

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EMERSON ELECTRIC CO.,
Petitioner,

v.

IP CO., LLC,
Patent Owner.

Case IPR2017-00252
Patent 8,000,314 B2

Before LYNNE E. PETTIGREW, STACEY G. WHITE, and
CHRISTA P. ZADO, *Administrative Patent Judges*.

WHITE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Emerson Electric Co. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) seeking to institute an *inter partes* review of claims 1, 4, 10, 11, and 15–19 of U.S. Patent No. 8,000,314 B2 (Ex. 1001, “the ’314 patent”) pursuant to 35 U.S.C. §§ 311–319. IP Co., LLC (“Patent Owner”) filed a Preliminary Response. Paper 6. Based on our review of these submissions and associated evidence, we instituted *inter partes* review of claims 1 and 4 of the ’314 patent. Paper 7 (“Dec.”). Subsequently, the Supreme Court held that under 35 U.S.C. § 314 the Board may not institute on less than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1352–53 (2018). The parties filed a Joint Motion to Limit the Petition, and by that motion the parties sought to limit this proceeding to the claims and grounds upon which *inter partes* review initially had been instituted. Paper 35. We granted the Joint Motion (Paper 36) and thereby permitted the parties to limit this proceeding to the following claims and grounds:

References	Claim Challenged
Jubin ¹ and Fifer ²	1

¹ John Jubin & Janet D. Tornow, *The DARPA Packet Radio Network Protocols*, Proceedings of the IEEE, Vol. 75, No. 1, Jan. 1987 (Ex. 1003, “Jubin”).

² William C. Fifer & Frederick J. Bruno, “The Low-Cost Packet Radio,” Proceedings of the IEEE, Vol. 75, No. 1, January 1987 (Ex. 1004, “Fifer”).

References	Claim Challenged
Jubin, Fifer, APA, ³ and Cerf ⁴	4
Kahn, ⁵ Burchfiel, ⁶ Schwartz, and Cerf	4

Id. at 2–3.

Patent Owner filed a Patent Owner’s Response (Paper 14, “PO Resp.”), and Petitioner filed a Reply (Paper 25, “Reply”). An oral hearing was held on February 5, 2018. Paper 33 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 318(a). For the reasons discussed below, Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 4 of the ’314 patent are unpatentable.

B. Related Proceedings

We have been informed that *SIPCO, LLC, v. Emerson Electric Co.*, No. 6:15-cv-00907-JRG-KNM (E.D. Tex.), which has been transferred to the Northern District of Georgia and consolidated with Civil Action No. 1:15-cv-0319-AT (N.D. Ga.), may be impacted by this proceeding. Paper 3, Paper 23. In addition, the ’314 patent was the subject of an *inter partes* review involving the same parties. *Emerson Electric Co., v. IPCO, LLC*,

³ Petitioner relies upon the disclosures found in column 7, lines 33 through 37 of the ’314 patent as Admitted Prior Art (“APA”). See Pet. 26.

⁴ Vinton G. Cerf & Peter T. Kirstein, *Issues in Packet-Network Interconnection*, Proceedings of the IEEE, Vol. 66, No. 11, Nov. 1978 (Ex. 1008, “Cerf”).

⁵ Robert E. Kahn, *Advances in Packet Radio Network Protocols*, Proceedings of the IEEE, Vol. 66, No. 11, Nov. 1978 (Ex. 1006, “Kahn”).

⁶ J. Burchfiel et al., *Functions and structure of a packet radio station*, National Computer Conference presented paper, 1975 (Ex. 1007, “Burchfiel”).

Case IPR2015-01901, slip op. at 32 (PTAB Mar. 8, 2017) (Paper 28) (holding claims 10 and 12–19 to be unpatentable). The final written decision in that proceeding is under appeal. IPR2015-01901, Paper 29. In addition, Petitioner has filed a number of other petitions for *inter partes* review directed to related patents. Papers 23, 24.

C. The '314 Patent

The '314 patent describes a digital computer network. Ex. 1001, 1:13–15. This network is depicted in Figure 1, which is reproduced below.

