assertion that Activision had the opportunity to control and is funding this *inter partes* review. *See, e.g., id.*; Prelim. Resp. 30–39; Reply 20. We addressed Patent Owner’s arguments and evidence in detail in our pre-institution order denying Patent Owner’s Motion for Routine or Additional Discovery and the Institution Decision. *See* Inst. Dec. 26–33 (§ II.E); Paper 11. We note that

Patent Owner did not seek rehearing of the Institution Decision or permission for a renewed request for discovery after institution. Nonetheless, having reconsidered the issue in light of Patent Owner's arguments in the Response, we remain unpersuaded that there is sufficient evidence that Activision is an unnamed real party in interest for the reasons given in the Institution Decision. Inst. Dec. 26–33 (§ II.E).

In addition, the only argument in the Response that is meaningfully distinct from arguments previously raised and considered is Patent Owner's assertion that it produced in the District Court Case evidence corroborating its conception arguments and Activision's counsel in that case has refused to de-designate this evidence as confidential, thereby preventing Patent Owner from producing the evidence in this proceeding and showing that Activision has exercised control over the proceeding. Resp. 40 n.10, 45 n.11. We do not find these allegations related to a discovery dispute between Patent Owner and Activision in the District Court Case to support Patent Owner's allegations that Activision is a real party in interest in this proceeding.

G. ALLEGED UNCONSTITUTIONALITY OF THIS PROCEEDING

Patent Owner argues that an unpatentability ruling in this *inter partes* review proceeding constitutes an impermissible taking of a private right without Article III oversight. *Id.* at 42–44. Petitioner responds that the U.S. Court of Appeals for the Federal Circuit has addressed such arguments and held that the *inter partes* review process is not unconstitutional. Reply 20. Petitioner is correct that the Federal Circuit has addressed the issue and rejected a challenge to the constitutionality of *inter partes* reviews as violative of Article III. *See MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1289–92 (Fed. Cir. 2015), *cert. denied*, 2016 WL 1724103

(S.C. Oct. 11, 2016). Accordingly, we disagree with Patent Owner's arguments on this issue.

H. Patent Owner's Motion to Exclude

In its Motion to Exclude, Patent Owner seeks to exclude five exhibits, specifically Exhibits 1033, 1034, 1037, 1041, and 1042. *See generally* Mot. We have not relied on four of these exhibits—Exhibits 1033, 1034, 1037, and 1042—in reaching our decision and, therefore, Patent Owner's arguments as to these exhibits are moot. For Exhibit 1042, in particular, we note that Petitioner does not cite this exhibit in its Petition or its Reply and, thus, has not proffered any argument relying on this exhibit. *See id.* at 9; Opp'n 11; *see generally* Pet.; Reply. Accordingly, Patent Owner's Motion to Exclude is *dismissed* as moot as to Exhibits 1033, 1034, 1037, and 1042.

The remaining exhibit, Exhibit 1041, is an excerpt from an interview of Mr. Pesce at the 1999 AllChemical Arts conference in which Mr. Pesce discusses his use of psychedelic drugs beginning in college and how this usage has affected and facilitated his work and career. Ex. 1041. Patent Owner objects to its admissibility under Rules 402, 403, 404, 405, and 608. Mot. 7. Specifically, Patent Owner argues Petitioner uses the exhibit "to attack Mr. Pesce through irrelevant and improper evidence directed to general character and specific instances of conduct, rather than to his qualifications to testify on the knowledge and understanding of a person of ordinary skill in the art. *See* Fed. R. Evid. 402, 404, 405, 608." Mot. 8; *see* Mot. Reply 6. In addition, Patent Owner asserts that even if the Board were to conclude that Exhibit 1041 is "relevant to any issue in this proceeding," the exhibit should be excluded under Rule 403 because "any probative value" is substantially outweighed by the "risk of unfair prejudice,"

"namely, that Mr. Pesce's entire testimony would be entitled to no weight due to any use of psychedelics." Mot. 8.

