

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EMERSON ELECTRIC CO.,
Petitioner,

v.

IPCO, LLC,
Patent Owner.

Case IPR2017-00007
Patent 8,233,471 B2

Before BRYAN F. MOORE, MICHAEL J. FITZPATRICK, and
ROBERT J. WEINSCHENK, *Administrative Patent Judges*.

WEINSCHENK, *Administrative Patent Judge*.

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

I. INTRODUCTION

Emerson Electric Co. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 2–4, 6–8, 10–12, 14–16, 40, and 41 (“the challenged claims”) of U.S. Patent No. 8,233,471 B2 (Ex. 1001, “the ’471 patent”). IPCO, LLC (“Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”) to the Petition. On April 5, 2017, we instituted an *inter partes* review of the challenged claims of the ’471 patent on the following grounds:

Claims	Statutory Basis	Applied References
2, 3, 6, 7, 10, 11, 14, 15, 40, and 41	35 U.S.C. § 103(a) ¹	J. Burchfiel et al., <i>Functions and Structure of a Packet Radio Station</i> , 44 AFIPS Conference Proceedings, 245–51 (1975) (Ex. 1004, “Burchfiel”); and I. Gitman et al., <i>Routing in Packet-Switching Broadcast Radio Networks</i> , 24:8 IEEE Transactions on Communications, 926–30 (1976) (Ex. 1005, “Gitman”)
4, 8, 12, and 16	35 U.S.C. § 103(a)	Burchfiel; Gitman; and Robert E. Kahn, <i>The Organization of Computer Resources Into a Packet Radio Network</i> , 44 AFIPS Conference Proceedings, 177–86 (1975) (Ex. 1007, “Kahn”) ²

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, which was enacted on September 16, 2011, made amendments to 35 U.S.C. §§ 102, 103. AIA § 3(b), (c). Those amendments became effective eighteen months later on March 16, 2013. *Id.* § 3(n). Because the application from which the ’471 patent issued was filed before March 16, 2013, any citations herein to 35 U.S.C. §§ 102, 103 are to their pre-AIA versions.

² Petitioner refers to Kahn as Kahn75. Pet. 4–6.

Claims	Statutory Basis	Applied References
4, 8, 12, and 16	35 U.S.C. § 103(a)	Burchfiel; Gitman; Kahn; and Admitted Prior Art (“APA”) ³

Paper 12 (“Dec. on Inst.”), 19.

After institution, Patent Owner filed a Response (Paper 21, “PO Resp.”) to the Petition, and Petitioner filed a Reply (Paper 29, “Pet. Reply”) to the Response. An oral hearing was held on December 19, 2017, and a transcript of the hearing is included in the record. Paper 39 (“Tr.”).

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a). For the reasons set forth below, Petitioner has shown by a preponderance of the evidence that claims 2–4, 6–8, 10–12, 14–16, 40, and 41 of the ’471 patent are unpatentable.

A. Related Proceedings

The parties indicate that the ’471 patent is at issue in the following district court cases: *Emerson Electric Co. v. SIPCO, LLC*, No. 1:15-cv-00319 (N.D. Ga.)⁴; and *SIPCO, LLC v. Streeline, Inc.*, No. 1:16-cv-00830 (D. Del.). Pet. 3; Paper 3, 1–2; Paper 32, 2; Paper 36, 2. The parties also indicate that the following petitions for *inter partes* review are related to this case:

Case No.	Involved U.S. Patent No.
IPR2013-00482	U.S. Patent No. 6,044,062
IPR2014-00147	U.S. Patent No. 6,249,516

³ Petitioner cites to portions of the ’471 patent as evidence of APA. *See, e.g.*, Pet. 61 (citing Ex. 1001, 15:12–27). Patent Owner does not raise any issue with respect to Petitioner’s reliance on APA in this case.

⁴ *SIPCO, LLC v. Emerson Electric Co.*, No. 6:15-cv-00907 (E.D. Tex) was transferred to the Northern District of Georgia, opened as *SIPCO, LLC v. Emerson Electric Co.*, No. 1:16-cv-02690 (N.D. Ga.), and then consolidated with *Emerson Electric Co. v. SIPCO, LLC*, No. 1:15-cv-00319 (N.D. Ga.).

IPR2015-01901	U.S. Patent No. 8,000,314
IPR2016-01602	U.S. Patent No. 6,249,516
IPR2017-00008	U.S. Patent No. 8,233,471
IPR2017-00213	U.S. Patent No. 8,625,496
IPR2017-00252	U.S. Patent No. 8,000,314

Pet. 3; Paper 3, 2; Paper 32, 2; Paper 36, 2.

B. *The '471 Patent*

The '471 patent relates to a wireless network for transmitting digital data packets. Ex. 1001, 1:22–24. The '471 patent explains that prior wireless networks did not allow each client in the network to efficiently and effectively communicate with a multiplicity of other clients and servers in the network. *Id.* at 4:35–44. To improve on these prior wireless networks, the '471 patent describes a wireless network in which each client selects the path by which it transmits packets to a server. *Id.* at 5:18–23. The path can be either a direct path to the server or an indirect path through other clients. *Id.* at 5:23–26. According to the '471 patent, the client also searches for an improved path to the server and preferably chooses the best path, whether that is a direct path or an indirect path. *Id.* at 5:26–28, 5:40–43.

C. *Illustrative Claim*

Claims 2, 6, 10, 14, and 40 are independent. Claim 2 is reproduced below.

2. A wireless network system comprising:

a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and

a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio

modem, said client process including the receipt and transmission of data packets via said client radio modem,

wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one [of] the remainder of said plurality of clients,

wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and

wherein the server process is configured to:

receive the selected transmission path from each of the plurality of clients,

determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients,

update the client link entries to provide the optimized transmission path, and

send the optimized transmission path for each of the clients to the respective clients.

Ex. 1001, 23:20–51.

II. ANALYSIS

A. *Level of Ordinary Skill in the Art*

Petitioner argues that a person of ordinary skill in the art would have had “a minimum of a bachelor’s degree in Electrical Engineering and 2–3 years of experience in the development and design, or technical marketing, of radio communications and computer network systems, or the equivalent (*e.g.*, education substituting for experience or vice-versa).” Pet. 10 (citing Ex. 1003 ¶¶ 9–11). Patent Owner’s declarant, Dr. Kevin C. Almeroth, testifies that a person of ordinary skill in the art would have had “the

equivalent of a four-year degree from an accredited institution (usually denoted as a B.S. degree) in computer science, computer engineering or the equivalent and experience with, or exposure to, computer networks and routing” and “approximately two years of professional experience with computer networking, routing, and wireless networks.” Ex. 2002 ¶ 75. Dr. Almeroth notes that “[a]dditional graduate education could substitute for professional experience, while significant experience in the field might substitute for formal education.” *Id.*

Neither party identifies any specific instance in which the difference between the parties’ respective definitions of the level of ordinary skill in the art impacts the analysis or conclusions of either party, or either party’s declarant, in this case. Our findings and conclusions in this case would be the same under either party’s definition of the level of ordinary skill in the art. To the extent necessary, though, we adopt Petitioner’s definition, which is supported by the testimony of Petitioner’s declarant, Mr. James T. Geier.⁵ Pet. 10; Ex. 1003 ¶¶ 9–11.

B. *Claim Construction*

The parties agree that the ’471 patent has expired. Pet. 8; PO Resp. 9. As a result, we may construe the claims of the ’471 patent pursuant to *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); *see also In re Rambus, Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012) (holding, on appeal from a reexamination decision by the Board of Patent Appeals and Interferences, that “the Board’s review of the claims of an expired patent is similar to that of a district court’s review”). Under *Phillips*,

⁵ Dr. Almeroth notes that “I have considered Mr. Geier’s definition and it does not alter my opinions.” Ex. 2002 ¶ 80.

we generally give claim terms their “ordinary and customary meaning” as understood by a person of ordinary skill in the art in question at the time of the invention. 415 F.3d at 1312–13. We consider the intrinsic evidence, namely, the claim language, the specification, and the prosecution history, if in evidence. *Id.* at 1314–17. We also can consider extrinsic evidence, but it is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’” *Id.* at 1317.

1. *Transmission Path / Link*

Petitioner proposes construing the term “selected transmission path” to mean a path “established/observed/chosen by a client, including the identification of each of the hops to be traversed by the data message packet en route to the server.” Pet. 9. Petitioner cites to the specification of the ’471 patent as support for its proposed construction. *Id.* (citing Ex. 1001, 4:60–5:43, 11:18–28, 20:60–21:7). Patent Owner proposes construing the terms “transmission path” and “link” to mean “a description of the entire path from the client to the server.” PO Resp. 13. Patent Owner argues that its proposed construction is supported by the claim language and the specification of the ’471 patent. *Id.* at 11–15 (citing Ex. 1001, 4:65–5:1, 9:61–67).