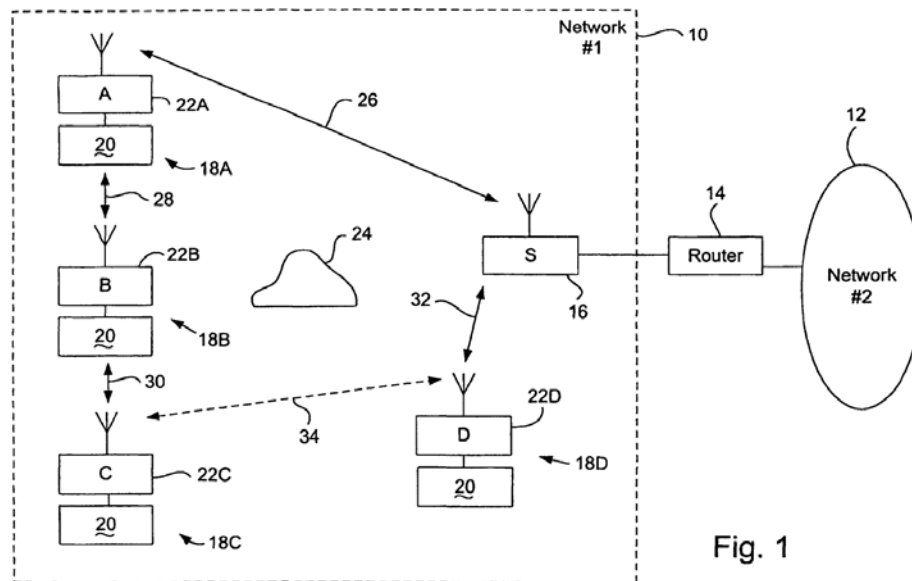


Figure 1 shows wireless network 10 that is in communication with second network 12. *Id.* at 7:18–22. Wireless network 10 includes one or more servers 16 that may act as a gateway between the two networks. *Id.* at 7:42–46. Servers include a digital controller that “maintains a map of the links of the first network and provides a map to the first network clients on request.” *Id.* at 5:53–55. The network also includes any number of clients 18. *Id.* at 7:64–67. Servers implement processes for receiving and transmitting data packets from the clients. *Id.* at 5:6–9. Clients implement processes for receiving and transmitting data packets to and from the server and other

clients. *Id.* at 5:9–11. “Preferably, the client process of each of the clients initiates, selects, and maintains a radio transmission path (‘link’) to the server . . . [and] also constantly searches for improved paths to the server.” *Id.* at 5:11–15, 5:19–21.

D. Instituted Claims

We instituted *inter partes* review of claims 1 and 4, which are reproduced below.

1. A wireless network system comprising:
 - a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem;
 - a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem, wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; andwherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.

Ex. 1001, 22:56–23:13.

4. A first node providing a gateway between a wireless network and a second network, the first node comprising:
 - a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and
 - a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and
 - a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.

Id. at 23:56–24:13.

E. Person of Ordinary Skill in the Art

Petitioner’s declarant, Dr. Stephen Heppe, opines that this individual would have, through formal education or practical experience, the equivalent of a Bachelor’s Degree in Electrical Engineering and two to three years of experience in designing and developing radio communications and/or computer network systems or marketing such systems from a technical standpoint. Pet. 13–14 (citing Ex. 1014 ¶ 9). Patent Owner’s declarant, Dr. Kevin Almeroth, opines that this individual would have a four-year degree

from an accredited institution (usually denoted as a B.S. degree) in computer science, computer engineering or the equivalent and at least two years of experience with, or exposure to, computer networks, routing, and wireless networks. Ex. 2011 ¶ 80. Dr. Almeroth also states that graduate education could substitute for professional experience and significant experience in the field might substitute for formal education. *Id.* Based upon our review of the '314 patent and prior art of record, we agree with Dr. Almeroth and adopt his definition of a person of ordinary skill in the art.