Petitioner contends Exhibit 1041 is relevant and admissible because it "bears on the credibility of Patent Owner's expert and the reliability of his testimony in this proceeding, including his ability to accurately recall details from the relevant time period." Opp'n 6–7; *see id.* at 10. In other words, according to Petitioner, Exhibit 1041 is relevant to Mr. Pesce's "capacity to remember details" and "recall events" from the 1990s, including "virtual reality technology," as well as "the quality of any such recollections." *Id.* at 7–9. Petitioner contends Exhibit 1041 "is not submitted to attack Mr. Pesce's character" and "thus, Patent Owner's citations to [Rules] 404, 405, and 608 are misplaced." *Id.* at 7 & n.1. Petitioner also asserts Patent Owner's argument regarding Rule 403 "should be denied," because the only unfair prejudice Patent Owner alleges is that the Board will give Mr. Pesce's testimony little or no weight but this would be "the correct outcome" for the reasons identified in its Reply. *Id.* at 10.

Patent Owner responds Petitioner has "no basis to argue that the contents of Exhibit 1041 weigh on Mr. Pesce's memory of events in the mid-1990s." Mot. Reply 5. As support, Patent Owner argues that even Petitioner's counsel acknowledged in referring to events in April 1993 that it is "hard to remember" events from such a "long time ago." *Id.* at 5–6 (quoting Ex. 1046, 28:8–13).

We first address Exhibit 1041's admissibility as to Mr. Pesce's capacity to recall events from the 1990s as well as the reliability of such recollections. As part of his testimony regarding claim construction and unpatentability in this proceeding, Mr. Pesce offers testimony, both in his declaration and at his deposition, regarding developments in virtual reality

from approximately 1991 through 1996 and the status of the art at various points of that time period. *See*, *e.g.*, Ex. 2017 ¶¶ 36–44, 49.a.iv, 59; Ex. 1046, 85:4–21, 89:10–90:7, 204:12–205:20, 222:1–223:6. Therefore, Exhibit 1041, featuring excerpts of an interview of Mr. Pesce from 1999 documenting his drug use beginning in college[18] and how this usage facilitated and impacted his work, is relevant to his capacity to perceive and recall these details and events on which he testifies, and the reliability of such perceptions and recollections. *See, e.g.*, *Jarrett v. United States*, 822 F.2d 1438, 1445–46 (7th Cir. 1987) (holding that a "witness's use of drugs" is "relevant" to, and may be used to attack, the witness's "ability to perceive the underlying events"); *United States v. Apperson*, 441 F.3d 1162, 1195–96 (10th Cir. 2006) (quoting *Jarrett*, 822 F.2d at 1446); *United States v. Robertson*, 583 F.3d 1365, 1272 (10th Cir. 2009) (recognizing that drug use bears on a witness's "capacity," which is significant "at the time of the event," and that "[a] witness's credibility may always be attacked by showing that his or her capacity to observe, remember, or narrate is impaired") (internal citations and quotations omitted); *United States v. Dixon*, 38 Fed. App'x 543, 548 (10th Cir. 2002) (unpublished) ("Evidence of a witness's drug use may be admitted to show the effect of the drug use on the witness's memory or recollection of events."); *United States v. Smith*, 156 F.3d 1046, 1055 (10th Cir. 1998) (upholding allowance of witness questioning regarding drug use twenty years earlier as relevant to her "ability to remember the [relevant] events" or her "recall and recollection").