In the Decision on Institution, we adopted Patent Owner’s proposed construction. Dec. on Inst. 6–8. Namely, we construed the terms “transmission path” and “link” to mean “a description of an entire path from a client to a server.” *Id.* at 8. We explained that our preliminary construction was supported by the claim language and the specification of the ’471 patent. *Id.* at 6–8. For example, claim 2 states that the client selects a radio transmission path “to said server” (Ex. 1001, 23:33–37), and

claim 14 states that the client selects a link “to a server” (*id.* at 26:46–53). Similarly, the specification of the ’471 patent explains that a path or link is “the entire path description from a given client to a given server.” *Id.* at 4:54–57, 4:64–67, 9:61–67.

Petitioner agrees with Patent Owner that the terms “transmission path” and “link” refer to a description of an entire path from a client to a server. Pet. Reply 3–4 (“For purposes of these proceedings, Petitioner does not dispute that a ‘link’/‘path’ provides ‘a description of the entire path from the client to the server.’”). Petitioner, nonetheless, takes issue with our preliminary construction, arguing that it includes “some circularity” because it still uses the term “path.” Pet. Reply 2–4; Tr. 4:9–17. Petitioner explains that its proposed construction provides further clarity by specifying that a path is the identification of each of the hops to be traversed by the data message packet en route to the server. Pet. Reply 2–4; Tr. 4:18–21. Petitioner acknowledges, though, that its proposed clarification regarding the term “path” does not affect the outcome of this proceeding. Pet. Reply 2 (“The construction of this term does not affect the outcome of these proceedings.”); Tr. 5:7–12.

Therefore, consistent with the parties’ agreement in this case, we determine that the terms “transmission path” and “link” include a description of an entire path from a client to a server. We determine that further construction of the terms “transmission path” and “link” is not necessary to resolve the parties’ disputes regarding the asserted grounds of unpatentability in this case. *See infra* Sections II.C–II.D; *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those

terms need be construed that are in controversy, and *only to the extent necessary to resolve the controversy.*") (emphasis added).

2. Client Link Tree

Petitioner proposes construing the phrase “a client link tree having client link entries” to mean “a data structure for storing radio transmission paths/links where each client has exactly one path/link to the server.” Pet. Reply 4. Petitioner argues that its proposed construction is supported by the specification of the ’471 patent and certain extrinsic evidence. *Id.* at 7 (citing Ex. 1001, 4:60–64, 15:28–16:48, Figs. 1a, 1b, 6b, 7, 9a; Ex. 1032 ¶¶ 46–47; Ex. 1037, 350; Ex. 2001, 84). Patent Owner proposes construing the phrase “a client link tree having client link entries” to mean “a data structure containing a representation of a plurality of transmission paths from a client to a first node through other clients in the form of a graph with no cycles.” PO Resp. 16. Patent Owner argues that its proposed construction is consistent with “the well-known definition of the claim term ‘tree’ as ‘a connected undirected graph with no cycles.’” *Id.* (citing Ex. 2001, 68, 84).

Petitioner contends that Patent Owner’s proposed construction improperly requires that each client must have a plurality of transmission paths to a server, and that each path must be an indirect path through other clients. Pet. Reply 6–7; Tr. 7:15–8:4. At the oral hearing, Patent Owner agreed with Petitioner that each client may have one path to a server, and that each path may be a direct path or an indirect path. Tr. 29:2–9. Further, Petitioner’s position is consistent with the claim language, which recites “a client link tree having client link entries corresponding to *an optimized transmission path* for each of the plurality of clients.” See, e.g., Ex. 1001, 23:39–41 (emphasis added).

Thus, the dispute between the parties focuses on Patent Owner's position that a tree is a graph with no cycles. Pet. Reply 7–8; Tr. 8:5–22. Patent Owner's proposed construction is based on a definition of the term "tree" in a book entitled "Introduction to Discrete Structures: For Computer Science and Engineering" by Franco P. Preparata and Raymond T. Yeh. PO Resp. 16 (citing Ex. 2001, 68, 84). Patent Owner, however, does not explain specifically why this particular definition of the term "tree" is consistent with how the '471 patent uses the term "client link tree" (see PO Resp. 16), and, therefore, we decline to incorporate that definition into the claims. Nonetheless, we note that, in this case, Patent Owner does not dispute that the asserted prior art teaches a client link tree even under its definition of the term "tree."

Therefore, consistent with the parties' agreement in this case, we determine that the phrase "a client link tree having client link entries" includes a data structure comprising entries in which each client may have one path to a server, and each path may be a direct path or an indirect path. We determine that further construction of the phrase "a client link tree having client link entries" is not necessary to resolve the parties' disputes regarding the asserted grounds of unpatentability in this case, as Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches this limitation. *See infra* Sections II.C–II.D; *Vivid Techs.*, 200 F.3d at 803 ("[O]nly those terms need be construed that are in controversy, and *only to the extent necessary to resolve the controversy.*") (emphasis added).

3. *Selects / Selecting / Selection / Selected*

Petitioner indicates in the Petition that the terms "selects," "selecting," "selection," and "selected" refer to "selecting between available choices."

Pet. 10. In the Reply, Petitioner argues that those terms should be given their plain and ordinary meaning and that they “relate to the . . . concept of establishing a route to the server.” Pet. Reply 8 (citing Ex. 1032 ¶¶ 49–50). Patent Owner proposes construing the terms “selects,” “selecting,” “selection,” and “selected” to mean “choose among alternatives.” PO Resp. 17. Patent Owner argues that its proposed construction is supported by the claim language and the specification of the ’471 patent. *Id.* at 17–19 (citing Ex. 1001, 9:63–10:2).

At the oral hearing, Petitioner acknowledged that its interpretation of the terms “selects,” “selecting,” “selection,” and “selected” in the Petition (i.e., selecting between available choices) is “synonymous” with Patent Owner’s interpretation of those terms (i.e., choose among alternatives). Tr. 9:3–13. In fact, Petitioner agreed with Patent Owner’s proposed construction. *Id.* at 9:14–17. Therefore, consistent with the parties’ agreement in this case, we determine that the terms “selects,” “selecting,” “selection,” and “selected” include choosing among alternatives. We determine that further construction of the terms “selects,” “selecting,” “selection,” and “selected” is not necessary to resolve the parties’ disputes regarding the asserted grounds of unpatentability in this case. *See infra* Sections II.C–II.D; *Vivid Techs.*, 200 F.3d at 803 (“[O]nly those terms need be construed that are in controversy, and *only to the extent necessary to resolve the controversy.*”) (emphasis added).

4. *Remaining Claim Terms and Phrases*

Petitioner proposes construing several other claim terms and phrases. Pet. 8–10. We determine that those claim terms and phrases do not require

express construction to resolve the parties' disputes regarding the asserted grounds of unpatentability in this case. *See infra* Sections II.C–II.D.

C. *Obviousness of Claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41 Over Burchfiel and Gitman*

Petitioner argues that claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41 would have been obvious over Burchfiel and Gitman. Pet. 5. A claim is unpatentable as obvious under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) any objective indicia of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

We have considered the parties' arguments and supporting evidence, and we determine that Petitioner has shown by a preponderance of the evidence that claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41 would have been obvious over Burchfiel and Gitman.

1. *Overview of Burchfiel and Gitman*

Burchfiel relates to a packet radio network. Ex. 1004, 245.⁶ Burchfiel explains that its packet radio network includes “fixed and mobile

⁶ The parties cite to the original page numbers of Burchfiel, rather than the page numbers Petitioner added when it filed Burchfiel as Exhibit 1004 in this case. Thus, we also cite to the original page numbers of Burchfiel.

digital terminals which are sources and sinks of information, stations which provide centralized routing control and interconnections to other networks, and repeaters which provide area coverage for mobile terminals by performing a store-and-forward function.” *Id.* According to Burchfiel, a station configures the packet radio network by providing each element with a minimum distance route to the station. *Id.* at 247–248. The station stores the minimum distance routes in a connection table. *Id.* A repeater may change that route, though, by “specify[ing] an alternate address for the next hop after some number of unsuccessful attempts to forward the packet along its specified route.” *Id.* at 247. When the station detects persistent alternate routing of packets, which indicates that an element has failed, the station updates the connection table by recomputing the minimum distance routes to the active elements. *Id.* at 247–248.