II. CLAIM CONSTRUCTION

A. Introduction

The '314 patent has expired. See Ex. 1001, 1:4–9; 35 U.S.C. § 154(a)(2); see also Pet. 14 (stating that the '314 patent will expire no later than December 6, 2016). The Board interprets claim terms in expired patents as would a district court, by applying the claim construction principles outlined in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). Under that standard, the “words of a claim ‘are generally given their ordinary and customary meaning,’” as would be understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips*, 415 F.3d at 1312 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). We also

can consider extrinsic evidence, although it is “less significant than the intrinsic record.” *Phillips*, 415 F.3d at 1317.

In the Petition, Petitioner requested construction of the terms “selecting a transmission path,” “first node,” and “changes to upgrade the selected transmission.” Pet. 15–19. In the Institution Decision, we construed “selecting a radio transmission path to said first node.” Dec. 11–12. We also determined that no other terms required express construction for the purposes of that Decision. *Id.* at 11 (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Patent Owner proposes constructions for “selecting a radio transmission path to said first node” and “transmission path from the second node to the first node based upon viable network paths observed by the second node.” PO Resp. 7–11. Based on the issues currently before us, we discern a need to address the proper construction of the term “selecting a radio transmission path to said first node.” For the purposes of this Decision, no other terms require express construction.

B. Construction of “Selecting a Radio Transmission Path to Said First Node”

Claim 1 recites, in relevant part, “selecting a radio transmission path to said first node.” In the Institution Decision, we preliminarily determined the broadest reasonable interpretation of “selecting a radio transmission path to said first node” is at least broad enough to encompass “choosing the entire path from the second node to the first node including the identification of all nodes in the path.” Dec. 11–12. We note that our Institution Decision contained a preliminary construction based on the broadest reasonable construction standard, and now we review the term using the principles

stated in *Phillips*. Thus, part of our analysis includes determining whether the change in construction standards affects our construction of the term. We conclude that in this case it does not. Here, the parties do not dispute that the preliminary construction is within the scope of the recited term. See PO Resp. 8; Reply 3. The only dispute is whether a broader construction should apply.

Patent Owner argues that “[t]he construction of the ‘radio transmission path’ portion of the claim limitation should not be limited to only one of many ways of describing a path..” PO Resp. 8. Thus, Patent Owner asserts that the construction should be “choosing a path to the server including an identification of an entire path from the client to the server.” *Id.* at 10. At the oral hearing, Patent Owner’s counsel stated that there was no need for further construction of this term “because it doesn’t involve issues related to patentability, [and thus, it is unnecessary] to resolve that particular portion of the dispute with respect to the construction of this claim limitation.” Tr. 14:23–15:3. Based on our review of the issues before us, we determine that it is unnecessary to determine whether this broader construction would be correct. The Federal Circuit has cautioned that “only those terms need be construed that are in controversy, *and only to the extent necessary to resolve the controversy.*” *Vivid Techs., Inc. v. Am. Sci.*, 200 F.3d 795, 803 (Fed. Cir. 2000) (emphasis added). Thus, we decline to decide whether the interpretation sought by Patent Owner would be correct. Therefore, we determine that the construction of “selecting a radio transmission path” is at least broad enough to encompass “choosing the entire path from the client to the server including the identification of all nodes in the path.”

III.ANALYSIS

A. *Objective Evidence of Nonobviousness*

All of the instituted grounds in this proceeding are based on allegations that the challenged claims would have been obvious over the cited art. As part of the obviousness inquiry we must consider evidence of relevant secondary considerations such as long-felt need in the art and unexpected results. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)).

Patent Owner asserts that the claims of the ’314 patent solved a long-felt need in regards to the reduction of overhead in wireless networks. PO Resp. 64–65. “Evidence of a long felt but unresolved need tends to show non-obviousness because it is reasonable to infer that the need would have not persisted had the solution been obvious.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1332 (Fed. Cir. 2016) (citing *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004)). Here, Patent Owner asserts that prior to the ’314 patent, “routing overhead had long been a bottleneck for wireless networks.” *Id.* at 64. Dr. Kevin Almeroth supports Patent Owner’s argument by explaining why he believes that several prior art references documented the existence of a long-felt need for a solution of the problem of routing overhead. *Id.* at 65 (citing Ex. 2011 ¶ 201). Patent Owner asserts that “[t]he invention claimed in the ’314 patent solved this long-felt need by significantly reducing the overhead of a distributed network through the use of both centralized and decentralized techniques — *e.g.*, selecting a radio transmission path to a server node at a client node and upgrading the selected radio transmission path to an optimized path at the server.” *Id.* at 68–69 (citing Ex. 2011 ¶ 205). Patent Owner also argues that