When offered for this purpose, Rules 404, 405, and 608 do not prohibit Exhibit 1041's admissibility. Rule 404, and related Rule 405, do

[18] According to his declaration, Mr. Pesce left MIT in 1982. Ex. 2017 ¶ 3.

not bar admission of Exhibit 1041 for this purpose because it is not being offered as character evidence to "show that on a particular occasion [Mr. Pesce] acted in accordance with" a particular "character" or "trait." Fed. R. Evid. 404(a)(1), (b)(1); *see* Fed. R. Evid. 405 (providing for allowable methods of proving a person's character when such evidence is admissible); *see also United States v. Skelton*, 514 F.3d 433, 441 (5th Cir. 2008) (concluding that "Rule 404(b) does not bar the evidence at issue because it is not being offered as character evidence to show action in conformity therewith"). Nor does Rule 608(b) apply. Rule 608(b) provides, in pertinent part, that "[e]xcept for a criminal conviction under Rule 609, extrinsic evidence is not admissible to prove specific instances of a witness's conduct in order to attack or support the witness's *character for truthfulness*." Fed. R. Evid. 608(b) (emphasis added). Therefore, by its express terms, "[t]he application of Rule 608(b) to exclude extrinsic evidence of a witness's conduct is limited to instances where the evidence is introduced to show a witness's *general character for truthfulness*." *Skelton*, 514 F.3d at 441–42; *see United States v. Taylor*, 426 Fed. App'x 702, 705–06 (11th Cir. 2011) (unpublished). In other words, the Rule acts as an "absolute prohibition on extrinsic evidence . . . only when the *sole* reason for proffering that evidence is to attack or support the witness' character for truthfulness" or "veracity." *United States v. Epstein*, 426 F.3d 431, 439 n.4 (1st Cir. 2005); Fed. R. Evid. 608(b) advisory committee's note to 2003 amendments (emphasis added). Accordingly, Rule 608(b) does not bar the admissibility of Exhibit 1041 because it is being offered as evidence of Mr. Pesce's capacity and reliability in perceiving and recalling events from the 1990s.

Given that Exhibit 1041 is relevant for this purpose and its admission is not barred by Rules 404, 405, and 608, we turn to Rule 403 to consider whether it should nonetheless be excluded because its "probative value is substantially outweighed by a danger of . . . unfair prejudice." Fed. R. Evid. 403.[19] Here, the probative value of Exhibit 1041 as to Mr. Pesce's ability to perceive and recall events and details from the art in the early to mid-1990s is limited as, for example, it lacks specific details regarding the extent and regularity of his drug use. Yet, on the other hand, the risk of unfair prejudice is minimal. To begin with, an unfair prejudice analysis is not well suited to a bench trial, such as this. *See*, *e.g.*, *Schultz v. Butcher*, 24 F.3d 626, 632 (4th Cir. 1994) ("[I]n the context of a bench trial, evidence should not be excluded under 403 on the ground that it is unfairly prejudicial."); *Gulf States Utilities Co. v. Ecodyne Corp.*, 635 F.2d 517, 519 (5th Cir.1981) (holding that "exclusion of evidence under Rule 403's weighing of probative value against prejudice was improper" and was a "useless procedure" because "[t]his portion of Rule 403 has no logical application to bench trials"). Moreover, the only "unfair prejudice" that Patent Owner alleges is that "all" of Mr. Pesce's testimony will be given little to no weight—which is not accurate, as we are considering the admissibility of Exhibit 1041 only for its relevance to his capacity and reliability in perceiving and recalling events and other details from the early to mid-1990s, on which he offers testimony. Although we are cognizant of the sensitive nature of evidence of drug use, there is minimal risk of any unfair prejudice from considering Exhibit 1041 for this limited purpose. In sum, the probative value of Exhibit 1041 for this limited purpose is not

[19] Rule 403 lists other considerations but Patent Owner does not argue that any of these apply and we conclude that they do not. *See id.*; Mot. 7–8.

"substantially outweighed" by any danger of unfair prejudice and, thus, exclusion under Rule 403 is not warranted.