Gitman also relates to a packet radio network. Ex. 1005, 926.⁷ Gitman explains that a station provides each repeater with a label that defines the “complete path” between the repeater and the station. *Id.* at 928. According to Gitman, “[t]he routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths.” *Id.* For example, when a repeater transmitting a data packet encounters blocking in the original path, the repeater sends a search packet to other repeaters. *Id.* at 929. The searching repeater then substitutes an entire alternate path provided by a responding repeater for the original path and transmits the data packet using the alternate path. *Id.*

⁷ The parties cite to the original page numbers of Gitman, rather than the page numbers Petitioner added when it filed Gitman as Exhibit 1005 in this case. Thus, we also cite to the original page numbers of Gitman.

2. *Claim 2*

Claim 2 recites “[a] wireless network system.” Ex. 1001, 23:20. Burchfiel teaches a packet radio network. Pet. 16; Ex. 1004, 245, Fig. 1. Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches the preamble of claim 2.

Claim 2 recites “a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem.” Ex. 1001, 23:21–26. Burchfiel teaches a station (i.e., a server) that includes a processor and a packet radio unit. Pet. 16–20; Ex. 1004, 249 (“PDP-11 processor interfaced to a packet radio unit”), Figs. 1, 4. Burchfiel teaches that the station’s processor controls the receipt and transmission of data packets via the packet radio unit. Pet. 16–20; Ex. 1004, 250 (“a pair of processes was created which send and receive packets to and from the PRU device”), Figs. 1, 5. Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches the above limitation of claim 2.

Claim 2 recites “a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem.” Ex. 1001, 23:27–32. Burchfiel teaches a plurality of terminals and repeaters (i.e., clients), each of which includes a processor and a packet radio unit. Pet. 20–22; Ex. 1004, 245 (“The programmable capability of the repeater is provided in its IMP-16 microprocessor . . . The set of functions which appear in common in a station, repeater, and terminal

are identified in Figure 1 as a Packet Radio Unit”), Fig. 1. Burchfiel teaches that each terminal’s processor (or repeater’s processor) controls the receipt and transmission of data packets via the packet radio unit. Pet. 20–22; Ex. 1004, 245 (“The programs for providing interprocess connections within the PRN must be programmed into each terminal (data connection), [and] each repeater (control connection)”), Fig. 1. Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches the above limitation of claim 2.

Claim 2 recites “wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients.” Ex. 1001, 23:33–37. Gitman teaches that when a repeater transmitting a data packet encounters blocking in the original path, the repeater sends a search packet to other repeaters. Pet. 24–26; Ex. 1003 ¶¶ 109–111; Ex. 1005, 929 (“This generalization involves the search for an alternate repeater when encountering blocking. A ‘search’ protocol uses a search packet specifying the class of repeaters sought.”). Gitman also teaches that the searching repeater substitutes an entire alternate path provided by a responding repeater for the original path and then transmits the data packet using the alternate path. Pet. 24–26; Ex. 1003 ¶¶ 109–111; Ex. 1005, 929 (“A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmit the packet.”).

Patent Owner responds that Gitman does not teach a client process that *selects* a path to the server.⁸ PO Resp. 26–28. Specifically, Patent Owner argues that, in Gitman, a repeater that encounters blocking and transmits a search packet receives “only a single response from a single responding repeater” and then “simply ‘substitutes the label of the responding repeater into the original packet and transmits the packet.’”⁹ *Id.* at 26–27 (citing Ex. 1005, 929). Thus, according to Patent Owner, “[t]here is no point at which the searching repeater selects between the blocked location or the responding repeater, or between one responding repeater and another.” PO Resp. 27 (citing Ex. 1005, 929; Ex. 2002 ¶¶ 124–129).

Patent Owner’s argument is not persuasive. Even if a searching repeater in Gitman receives only a single response to a search packet, the searching repeater nonetheless chooses among alternative paths. Gitman teaches that “[t]he searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet.” Ex. 1005, 929. When the searching repeater substitutes an entire alternate path provided by a responding repeater for the original path, the searching repeater chooses to transmit the data packet using the unblocked alternate path instead of the

⁸ Patent Owner also argues that Burchfiel does not teach a client process that selects a path to the server. PO Resp. 25–26. But Petitioner acknowledged at the oral hearing that it does not rely on Burchfiel for this limitation. Tr. 16:2–11.

⁹ Patent Owner directs us to a portion of Gitman (PO Resp. 27) that states “two hierarchical labels in the packet header are required when routing from the station” (Ex. 1005, 929). That portion of Gitman, however, describes routing a packet *from* the station, and, thus, does not relate to a repeater transmitting a packet *to* the station. Ex. 1032 ¶ 63.

blocked original path.¹⁰ Ex. 1003 ¶ 110; Ex. 1005, 929; Ex. 1032 ¶¶ 56, 59, 64. Even if the searching repeater’s process always makes the same choice (i.e., to use the unblocked alternate path instead of the blocked original path), it nonetheless chooses among alternatives.

Moreover, we are not persuaded by Patent Owner’s argument that a searching repeater in Gitman receives only a single response to a search packet. Gitman teaches that “[a] ‘search’ protocol uses a search packet specifying the *class of repeaters* sought” and that “[a] response by *such a repeater* contains the hierarchical label of the responding repeater.” Ex. 1005, 929 (emphases added). As such, Gitman indicates that a search packet is sent to multiple repeaters, and, thus, multiple repeaters may respond to the search packet. Ex. 1003 ¶ 111; Ex. 1005, 929; Ex. 1032 ¶ 62. Gitman also teaches that its routing strategy, in general, “is sufficiently flexible to allow departures from the first choice path and use of next shortest paths.” Ex. 1005, 928. As a result, Gitman indicates that when a searching repeater receives multiple responses to a search packet, the searching repeater may choose the next shortest path from among the alternate paths provided.¹¹ Ex. 1003 ¶ 111; Ex. 1005, 928–929; Ex. 1032 ¶ 60.

¹⁰ Patent Owner argues that the ’471 patent is not directed to routing around a failed node. PO Resp. 1 (“a client having at least two known, working paths”); Tr. 31:24–25. We disagree. For example, claim 20 recites “rerouting data packets around inactive or malfunctioning nodes.” Ex. 1001, 28:8–9. Similarly, the specification of the ’471 patent explains that “if the client 18A is lost due, for example, to a power or system failure, the data packets of client 18C can be routed through the client 18D.” *Id.* at 9:11–19.

¹¹ For example, Mr. Geier explains that a searching repeater may receive responses from different repeaters that are a different number of hops away from the station. Paper 35, 15; Ex. 2011, 67:6–68:1.

Patent Owner argues that the challenged claims require each client to select an *optimized* path to the server. PO Resp. 30 (“Gitman’s method of alternative route discovery does not teach determining an *optimal* route, but simply teaches bypassing an outage.”) (emphasis added); Tr. 32:2–3 (“Mr. Brownrigg’s hybrid approach was to get *more efficient* routing”) (emphasis added), 34:13–21 (“The idea of the 471 is this *continual optimization* . . . whenever this patent refers to *optimization*, it’s referring to *finding better paths*, searching for better paths, and choosing whether to use those paths”) (emphasis added). Neither the language of the challenged claims nor the specification of the ’471 patent supports Patent Owner’s argument.

For example, claim 2 states that the client process “initiates and selects a radio transmission path to said server.” Ex. 1001, 23:33–34. In contrast, the server process is configured to “determine the *optimized* transmission path for each of the plurality of clients.” *Id.* at 23:45–46 (emphasis added). The difference in the claim language used for the client process and the server process indicates that the client process does not have to select an optimized path. Further, like the claim language, the specification distinguishes between simply initiating and selecting a path to the server and determining an optimized path to the server. For example, the specification states:

Preferably, the client process of each of the clients *initiates, selects, and maintains a radio transmission path* (“link”) to the server. As noted previously, this radio transmission path to the server is either a direct path to the server (1 hop) or an indirect path to the server (multi-hop) through one or more clients. *Preferably*, the client process of a particular client *also constantly searches for improved paths* to the server.

Id. at 5:21–28 (emphases added). Because the challenged claims only recite that the client initiates and/or selects a path to the server, we are not persuaded that the challenged claims require the client to select an optimized path to the server.

Nonetheless, Gitman teaches that its repeaters select an optimized path to the station. As discussed above, when a searching repeater substitutes an entire alternate path provided by a responding repeater for the original path, the searching repeater chooses to transmit the data packet using the unblocked alternate path instead of the blocked original path. Ex. 1003 ¶ 110; Ex. 1005, 929; Ex. 1032 ¶¶ 56, 59, 64. By choosing the unblocked alternate path instead of the blocked original path, Gitman’s repeater chooses the better (i.e., optimized) path to the station. In addition, when a searching repeater receives multiple responses to a search packet, the searching repeater may choose the next shortest (i.e., optimized) path from among the alternate paths provided. Ex. 1003 ¶ 111; Ex. 1005, 928–929; Ex. 1032 ¶ 60.