the claims of the '314 patent provided an unexpected result by decreasing overhead (and increasing bandwidth) even as the number of nodes in the system increased. *Id.* at 71–72 (citing Ex. 2011 ¶ 210). Dr. Almeroth supports this assertion with testimony regarding the “minimal overhead” of the network claimed in the '314 patent. Ex. 2011 ¶ 210.

To be relevant, evidence of nonobviousness must be commensurate in scope with the claimed invention. *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). Thus, to be accorded substantial weight, there must be a nexus between the claimed invention and the evidence of secondary considerations. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). Nexus is a legally and factually sufficient connection between the objective evidence and the claimed invention, such that the objective evidence should be considered in determining nonobviousness. *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988). In the absence of an established nexus with the claimed invention, secondary consideration factors are not entitled to much, if any, weight and generally have no bearing on the legal issue of obviousness. *See In re Vamco Machine & Tool, Inc.*, 752 F.2d 1564, 1577 (Fed. Cir. 1985). The burden of showing that there is a nexus lies with the Patent Owner. *See In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir. 1994).

Patent Owner asserts that there is a nexus between challenged claims 1 and 4 and its evidence of unexpected results and long-felt need. PO Resp. 73. Specifically, Patent Owner directs us to Dr. Almeroth's testimony and claims 1 and 4 of the '314 patent. *Id.* Dr. Almeroth testifies that at the time of the invention of the '314 patent it was “generally accepted that routing overhead for a wireless network was directly proportional to the number of

nodes in the wireless networks.” Ex. 2011 ¶ 206. He opines that the ’314 patent solved this problem through the use of “a server [that] maintains a tree with paths from each client to the server (centralized) and clients [that] maintain the ability to select paths to the server independently (decentralized).” *Id.* at ¶ 208. Dr. Almeroth concludes that “[t]his centralized/decentralized approach is clearly recited in the challenged claims. That is, each of the challenged claims clearly recites the centralized/decentralized routing features that were demonstrated . . . to reduce the routing overhead and to thereby solve the long-felt need.” *Id.* at ¶ 212.

Petitioner disputes this assertion and contends that “[Patent Owner’s] evidence does not establish any nexus between the Claims and the purported long-felt needs [Patent Owner] imagines because the ’314 [patent] **never mentions**—let alone suggests it solves—‘routing overhead.’” Reply 26. We agree. The ’314 patent does not discuss routing overhead. Further, the term bandwidth only appears once in the specification and there it is part of a discussion of prior art. Ex.1001, 2:50–56. The ’314 patent states that the prior art “create[d] a great deal of ‘packet duplication’ or ‘pollution’ as copies of a particular data packet are multipl[ied] repeated[ly], rather than routed” (*id.* at 2:40–42) and that “such duplicate packets increase data congestion in the network and increases work that must be performed by the server” (*id.* at 2:47–50). The specification further describes the prior art as lacking “robustness (i.e. the ability to maintain communication with the network under adverse conditions).” *Id.* at 2:61–64. In addition, the specification notes that the prior art does not include a network that is both robust and efficient. *Id.* at 4:27–29; *see also id.* at 6:4–6 (stating that the

inventive network is both robust and efficient). Thus, on its face, the '314 patent is directed to solving problems of robustness and efficiency. In addition, neither claim 1 nor 4 contains a reference to routing overhead. We note that we are not requiring a specific wording here, but rather we are looking to the substance of the claims to see if one of ordinary skill in the art would have understood them to include a solution for the high overhead purportedly found in prior art systems.