We turn to the alleged relevance and admissibility of Exhibit 1041 regarding "Mr. Pesce's credibility" generally. Opp'n 7; *see id.* at 6, 10. Petitioner, in addition to specifying that Exhibit 1041 is relevant to Mr. Pesce's "capacity" and "ability to accurately recall details from the relevant time period" and "the quality of any such recollections," makes more general references to the exhibit's alleged relevance to his "credibility." *Id.* at 6–10. To the extent Petitioner is suggesting that we consider Exhibit 1041 to assess Mr. Pesce's truthfulness, Rule 608(b) bars the admissibility of extrinsic evidence to attack a "witness's character for truthfulness," as explained above. Fed. R. Evid. 608(b). Also, evidence of drug use generally is not considered relevant to or probative of truthfulness. *See United States v. Tanksley*, 35 F.3d 567, 1250 (6th Cir. 1997) (unpublished) ("Evidence of prior drug use generally is not relevant to the issue of truthfulness . . . .").

We recognize a witness's credibility may involve aspects beyond truthfulness. For example, "Rule 608(b) was amended by substituting 'character for truthfulness' in place of 'credibility,'" *Epstein*, 426 F.3d at 439 n.4, because, as the advisory committee explains, "*use of the overbroad term 'credibility'* had been read 'to bar extrinsic evidence for bias, competency and contradiction impeachment since they too deal with credibility," Fed. R. Evid. 608(b) advisory committee's note to 2003 amendments (emphasis added); *see also Skelton*, 514 F.3d at 441–42; *Taylor*, 426 Fed. App'x at 705. Petitioner, however, in discussing Exhibit 1041 in its Reply and in opposing Patent Owner's Motion to Exclude, does not articulate any relevance of Exhibit 1041 as to Mr. Pesce's

credibility that is distinct from his truthfulness, for which its admission is barred under Rule 608(b), and his capacity and reliability in recalling events in the art in the 1990s, for which we have determined above the evidence is relevant and admissible. *See* Reply 3; Opp'n 6–10. Nor do we see any such relevance. In addition, courts have often held that evidence of a witness's drug use, though relevant to the witness's capacity to perceive and recall relevant events, cannot be used to attack the witness's "general credibility." *E,g.*, *Jarrett*, 822 F.2d at 1446 ("A witness's use of drugs may not be used to attack his or her general credibility but only his or her ability to perceive the underlying events and testify lucidly at trial."); *Apperson*, 441 F.3d at 1195–96 (quoting *Jarrett*, 822 F.2d at 1446) (holding that "the district court correctly concluded that evidence of [the witness's] alleged prior drug use could not be used to attack [his] general credibility"); *see also, e.g.*, *United States v. Cousins*, 842 F.2d 1245, 1249 (11th Cir. 1988) ("[A]lthough extrinsic evidence of prior drug use could not properly be used just to attack [defendant]'s credibility, such evidence could be used to refute the specifics to which [defendant] had previously testified.").

Accordingly, we admit Exhibit 1041 and consider it for the limited purpose of assessing Mr. Pesce's capacity to perceive and recall events and details from the relevant art from the 1990s about which he testifies, as well as the reliability of such perceptions and recollections. We do not, however, consider Exhibit 1041 for Mr. Pesce's credibility more generally and particularly, his truthfulness. Thus, Patent Owner's Motion to Exclude is *denied* as to Exhibit 1041.

III. CONCLUSION

In conclusion, Petitioner has shown by a preponderance of the evidence that claim 1 of the ’856 patent is unpatentable as anticipated under 35 U.S.C. § 102 by Funkhouser and by Durward.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claim 1 of the ’856 patent is unpatentable;

FURTHER ORDERED that Patent Owner’s motion to exclude (Paper 33) is *dismissed* as moot as to Exhibits 1033, 1034, 1037, and 1042 and *denied* as to Exhibit 1041; and

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

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PETITIONER

Michael T. Rosato
Matthew A. Argenti
Andrew Brown
WILSON SONSINI GOODRICH & ROSATI
mrosato@wsgr.com
margenti@wsgr.com
asbrown@wsgr.com

PATENT OWNER:

Wayne M. Helge
Donald L. Jackson
Michael R. Casey
DAVIDSON BERQUIST JACKSON & GOWDEY, LLP
whelge@dbjg.com
djackson@dbjg.com
mcasey@dbjg.com