Patent Owner also argues that Gitman does not teach that *each* client selects a path to the server. PO Resp. 28. Specifically, Patent Owner contends that: 1) “alternate routing only occurs [in Gitman] when the ALL indicator in the packet is activated”; and 2) “[e]ven when alternate routing in Gitman does occur, each repeater would not initiate and select an alternate path to the station, but only the impacted repeater that ‘exceeds its allowed number of retransmission without receiving an HBH ack’ would initiate to seek an alternate route.” *Id.* (citing Ex. 1005, 928; Ex. 2002 ¶ 126). Patent Owner further contends that, even if Gitman teaches selecting a path to the server, “only the actual blocked repeater would ever actually initiate and

select such a path,” and, thus, “[t]he only way for each client to initiate and select (again, assuming Burchfiel and/or Gitman ever teach such) would be if every route assigned by the server failed on the first hop, which would require an essentially non-functioning network.” PO Resp. 33.

Patent Owner’s argument is not persuasive. Patent Owner effectively interprets the challenged claims to require that every client selects a path to the server *simultaneously*. We disagree with that interpretation. Claim 2, for example, recites “a plurality of clients each including a client controller . . . said client controller implementing a client process . . . wherein *said client process of each of said clients* initiates and selects a radio transmission path to said server.” Ex. 1001, 23:27–37. In other words, claim 2 requires that each client implements a process that selects a path to the server, but does not require that every client selects a path to the server simultaneously.¹² *Id.* As discussed above, Gitman teaches that each repeater in its network implements a search protocol (i.e., a search process) that selects a path to the station. Ex. 1003 ¶ 110; Ex. 1005, 929; Ex. 1032 ¶ 59.

Claim 2 recites “wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients.” Ex. 1001, 23:38–41. Burchfiel teaches that the station maintains a connection table with a minimum distance (i.e., optimized) route to each element. Pet. 27–

¹² Our reading of the claim language is consistent with the specification. For example, the ’471 patent explains that a client switches to a new path *when* it finds a better one. *See, e.g.*, Ex. 1001, 8:53–58, 9:53–60. In other words, every client does not simultaneously select a new path. Similarly, Gitman teaches that a repeater switches to a new path *when* it encounters blocking and finds an unblocked path. Ex. 1005, 929.

29; Ex. 1004, 247 (“each terminal is also given a connection to its controlling station, and this information is added to the station’s connection table”), 248 (“minimum distance routes”). Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches the above limitation of claim 2.¹³

Claim 2 recites that the server process is configured to “receive the selected transmission path from each of the plurality of clients.” Ex. 1001, 23:42–44. Burchfiel teaches that the station receives the route used for each data packet in the header of the data packet. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, Fig. 3 (“ROUTE”). Thus, in Burchfiel, when a repeater selects an alternate next hop for a data packet, the station receives an alternate route in the header of the data packet.¹⁴ Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247 (“permitting a repeater to specify an alternate address for the next hop”), Fig. 3 (“ROUTE”).

Claim 2 recites that the server process is configured to “determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients.” Ex. 1001, 23:45–47. Burchfiel teaches that the station detects persistent alternate routing of packets. Pet. 31–34, 36–37; Ex. 1004, 247–248 (“A less dynamic

¹³ Patent Owner mentions this limitation in its Response, but does not provide any specific reason why the combination of Burchfiel and Gitman fails to teach this limitation. See PO Resp. 20.

¹⁴ As discussed above, Gitman’s repeaters substitute an entire alternate path to the station for the original path in the data packet. Ex. 1003 ¶ 110; Ex. 1005, 929; Ex. 1032 ¶¶ 56, 59, 64. Thus, in Petitioner’s proposed combination, when one of Gitman’s repeaters selects an entire alternate path for a data packet, Burchfiel’s station receives the entire alternate path in the data packet. Pet. 37; Ex. 1003 ¶ 149.

but more global routing change is required when a repeater or station fails: persistent alternate routing of packets signals this failure, and the station detecting it must reconfigure the PRN to route all traffic around the failed element.”). A person of ordinary skill in the art reading Burchfiel would have known that the station can detect persistent alternate routing of packets by comparing the routes in the headers of the data packets to the entries in the connection table. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248. A person of ordinary skill in the art also would have recognized that doing so would have been advantageous because it would have allowed the station to detect persistent alternate routing of packets by using information already in the station’s possession, rather than requiring additional communication over the network. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248. Thus, Burchfiel’s teachings, together with the background knowledge and perspective of a person of ordinary skill in the art, demonstrate that it would have been obvious to detect persistent alternate routing of packets by comparing the routes in the headers of the data packets to the entries in the connection table. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248; *see In re Simon*, 461 F.2d 1387, 1390 (CCPA 1972) (“the question in a section 103 case is not only what the references expressly teach, but what they would collectively suggest to one of ordinary skill in the art”). Burchfiel also teaches that because persistent alternate routing of packets indicates that an element has failed, the station updates the connection table by recomputing the minimum distance (i.e., optimized) routes to the active elements. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248 (“The station performs this reconfiguration by updating the connectivity matrix to indicate that the failed element is

incommunicado; by recomputing minimum distance routes to the elements which are still active; and finally, by updating repeater routing parameters to route packets along these new routes.”).

Patent Owner reiterates its previous argument that *each* of Gitman’s repeaters do not *select* a path to the station, and, as a result, Burchfiel’s station cannot receive selected transmission paths from each of Gitman’s repeaters (PO Resp. 32–33) or determine the optimized transmission path based on the selected transmission paths (*id.* at 30–31). Patent Owner’s argument that each of Gitman’s repeaters do not select a path to the station is not persuasive for the reasons discussed above.

According to Patent Owner, Petitioner asserts that “Gitman’s repeaters use a shortest path algorithm to determine which route to use from multiple routes received when a search packet is sent out,” but Petitioner “has not provided any rationale for why a person of skill in the art would have the repeaters determine an optimal route, and then have the servers determine an optimal route.” *Id.* at 29 (citing Ex. 2008, 60:20–61:4). Patent Owner’s argument is not persuasive. Gitman teaches that when a repeater encounters blocking in the original path, the repeater selects an alternate path *for that particular repeater* to the station. Ex. 1003 ¶ 111; Ex. 1005, 928–929. Burchfiel, on the other hand, teaches that when a station detects persistent alternate routing of packets, the station updates the connection table by recomputing the minimum distance routes *to all active elements*. Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248. Thus, contrary to Patent Owner’s argument, the teachings of Gitman and Burchfiel are not duplicative.

Patent Owner argues that Burchfiel only teaches “re-computing and modifying the routing control parameters in effected repeaters, *i.e.*, not ‘each

of the plurality of clients’ as required by the Independent Claims.” PO Resp. 31 (citing Ex. 1004, 250). Patent Owner’s argument is not persuasive. As discussed above, Burchfiel teaches that the station recomputes the minimum distance routes to the “elements which are still active,” not just affected repeaters. Ex. 1004, 247–248; Ex. 1032 ¶ 83.

Patent Owner argues that “Burchfiel does not teach that a station recomputes an alternate transmission path . . . based on the station detecting ‘persistent routing information’ received from repeater and terminal as asserted by Petitioner.” PO Resp. 40. Specifically, Patent Owner contends that Burchfiel’s station “becomes aware of persistent alternate routing of packets via two different pathways,” namely, via an initialization algorithm or control connection messages. *Id.* at 40–41 (citing Ex. 1004, 247, 250; Ex. 2002 ¶¶ 144–145). According to Patent Owner, “[i]n both situations, a station in Burchfiel does not compare any ‘route’ field in packet header with entries in connectivity matrix nor connection table.” PO Resp. 41.

Patent Owner’s argument is not persuasive. Burchfiel teaches that the detection of persistent alternate routing of packets is one of several *different* ways to identify a component failure in the network. For example, Burchfiel teaches that the initialization algorithm “provide[s] a continuous monitor on connectedness to identify component failures,” but Burchfiel does not indicate that the initialization algorithm monitors persistent alternate routing of packets. Ex. 1004, 247; Ex. 1032 ¶ 104. Burchfiel also teaches that a repeater transmits a control connection message to identify “failure of some previously established route,” but Burchfiel does not indicate that a repeater transmits a control connection message to identify persistent alternate routing of packets. Ex. 1004, 250; Ex. 1032 ¶ 105. Burchfiel separately

teaches that the repeaters may “specify an alternate address for the next hop,” and that the station (not the repeaters) independently “detect[s]” whether there is “persistent alternate routing of packets,” and, thus, whether an element has failed. Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248; Ex. 1032 ¶ 106. In other words, Burchfiel indicates that the initialization algorithm and control connection messages identified by Patent Owner are separate from the detection of persistent alternate routing of packets relied on by Petitioner.