We are not persuaded that one of ordinary skill in the art would have understood the '314 patent to be solving issues of routing overhead. Nor are we persuaded that one of ordinary skill in the art would have found this purported reduction in overhead (and increase in bandwidth) to be caused by the network and apparatus of the challenged claims. We do not credit Dr. Almeroth's testimony on this point because he does not provide sufficient factual support for his conclusions. For example, Dr. Almeroth's discussion of secondary considerations does not include a single citation to the '314 patent. See Ex. 2011 ¶¶ 199–212.

Thus, we are not persuaded that Patent Owner has presented sufficient evidence of nexus between its asserted secondary considerations and the challenged claims. Therefore, we give little weight to Patent Owner's assertions of secondary considerations of non-obviousness. See *Vamco Machine & Tool, Inc.*, 752 F.2d at 1577.

B. Analysis of Asserted Ground of Obviousness Based on Jubin and Fifer

Petitioner argues that claim 1 is unpatentable under 35 U.S.C. § 103(a) over Jubin and Fifer. Pet. 29–43. Petitioner's assertions are supported by a declaration from Dr. Stephen Heppe. Ex. 1014.

1. Overview of Jubin

Jubin provides a description of the state of the Defense Advanced Research Projects Agency (“DARPA”) Packet Radio Network (also known as PRNET) in 1986. Ex. 1003, 21, col. 1. Figure 4 of Jubin is reproduced below.

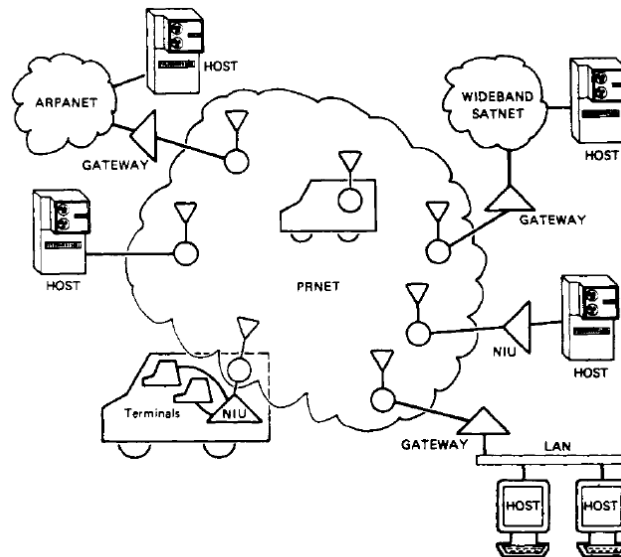


Fig. 4. Packet radio network in the Internet.

Figure 4 of Jubin depicts PRNET with its packet radios (“PRs”) and associated host computers and user terminals. *Id.* at 23, col. 1. PRNET includes a plurality of PRs, each comprising a digital subsystem and a radio subsystem. *Id.* at 22, col. 1. Figure 4 also depicts a gateway connecting the PRNET to the internet. *Id.* at 23, col. 1.

“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination, even before it is given a packet to deliver or forward.” *Id.* at 23, col. 2. Jubin discloses storing network information in three tables: (1) neighbor table, (2) tier table, and (3) device table. *Id.*

A PR's neighbor table maintains a list of PRs that are one hop away from that PR and information about the quality of the links to those PRs. *Id.* at 24, col. 1; *see id.* at Fig. 5. Neighbor tables are populated using Packet Radio Organization Packets ("PROPs"). *Id.* at 23, col. 2–24, col. 1. PROPs are broadcast by a PR every 7.5 seconds. *Id.* at 23, col. 1. These packets announce the existence of the PR and information about the network's topology from the perspective of the broadcasting PR. *Id.* at 24, col. 1.

The tier table allows a PR to track how many hops away it is from each of the other PRs in the network. *Id.* at 24, col. 2; *see id.* at Fig. 5. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." *Id.* This table is updated as conditions change. *Id.* Finally, the device table maintains a listing of the network's device to PR mapping. *Id.* at 25, col. 1.

In PRNET, "a packet traverses a single path through the network, and is acknowledged at every packet radio along the path." *Id.* at 25, col. 2. This routing of packets is accomplished by using a PR's routing tables and the packet's header information. *Id.* The header includes fields such as the identity of the source of the packet, the identity of the previous PR, and the identity of the destination PR. *Id.*

2. Overview of Fifer

Fifer is a paper titled "The Low-Cost Packet Radio." Ex. 1004. Fifer describes the state of packet radios in 1986. *Id.* at 33. Fifer was cited in Jubin as providing further description of the PRs. Ex. 1003, 30 n.14. In addition, Jubin was published in the same issue of the IEEE Proceedings as Fifer and Fifer appears to be the article directly after Jubin. Ex. 1014 ¶ 25;

Ex. 1003, 32 (showing last page of Jubin as page 32 of the IEEE Proceedings); Ex. 1004, 33 (showing the first page of Fifer as page 33 of the same issue of the IEEE Proceedings). Figure 2 of Fifer is reproduced below.

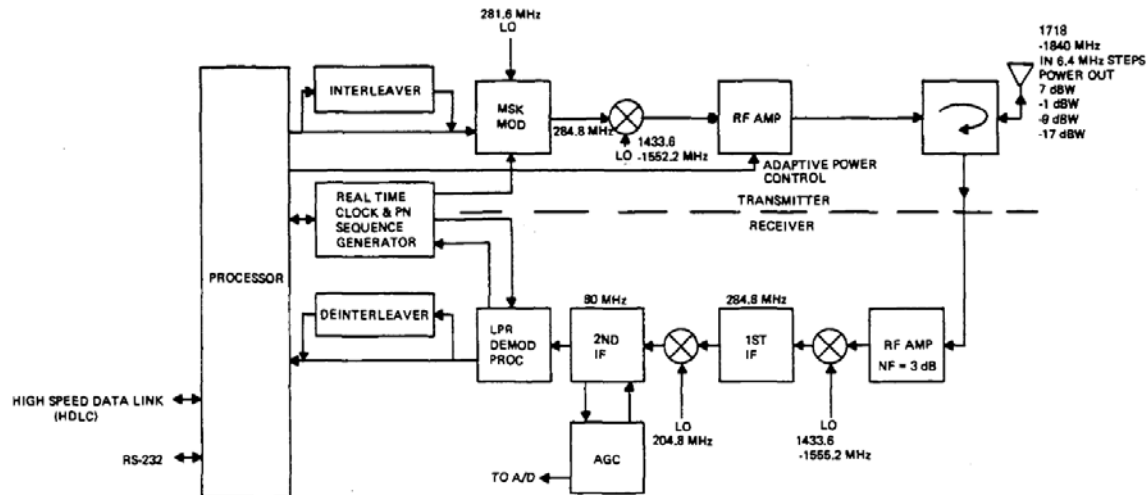


Fig. 2. LPR system basic block diagram.

Figure 2 of Fifer depicts a block diagram of a low cost packet radio (“LPR”). Ex. 1004, 36.

3. Claim 1

Petitioner’s assertions regarding claim 1 may be summarized as follows: Petitioner asserts that Jubin’s PRs teach the recited first and second nodes. Pet. 30–32. Petitioner asserts that Fifer provides a detailed description of the recited modem and controller found in each of the first and second nodes. *Id.* at 30–31. According to Petitioner, Jubin’s discussion of PRs maintaining their own optimal tier table teaches the recited selection of the transmission path utilizing the least number of second nodes. *Id.* at 35. Petitioner also relies on Jubin to teach the recited first controller implementing changes to upgrade the path in response to a request from a second node. *Id.* Petitioner asserts that this limitation is taught by Jubin’s disclosure of using PROP packets to disseminate “good” news and “bad” news regarding changes to the network’s topology and then implementing

changes to the PR's tier table in response to the receipt of "bad" news regarding changes to the topology. *Id.* at 35–36. Petitioner asserts that it would have been obvious to one of ordinary skill in the art to combine the teachings of Jubin and Fifer because Fifer would have provided additional details regarding Jubin's PRs and this combination would have provided a predictable result. *Id.* at 31.