Claim 2 recites that the server process is configured to “update the client link entries to provide the optimized transmission path,” and “send the optimized transmission path for each of the clients to the respective clients.” Ex. 1001, 23:48–51. Burchfiel teaches that the station maintains a connection table with a minimum distance (i.e., optimized) route to each element. Pet. 31–34, 36–37; Ex. 1004, 247 (“each terminal is also given a connection to its controlling station, and this information is added to the station’s connection table”), 248 (“recomputing minimum distance routes”). Burchfiel teaches that when the station detects persistent alternate routing, the station updates the connection table by recomputing the minimum distance (i.e. optimized) routes to the active elements and updating repeater routing parameters to route packets along these new routes. Pet. 31–34, 36–37; Ex. 1004, 247–248.

Patent Owner argues that Burchfiel “does not update its connection table with ‘route’ field information, but, rather, updates its connectivity matrix and recomputes minimum distance routes independently.” PO Resp. 41–42 (citing Ex. 2002 ¶¶ 146–147). Patent Owner’s argument is not persuasive. Burchfiel teaches that the station maintains a connectivity

matrix of binary values that indicate which radio units are capable of directly communicating with each other. Ex. 1004, 247. Thus, the station updates the connectivity matrix to indicate that a failed element is incommunicado. *Id.* at 248. Burchfiel teaches that the station separately maintains a connection table with a minimum distance route to each element. *Id.* at 247. Thus, when the station recomputes the minimum distance routes to active elements, the station updates the connection table, not the connectivity matrix. *Id.* at 247–248.

3. Claim 3

Claim 3 depends from claim 2, and recites that the server process comprises “logic that compares a selected link from said client to said server to a current client link entry in said client link tree,” and “logic that updates said client link tree when said comparison meets predetermined conditions.” Ex. 1001, 23:52–58. Burchfiel teaches that when a repeater selects an alternate next hop for a data packet, the station receives an alternate route in the header of the data packet. Pet. 31–34, 36–37, 39–40; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247 (“permitting a repeater to specify an alternate address for the next hop”), Fig. 3 (“ROUTE”). Burchfiel also teaches that the station detects persistent alternate routing of packets. Pet. 31–34, 36–37, 39–40; Ex. 1004, 247–248 (“A less dynamic but more global routing change is required when a repeater or station fails: persistent alternate routing of packets signals this failure, and the station detecting it must reconfigure the PRN to route all traffic around the failed element.”).

A person of ordinary skill in the art reading Burchfiel would have known that the station can detect persistent alternate routing of packets by comparing the routes in the headers of the data packets to the entries in the

connection table. Pet. 31–34, 36–37, 39–40; Ex. 1003 ¶¶ 147, 161, 186; Ex. 1004, 247–248. A person of ordinary skill in the art also would have recognized that doing so would have been advantageous because it would have allowed the station to detect persistent alternate routing of packets by using information already in the station’s possession, rather than requiring additional communication over the network. Pet. 31–34, 36–37, 39–40; Ex. 1003 ¶¶ 147, 161, 186; Ex. 1004, 247–248. Thus, Burchfiel’s teachings, together with the background knowledge and perspective of a person of ordinary skill in the art, demonstrate that it would have been obvious to detect persistent alternate routing of packets by comparing the routes in the headers of the data packets to the entries in the connection table. Pet. 31–34, 36–37, 39–40; Ex. 1003 ¶¶ 147, 161, 186; Ex. 1004, 247–248; *see Simon*, 461 F.2d at 1390. Burchfiel also teaches that because persistent alternate routing of packets (i.e., predetermined conditions) indicates that an element has failed, the station updates the connection table by recomputing the minimum distance (i.e., optimized) routes to the active elements. Pet. 31–34, 36–37, 40–41; Ex. 1003 ¶¶ 147, 161, 194; Ex. 1004, 247–248 (“The station performs this reconfiguration by updating the connectivity matrix to indicate that the failed element is incommunicado; by recomputing minimum distance routes to the elements which are still active; and finally, by updating repeater routing parameters to route packets along these new routes.”).

Patent Owner reiterates its previous argument that Burchfiel teaches two pathways by which a station becomes aware of persistent alternate routing (i.e., an initialization algorithm or control connection messages), but neither one involves comparing a selected path with a current entry in the

connection table. PO Resp. 42–44. For the same reasons discussed above, Patent Owner’s argument is not persuasive. *See supra* Section II.C.2.

4. *Claims 6, 10, 14, and 40*

Claims 6, 10, 14, and 40 recite limitations similar to those discussed above for claim 2. Petitioner identifies evidence showing that the combination of Burchfiel and Gitman teaches the limitations of claims 6, 10, 14, and 40. Pet. 43–53. Our analysis of the limitations of claim 2 applies to the similar limitations of claims 6, 10, 14, and 40. Patent Owner raises the same arguments for claims 6, 10, 14, and 40 that we discussed above for claim 2. PO Resp. 24 (“As Recited In Independent Claim 2 And Similarly Recited In Independent Claims 6, 10, 14, and 40”), 29 (same), 32 (same), 34 (same), 36 (same), 39 (same). For the same reasons discussed above, Patent Owner’s arguments are not persuasive. *See supra* Section II.C.2.

At the oral hearing, Patent Owner argued that method claims 10 and 14 differ in scope from claim 2. Specifically, Patent Owner argued:

Well, I’m interpreting the claim to mean -- because this is what it says, right, in the claim -- it says each of the claims is performing this function of selecting a path; and there was a reference to some of the claims being system claims, but what about the method claims, for instance? Claim 10 is a method claim; it’s got steps in there, and that’s one of the required steps. It’s not that a repeater may happen to have a capability of doing this, that’s not recited in Claim 10. Rather, what’s recited in Claim 10 and all the method claims is this specific steps that need to be recited, and one of them is that each client is initiating and selecting a transmission path to the server.

Tr. 36:20–37:6. Patent Owner’s argument is not persuasive. Claims 10 and 14 do not recite that every client selects a path to the server simultaneously. Similar to system claim 2, method claim 10 recites “providing a plurality of clients, each client *providing a client process* including . . . selecting a

transmission path to said server” (Ex. 1001, 25:41–47), and method claim 14 recites “a plurality of clients each *providing a client process* including . . . a link selection step that is one of a direct link to a server and an indirect link to said server” (*id.* at 26:46–53). In other words, like claim 2, claims 10 and 14 require that each client provide a process that selects a path to the server, but do not require that every client selects a path to the server simultaneously.

5. *Claims 7, 11, and 15*

Claims 7, 11, and 15 depend from claims 6, 10, and 14, respectively, and recite limitations similar to those discussed above for claim 3. Petitioner identifies evidence showing that the combination of Burchfiel and Gitman teaches the limitations of claims 7, 11, and 15. Pet. 48, 50. Our analysis of the limitations of claim 3 applies to the similar limitations of claims 7, 11, and 15. Patent Owner raises the same arguments for claims 7, 11, and 15 that we discussed above for claim 3. PO Resp. 42 (“As Required By Dependent Claims 3–4, 7–8, 11–12, 15–16”). For the same reasons discussed above, Patent Owner’s arguments are not persuasive. *See supra* Section II.C.3.

6. *Claim 41*

Claim 41 depends from claim 40, and recites that “the server process is further configured to perform gateway functions.” Ex. 1001, 32:33–34. Burchfiel teaches that the station’s processor performs gateway functions. Pet. 53; Ex. 1004, 250 (“the PRN TELNET process performs the second type of gateway function described above”), Fig. 5. Patent Owner does not dispute that the combination of Burchfiel and Gitman teaches the above limitation of claim 41.

7. *Reasons for Combining Burchfiel and Gitman*

Petitioner argues that a person of ordinary skill in the art would have had a reason to combine the cited teachings of Burchfiel and Gitman. Pet. 10–14 (citing Ex. 1003 ¶¶ 56–67). We agree with and adopt Petitioner’s reasoning. Specifically, Burchfiel and Gitman relate to the same field of endeavor as the ’471 patent, that is, a wireless network for transmitting data packets between clients and servers. Pet. 10–13; Ex. 1001, Abstract, 1:22–24; Ex. 1003 ¶¶ 57, 62; Ex. 1004, 246 (“One of the basic facilities required in the PRN is support of interprocess connections which provide reliable delivery of data from a PRN source to a PRN destination”); Ex. 1005, 928 (“A major use of the radio network will be local collection and distribution of traffic. This traffic primarily flows from repeaters to stations and from stations to repeaters.”). It would have been obvious to a person of ordinary skill in the art to combine Burchfiel and Gitman because Gitman’s search protocol would have improved Burchfiel’s network by increasing the likelihood of successfully transmitting a data packet to its intended destination. Pet. 13, 26; Ex. 1003 ¶¶ 65, 111. In addition, a person of ordinary skill in the art reasonably would have expected the combination to work. Pet. 14; Ex. 1003 ¶ 66.