Patent Owner argues that the disclosures of Jubin and Fifer are insufficient to teach the limitations of claim 1. Specifically, Patent Owner asserts that the cited art does not teach (1) "said second node process . . . selecting a radio transmission path to said first node" (PO Resp. 17–20) or (2) "the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes" (*id.* at 20–23).

Patent Owner asserts that Jubin does not teach "said second node process . . . selecting a radio transmission path to said first node" because (1) Jubin's hops are not radio transmission paths (*id.* at 17–18); and (2) Jubin's PRs do not select a radio transmission path to a first node (*id.* at 18–20). We address each argument in turn.

First, Patent Owner argues that claim 1 requires the second node to select an entire path. *Id.* at 18. According to Patent Owner, Jubin fails to teach this limitation "because Jubin's PRs use distance-vector routing and, thus, only select the next 'hop' to the destination and not the entire path." *Id.* at 17. Petitioner directs us to Jubin's disclosure of neighbor, tier, and device tables. Reply 6 (citing Ex. 1003, 23). Dr. Heppe testifies that Jubin's PRs make independent routing decisions using these tables. Ex. 1028 ¶ 27. Petitioner asserts that "Jubin maintains a 'tier table,' which shows direct

connections (tier 1) and connections through another route (tier 2 or more).”
Pet. 33. Figures 2 and 5 of Jubin (as annotated by Petitioner) are reproduced below.

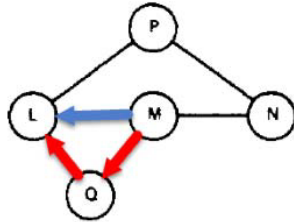


Fig. 2. Small packet radio network.

TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR N.

Figure 2 depicts a small packet radio network with PRs L, M, N, Q, and P. *Id.* at 32. Figure 5 illustrates a tier table for PR N of the network displayed in Figure 2. *Id.* at 32–33. The tier table contains information for each destination in the network including the number of hops (for example L is tier 2 and thus, it is two hops away) and the next PR that should receive the packet in order to route a packet to a particular destination. Dr. Heppe opines that “in Figure 2, Jubin discloses network connectivity that would support two potential routes from PR M to PR L: a) a direct route (highlighted here in blue) to L; and b) an indirect route to L through Q (highlighted here in red).” Ex. 1028 ¶ 27. In addition, he notes that “when PR M transmits its PROP packet, it reports that it is ‘tier 1’ with respect to PR L (Ex. 1003, 24), indicating that the selected route is direct from M to L.” *Id.* Petitioner also directs us to Jubin’s disclosure of routing information in the headers of packets. Pet. 34. Specifically, Jubin’s packets contain source, destination, and next hop for each packet. *Id.* Jubin provides an example in which the header contains all of the nodes necessary to transmit a packet from PR L to PR N. *Id.* Thus, Petitioner asserts that Jubin discloses a PR that selects a radio transmission path to another PR. Reply 6–7.

We find Petitioner’s contentions to be persuasive and supported by the record in this matter. We also credit Dr. Heppe’s testimony and find it to be well supported by the record. Each of Jubin’s PRs “gathers and maintains enough information about network topology so that it *can make independent decisions about how to route data through the network* to any destination, even before it is given a packet to deliver or forward.” Ex. 1003, 23 (emphasis added). “Once installed, the system discovers the radio connectivity between packet radios and organizes routing strategies dynamically on the basis of this connectivity.” *Id.* at 22. Further, Jubin states that, “[t]he goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” The tier table contains the complete route for any first or second tier connections. For example as shown in Figures 2 and 5, a packet traveling from PR N to PR L would travel from N to M to L. *See* Fig. 5.