It also would have been obvious to a person of ordinary skill in the art to combine Burchfiel and Gitman based on their interrelated teachings. Pet. 13; Ex. 1003 ¶ 65; *see KSR*, 550 U.S. at 418 (“Often, it will be necessary for a court to look to interrelated teachings of multiple patents.”). For example, Burchfiel and Gitman both teach repeaters that implement an alternate routing process when blocking is encountered in the original path to a station. Pet. 11–13; Ex. 1004, 247 (“permitting a repeater to specify an

alternate address for the next hop after some number of unsuccessful attempts to forward the packet along its specified route.”); Ex. 1005, 929 (“This generalization involves the search for an alternate repeater when encountering blocking.”). Thus, combining Gitman’s search protocol with Burchfiel’s network would have been the predictable use of prior art elements according to their established functions. Pet. 13–14; Ex. 1003 ¶¶ 65, 66, 111; see *KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

Patent Owner responds that Petitioner has not shown sufficiently that it would have been obvious to combine the cited teachings of Burchfiel and Gitman. PO Resp. 34–39. In particular, Patent Owner argues that “the search protocol described in Gitman is a complex dynamic routing algorithm beyond the capabilities of the repeaters in Burchfiel.” *Id.* at 34. According to Patent Owner, Burchfiel’s repeaters only “perform functions which are simple and require low processing power,” such as retrieving a next hop address from stored routing parameters. *Id.* at 34–35 (citing Ex. 1004, 247; Ex. 2002 ¶ 136; Ex. 2008, 45:12–46:2, 46:14–17). Patent Owner contends that “[t]his is in sharp contrast with Gitman, where the repeater executing a search protocol is required to immediately seek alternate repeater(s) to get an alternate route in order to resolve blocking.” PO Resp. 35 (citing Ex. 1005, 929; Ex. 2002 ¶ 137). Patent Owner concludes that a person of ordinary skill in the art would not have replaced Burchfiel’s simple solution with Gitman’s more complex solution to address the same problem. PO Resp. 35–36 (citing Ex. 2002 ¶¶ 138, 184–195).

Patent Owner's argument is not persuasive. Patent Owner does not identify specific evidence indicating how much processing power and memory would have been available to Burchfiel's repeaters or how much processing power and memory would have been required to execute Gitman's search protocol. *See* PO Resp. 34–36. Patent Owner instead compares the functions performed by Burchfiel's repeaters and Gitman's repeaters. *Id.* However, Patent Owner's assertion that the functions performed by Burchfiel's repeaters and Gitman's repeaters differ sharply is not supported by the evidence of record. For example, Burchfiel teaches that its repeaters “send ‘search’ packets,” “get local repeaters to bounce back search packets,” and perform “[d]ynamic routing changes . . . [by] specify[ing] an alternate address for the next hop after some number of unsuccessful attempts to forward the packet along its specified route.” Ex. 1004, 247. Gitman similarly teaches that its repeaters send search packets and select an alternate path from a responding repeater. Ex. 1005, 929. In other words, Burchfiel's repeaters and Gitman's repeaters perform similar functions. Ex. 1004, 247; Ex. 1005, 929; Ex. 1032 ¶ 68. Thus, the evidence of record indicates that Gitman's search protocol would have been within the capabilities of Burchfiel's repeaters.¹⁵ Pet. Reply 13–14; Ex. 1003 ¶ 66; Ex. 1032 ¶ 68.

Moreover, even if Burchfiel's repeaters would have required additional processing power and/or memory to execute Gitman's search

¹⁵ Gitman notes that its “search protocol must be implemented within the repeater, which requires additional memory.” Ex. 1005, 929. As discussed above, Burchfiel's repeaters implement similar functionality, and, thus, Burchfiel's repeaters would have had sufficient memory to implement Gitman's search protocol. Ex. 1004, 247; Ex. 1032 ¶ 68.

protocol, it would have been obvious to a person of ordinary skill in the art to provide Burchfiel's repeaters with the necessary processing power and/or memory. Pet. Reply 14; Ex. 1032 ¶ 69. Specifically, it would have been obvious to do so in order to achieve the benefit of Gitman's search protocol discussed above, namely, to improve Burchfiel's network by increasing the likelihood of successfully transmitting a data packet to its intended destination. Pet. 13; Pet. Reply 14; Ex. 1003 ¶ 65; Ex. 1032 ¶ 69.

Patent Owner also argues that Burchfiel teaches away from Gitman's search protocol. PO Resp. 37. Patent Owner points out (*id.*) that, in Burchfiel, "[t]he repeater is required to operate unattended in relatively remote areas for long periods of time," and "must therefore be a simple, low-powered component" (Ex. 1004, 245). As a result, according to Patent Owner, Burchfiel teaches away from the adding the steps and memory required to implement Gitman's search protocol. PO Resp. 37 (citing Ex. 2002 ¶ 140).

Patent Owner's argument is not persuasive. As discussed above, the evidence of record indicates that Gitman's search protocol would have been within the capabilities of Burchfiel's repeaters, and, thus, Burchfiel's repeaters would not have required additional processing power or memory to implement Gitman's search protocol. Ex. 1004, 247; Ex. 1005, 929; Ex. 1032 ¶ 68. Moreover, even if Burchfiel's repeaters would have required additional processing power and/or memory to execute Gitman's search protocol, the evidence of record indicates that it would not have affected the ability of Burchfiel's repeaters to operate unattended in relatively remote areas for long periods of time. Specifically, similar to Burchfiel, Gitman teaches that the repeaters in its radio packet network are suitable to be

“located in remote or hostile locations where hardwire connections are uneconomical or not feasible.” Ex. 1005, 926.

Patent Owner argues that Petitioner’s proposed combination of Burchfiel and Gitman is based on impermissible hindsight. PO Resp. 37–39. In particular, Patent Owner contends that “Petitioner has not offered any rationale for why one skilled in the art would take a functioning process (*i.e.*, Burchfiel’s alternate next hop), and substitute a completely different process (*i.e.*, Gitman’s hierarchical label replacement) to solve the exact same problem (*i.e.*, rerouting around node outages), especially when the new process adds complexity to a system that is designed to remain as simple as possible.” *Id.* at 38. Further, Patent Owner asserts that “[e]mploying Gitman’s search protocol destroys the original capability of Burchfiel repeater to quickly identify the next hop address.” *Id.*

Patent Owner’s argument is not persuasive. Petitioner identifies a specific reason why a person of ordinary skill in the art would have combined Gitman’s search protocol with Burchfiel’s network. As discussed above, a person of ordinary skill in the art would have combined Burchfiel and Gitman because it would have increased the likelihood of successfully transmitting a data packet to its intended destination and because it would have been the predictable use of prior art elements according to their established functions. Pet. 13–14, 26; Ex. 1003 ¶¶ 65, 66, 111. Further, as discussed above, the evidence of record does not support Patent Owner’s assertion that Gitman’s search protocol would have added complexity to Burchfiel’s network. Pet. Reply 13–14; Ex. 1032 ¶ 68. However, even if Gitman’s search protocol would have added some complexity, a person of ordinary skill in the art would have balanced any additional complexity

against the enhanced network capabilities provided by Gitman's search protocol and would have been motivated to make the combination. Pet. Reply 15–16; Ex. 1032 ¶ 71.

Patent Owner argues that the proposed combination of Burchfiel and Gitman “would lead to an unpredictable result if a Burchfiel station updates its connection table *with* Gitman's alternate route, which may not be the most optimized route.” PO Resp. 40 (emphasis added). According to Patent Owner, “Burchfiel would still have to recompute the most optimized path and update the connection table accordingly,” and, thus, “[t]here is no benefit to combining [Burchfiel and Gitman].” *Id.* (citing Ex. 2002 ¶ 143). Patent Owner's argument is not persuasive. Petitioner does not assert that Burchfiel's station would update the connection table *with* the selected paths received from Gitman's repeaters. Rather, as discussed above, Burchfiel teaches that the station detects persistent alternate routing of packets *based on* the selected paths received from the repeaters, and then updates the connection table by recomputing the minimum distance (i.e., optimized) routes to the active elements. Pet. 31–34, 36–37; Ex. 1003 ¶¶ 147, 161; Ex. 1004, 247–248. Further, as discussed above, combining Burchfiel and Gitman would have improved Burchfiel's network by increasing the likelihood of successfully transmitting a data packet to its intended destination. Pet. 13; Pet. Reply 14; Ex. 1003 ¶ 65; Ex. 1032 ¶ 69.

8. *Objective Indicia of Non-Obviousness*

Patent Owner argues that certain objective indicia, including a long-felt but unmet need and unexpected results, demonstrate non-obviousness of the challenged claims. PO Resp. 44–51.

a. *Long-Felt but Unmet Need*

Patent Owner argues that there was a long-felt but unmet need for “a packet-based wireless computer network that is both robust and efficient.” *Id.* at 45 (citing Ex. 1001, 4:36–38; Ex. 2002 ¶ 205). Specifically, Patent Owner contends that, prior to the ’471 patent, the majority of wireless networks were distributed networks in which each client dynamically tracked the topography of the network. PO Resp. 45 (citing Ex. 2002 ¶ 206; Ex. 2006 ¶ 11). According to Patent Owner, this placed a significant overhead burden on the network and limited the number of clients that the network could support. PO Resp. 45 (citing Ex. 2002 ¶ 206; Ex. 2006 ¶ 11). Patent Owner points to specific prior art systems that allegedly suffered from overhead burden, packet duplication, and data congestion. PO Resp. 45–47 (citing Ex. 1001, 2:49–3:5, 3:17–22; Ex. 1012, 42–55; Ex. 2002 ¶¶ 207–215; Ex. 2004; Ex. 2005).

Patent Owner argues that the ’471 patent satisfied the aforementioned long-felt need by increasing efficiency and reducing the overhead burden on a wireless network. PO Resp. 47. Patent Owner relies on: 1) the 37 C.F.R. § 1.132 Declaration of one of the named inventors of the ’471 patent, Dr. Edwin B. Brownrigg, that was submitted during prosecution of the application that issued as the ’471 patent; and 2) the Declaration of Dr. Almeroth that was prepared for this proceeding. PO Resp. 48–49 (citing Ex. 2002 ¶¶ 216–223; Ex. 2006 ¶¶ 19, 21, 23–26). Dr. Brownrigg’s Declaration describes a simulation he performed on his “wireless network invention.” Ex. 2006 ¶¶ 24–25. According to Dr. Brownrigg, the simulation demonstrates that his wireless network invention “not only alleviated the problems of conventional wireless networks regarding a decrease in total

bandwidth as more nodes are added, but . . . actually increased the network bandwidth as nodes were added to a wireless network already containing a substantial number of nodes.” *Id.* ¶ 26. Dr. Almeroth’s Declaration relies on Dr. Brownrigg’s Declaration, but does not identify any other evidence indicating that the ’471 patent increased efficiency and reduced the overhead burden on a wireless network. Ex. 2002 ¶¶ 219–223.

Patent Owner argues that there is a nexus between the evidence of a long-felt but unmet need and the challenged claims. PO Resp. 49–51. In particular, Patent Owner contends that “the ’471 patent solved this long-felt need . . . by employing both centralized and decentralized features in which a server maintains a tree with paths (centralized) and clients selected paths to the server independently (decentralized).” *Id.* at 50–51 (citing Ex. 2002 ¶¶ 216–223). According to Patent Owner, this centralized/decentralized approach is recited in the challenged claims. PO Resp. 51.

Based on the evidence of record, we determine that the nexus between Patent Owner’s evidence of a long-felt but unmet need and the challenged claims is weak. Dr. Brownrigg states generally in his Declaration that he performed a simulation on his “wireless network invention.” Ex. 2006 ¶¶ 24–25. But Patent Owner, Dr. Brownrigg, and Dr. Almeroth do not compare the system on which Dr. Brownrigg performed the simulation with the system or method recited in the challenged claims. *See* PO Resp. 48–51; Ex. 2002 ¶¶ 219–223; Ex. 2006 ¶¶ 24–27; Tr. 47:8–48:13.

Further, Dr. Brownrigg’s Declaration indicates that the simulated system increased efficiency and reduced overhead burden because of a feature that is *not* recited in the challenged claims. Specifically, Dr. Brownrigg states in his Declaration:

The tree sort algorithm, upon which my novel wireless network invention was based, enabled the wireless network to actually perform more efficiently with an increase of a certain number of nodes in the network, as these nodes were enabled to eavesdrop on each other to learn routing information from the server without having to broadcast on the wireless network.

Ex. 2006 ¶ 27. In other words, Dr. Brownrigg attributes the increased efficiency and reduced overhead burden to the tree sort algorithm that enabled nodes to eavesdrop on each other and learn routing information from the server without having to broadcast on the wireless network. *Id.* Similarly, Dr. Almeroth states in his Declaration:

Thus, the overhead routing information in the '471 Patent is the communication of a client link tree from the server to the clients. The remainder of information necessary to make routing decisions can be gathered from regular network traffic, without requiring additional routing overhead. . . . On the other hand, in conventional distributed wireless networks, each node continually transmitted network routing information to other nodes in the network. This significantly increased the routing overhead of the network. . . . In the '471 Patent, however, only minimal overhead results from adding each additional node, regardless of the previous number of nodes in the network. Further, by adding additional nodes, the ability of nodes to “eavesdrop” on transmissions of neighbors and make routing selections without the use of additional routing overhead increases.

Ex. 2002 ¶¶ 221–223. Thus, Dr. Almeroth also attributes the increased efficiency and reduced overhead burden to the clients’ ability to eavesdrop on each other and use information gathered from regular network traffic to make routing decisions. *Id.*

Although this eavesdropping feature may be included in an embodiment described in the specification of the '471 patent (*see, e.g.*, Ex. 1001, 8:53–58, 9:53–60), Patent Owner does not identify where that feature

is recited in the challenged claims (*see* PO Resp. 48–51; Ex. 2002 ¶¶ 219–223; Ex. 2006 ¶¶ 24–27; Tr. 47:8–48:13). As discussed above (*see supra* Section II.C.2), the challenged claims recite generally that each client includes a process for initiating and selecting a path to the server (Ex. 1001, 23:33–34, 24:41, 25:46, 26:50, 32:22). But the challenged claims do not recite specifically how the clients select a path, and, thus, do not require that the clients eavesdrop on each other and use routing information gathered from regular network traffic to select a path. *See id.*; Ex. 1046, 102:24–103:14. Therefore, we determine that the nexus between Patent Owner’s evidence of a long-felt but unmet need and the challenged claims is weak.

b. *Unexpected Results*

Patent Owner argues that the system and method described in the ’471 patent produced unexpected results. PO Resp. 47–49. Specifically, Patent Owner contends that, prior to the ’471 patent, it was well known that the overhead burden for a wireless network increases as the number of nodes in the network increases. *Id.* at 48 (citing Ex. 2002 ¶¶ 217–218; Ex. 2004; Ex. 2005; Ex. 2006 ¶ 19; Ex. 2007). According to Patent Owner, the aforementioned simulation performed by Dr. Brownrigg demonstrates the unexpected result that the overhead burden for the simulated wireless network decreases as the number of nodes in the network increases. PO Resp. 48–49 (citing Ex. 2002 ¶¶ 219–223; Ex. 2006 ¶¶ 21, 24–26).

Patent Owner relies on the same arguments and evidence discussed above to show that there is a nexus between the evidence of unexpected results and the challenged claims. PO Resp. 49–51 (citing Ex. 2002 ¶¶ 216–223). For the same reasons discussed above, we determine that the nexus

between Patent Owner's evidence of unexpected results and the challenged claims is weak. *See supra* Section II.C.8.a.

9. *Totality of the Evidence*

For the reasons discussed above in Section II.C.1 through Section II.C.7, the evidence presented by Petitioner strongly indicates that claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41 would have been obvious over the cited prior art. For the reasons discussed above in Section II.C.8, Patent Owner's evidence of long-felt but unmet need and unexpected results is weak. When considering all of the *Graham* factors, Patent Owner's weak evidence of long-felt but unmet need and unexpected results is substantially outweighed by Petitioner's strong evidence of obviousness. Thus, when considering all the evidence of obviousness and non-obviousness together, *see In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litigation*, 676 F.3d 1063, 1079 (Fed. Cir. 2012), we determine that Petitioner has shown by a preponderance of the evidence that claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41 of the '471 patent are unpatentable as obvious.

D. *Obviousness of Claims 4, 8, 12, and 16 Over Burchfiel, Gitman, and Kahn, and Over Burchfiel, Gitman, Kahn, and APA*

Petitioner argues that claims 4, 8, 12, and 16 would have been obvious over Burchfiel, Gitman, and Kahn, and over Burchfiel, Gitman, Kahn, and APA. Pet. 5. We have considered the parties' arguments and supporting evidence, and we determine that Petitioner has shown by a preponderance of the evidence that claims 4, 8, 12, and 16 would have been obvious over Burchfiel, Gitman, and Kahn, and over Burchfiel, Gitman, Kahn, and APA.

1. *Claim 4*

Claim 4 depends from claim 3, and recites that the server process comprises "logic that determines if said client authentic." Ex. 1001, 23:59–

61. Kahn teaches “verify[ing] the authenticity” of repeaters and terminals. Pet. 60; Ex. 1007, 183.¹⁶ APA teaches authentication techniques using one-way seeds. Pet. 61; Ex. 1001, 15:12–27.

Claim 4 recites that the server process comprises “logic that determines if said client is already in said client link tree if client is determined to be authentic.” Ex. 1001, 23:62–63. Burchfiel teaches that the station detects persistent alternate routing of packets. Pet. 63–64, 67–68; Ex. 1003 ¶ 316; Ex. 1004, 247–248 (“A less dynamic but more global routing change is required when a repeater or station fails: persistent alternate routing of packets signals this failure, and the station detecting it must reconfigure the PRN to route all traffic around the failed element.”). A person of ordinary skill in the art reading Burchfiel would have known that the station can detect persistent alternate routing of packets by comparing the routes in the headers of the data packets to the entries in the connection table. Pet. 63–64, 67–68; Ex. 1003 ¶ 316; Ex. 1004, 247–248. A person of ordinary skill in the art also would have recognized that doing so would have been advantageous because it would have allowed the station to detect persistent alternate routing of packets by using information already in the station’s possession, rather than requiring additional communication over the network. Pet. 63–64, 67–68; Ex. 1003 ¶ 316; Ex. 1004, 247–248. As such, Burchfiel’s teachings, together with the background knowledge and perspective of a person of ordinary skill in the art, demonstrate that it would have been obvious to detect persistent alternate routing of packets by

¹⁶ The parties cite to the original page numbers of Kahn, rather than the page numbers Petitioner added when it filed Kahn as Exhibit 1007 in this case. Thus, we also cite to the original page numbers of Kahn.

comparing the routes in the headers of the data packets to the entries in the connection table, and, thus, to determine that a repeater or terminal already has an entry in the connection table. Pet. 63–64, 67–68; Ex. 1003 ¶ 316; Ex. 1004, 247–248; *see Simon*, 461 F.2d at 1390.

Claim 4 recites that the server process comprises “logic that deletes said client from said client link tree if said client is already in said client link tree,” and “logic that inserts said client in said client link tree if said client is authentic.” Ex. 1001, 23:64–67. Burchfiel teaches that when the station detects persistent alternate routing of packets, the station updates the connection table by recomputing the minimum distance routes to the active elements, and, thus, deletes the original entry for a repeater and inserts a new entry. Pet. 63–64, 67–68; Ex. 1003 ¶ 316; Ex. 1004, 247–248 (“The station performs this reconfiguration . . . by recomputing minimum distance routes to the elements which are still active; and finally, by updating repeater routing parameters to route packets along these new routes.”).

Other than the arguments discussed above with respect to claims 2 and 3, Patent Owner does not dispute that the combination of Burchfiel, Gitman, and Kahn, and the combination of Burchfiel, Gitman, Kahn, and APA teach the limitations of claim 4.

2. *Claims 8, 12, and 16*

Claims 8, 12, and 16 depend from claims 7, 11, and 15, respectively, and recite limitations similar to those discussed above for claim 4. Petitioner identifies evidence showing that the combination of Burchfiel, Gitman, and Kahn, and the combination of Burchfiel, Gitman, Kahn, and APA teach the limitations of claims 8, 12, and 16. Pet. 71. Our analysis of the limitations of claim 4 applies to the similar limitations of claims 8, 12, and 16. Other

than the arguments discussed above with respect to claims 6, 7, 10, 11, 14, and 15, Patent Owner does not dispute that the combination of Burchfiel, Gitman, and Kahn, and the combination of Burchfiel, Gitman, Kahn, and APA teach the limitations of claims 8, 12, and 16.

3. *Reasons for Combining Burchfiel, Gitman, Kahn, and APA*

Petitioner argues that a person of ordinary skill in the art would have had a reason to combine the cited teachings of Burchfiel and Kahn. Pet. 55 (citing Ex. 1003 ¶ 281). We agree with and adopt Petitioner’s reasoning. Like Burchfiel and Gitman, Kahn relates to the same field of endeavor as the ’471 patent, that is, a wireless network for transmitting data packets between clients and servers. Pet. 55; Ex. 1001, Abstract, 1:22–24; Ex. 1007, 179 (“The system consists of terminals and stations linked together by line of sight radio repeaters.”). It would have been obvious to a person of ordinary skill in the art to combine Burchfiel and Kahn so that Burchfiel’s station implements Kahn’s authentication technique to advantageously prevent unauthorized access. Pet. 55; Ex. 1003 ¶ 281; Ex. 1007, 183. In addition, a person of ordinary skill in the art reasonably would have expected the combination to work. Pet. 55; Ex. 1003 ¶ 281.

Petitioner also argues that a person of ordinary skill in the art would have had a reason to combine the cited teachings of Burchfiel, Kahn, and APA. Pet. 56 (citing Ex. 1003 ¶ 282). We agree with and adopt Petitioner’s reasoning. Specifically, it would have been obvious to a person of ordinary skill in the art to implement Kahn’s authentication technique using APA’s authentication algorithm to advantageously add a layer of security. Pet. 56; Ex. 1003 ¶ 282. In addition, a person of ordinary skill in the art reasonably would have expected the combination to work. Pet. 56; Ex. 1003 ¶ 282.

4. *Objective Indicia of Non-Obviousness*

Patent Owner relies on the same objective indicia of non-obviousness discussed above with respect to claims 2, 3, 6, 7, 10, 11, 14, 15, 40, and 41. PO Resp. 44–51. Therefore, for the same reasons discussed above, we determine that the nexus between Patent Owner’s evidence of objective indicia of non-obviousness and the challenged claims is weak. *See supra* Section II.C.8.

5. *Totality of the Evidence*

For the reasons discussed above in Section II.D.1 through Section II.D.3, the evidence presented by Petitioner strongly indicates that claims 4, 8, 12, and 16 would have been obvious over the cited prior art. For the reasons discussed above in Section II.D.4, Patent Owner’s evidence of long-felt but unmet need and unexpected results is weak. When considering all of the *Graham* factors, Patent Owner’s weak evidence of long-felt but unmet need and unexpected results is substantially outweighed by Petitioner’s strong evidence of obviousness. Thus, when considering all the evidence of obviousness and non-obviousness together, *see In re Cyclobenzaprine*, 676 F.3d at 1079, we determine that Petitioner has shown by a preponderance of the evidence that claims 4, 8, 12, and 16 of the ’471 patent are unpatentable as obvious.

E. *Patent Owner’s Observations*

Patent Owner filed Observations on the cross examination of Mr. Geier (Paper 35), to which Petitioner filed a Response (Paper 38). We have considered Patent Owner’s observations and Petitioner’s responses, and we determine that Patent Owner’s observations do not demonstrate any issues with respect to the credibility of Mr. Geier’s testimony. We also have

considered Patent Owner's observations in connection with the arguments and evidence discussed above, and we have given Mr. Geier's testimony the appropriate weight in making our determination in this case.

F. *Constitutionality of Inter Partes Review*

Patent Owner argues that "[t]his IPR should be terminated and the petition dismissed because the IPR system is unconstitutional." PO Resp. 52. We decline to consider the constitutional challenge as, generally, "administrative agencies do not have jurisdiction to decide the constitutionality of congressional enactments" where consideration of the constitutional question would "require the agency to question its own statutory authority or to disregard any instructions Congress has given it." *Riggin v. Office of Senate Fair Emp't Practices*, 61 F.3d 1563, 1569–70 (Fed. Cir. 1995). Nonetheless, we note that our reviewing court has upheld the constitutionality of *inter partes* review proceedings. *See MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1288–93 (Fed. Cir. 2015).

III. CONCLUSION

Petitioner has shown by a preponderance of the evidence that claims 2–4, 6–8, 10–12, 14–16, 40, and 41 of the '471 patent are unpatentable.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 2–4, 6–8, 10–12, 14–16, 40, and 41 of the '471 patent are shown unpatentable; and

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

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