Patent Owner also argues that Jubin does not teach this limitation because Jubin’s devices (destinations) lie outside of the PRNET and thus, any radio transmission path discussed in Jubin would terminate before reaching the destination. PO Resp. 17. Petitioner disputes this argument and contends that “Claim 1 recites ‘a radio transmission path ***to said first node***’—not that the ‘first node’ is a ‘device,’ ‘client,’ or ‘server.’” Reply 7. Thus, under Petitioner’s view the claim language would encompass a path from a PR to another PR and does not require that the path reach a device that may be connected to a PR. *Id.* Jubin describes that “[t]he packets can be routed either to another PR over the radio channel or to an attached device.” Ex. 1003, 22. Further, as discussed above, Jubin’s routing tables

contain information regarding the path from one PR to another PR in the network. *See e.g., id.* at Fig. 5. We are persuaded by Petitioner’s arguments. Claim 1 requires routing data packets from the second node to the first node. We are not persuaded that the claim should be read to exclude routes between PRs. The ’314 patent refers to nodes broadly and uses the term node interchangeably with terms such as client and server. *See e.g.,* Ex. 1001, Figs. 2f, 2h, 9:63–64. We determine that claim 1’s nodes are not limited to a terminal device that would be connected to a radio and that the term node is broad enough to include Jubin’s PRs.

Next, Patent Owner argues that Jubin and Fifer do not teach “the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.” PO Resp. 20–23. According to Patent Owner, “[i]n Jubin, the PR destination (which corresponds to the first node as claimed) has no control of and no ability to change the way that nodes get to it, in particular, the paths used to reach itself.” *Id.* at 21 (quoting Ex. 2011 ¶ 135).

Petitioner responds by contending that “Jubin discloses that the first node controller (*e.g.*, digital subsystem of PR *L* mapped to gateway) implements changes to upgrade the selected transmission path (*e.g.*, route to PR *L* mapped to gateway) in response to a request (*e.g.*, “bad” news) from at least one of said second nodes (*e.g.*, PRs *N*, *M*).” Reply 9. Petitioner points out that Jubin’s PRs track the “bidirectional quality” of the links between the PRs. *Id.* (citing Ex. 1003, 24). For example, Dr. Heppe testifies that if the link between *N* and *M* fails then *N* will broadcast a bad news PROP packet announcing the failure of the *N/M* link. Ex. 1028 ¶ 37. In response, the other PRs in the network will update their tier tables to use alternate routes

to N that do not include passing through M. *Id.* Thus, by sending out good or bad news packets, N has updated the route that other PRs will take to arrive at N. Reply 9–10. We credit Dr. Heppe’s testimony and find that Petitioner’s interpretation of Jubin is reasonable and well supported by the record.

Patent Owner further asserts that the proper construction of the claim term “request” is “the act or an instance of asking.” PO Resp. 22. According to Patent Owner, Jubin’s PROP packets are not requests because these messages “are not asking for the first node to upgrade a radio transmission path that was previously selected by the second node.” *Id.* (citing Ex. 2011 ¶ 137). Purportedly, the prior art is insufficient because “the ‘good’ and ‘bad’ news included in the PROP messages cited by the Petitioner are merely informative messages about changes in the network topology.” *Id.* (citing Ex. 2011 ¶ 137). Further, Patent Owner contends that the PRs use the information from the PROP packets only to update the next PR and not the transmission path. *Id.*

According to Petitioner, the claimed “request” is not so narrow; instead, the “request” should be defined as a “[t]ransaction that is generated by a requester, to initiate an action on a responder.” Reply 10 (quoting Ex. 1031). Petitioner asserts that Jubin’s PROP packets meet that definition because they “generate transactions causing receiving PRs to upgrade their routing tables based on the received information.” *Id.* at 11. Further, the PROP packets “are used to build and maintain neighbor tables, tier tables and device tables.” Pet. 36. According to Petitioner, “Jubin teaches that, ‘[t]he goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently

defined as the shortest route with good connectivity on each hop.” *Id.* (quoting Ex. 1003, 24). Petitioner relies upon Jubin’s PROP packets and packet headers to teach updating the PR’s routing tables to contain the best routes. *Id.* at 36–37. In support of Petitioner’s arguments, Dr. Heppe testifies that

any packet that demands a response packet is an implicit request for an upgrade to the first node’s routing tables, regardless of any other purpose of the data exchange. Thus, when a node in Jubin sends a packet demanding a response to another node, it also ‘requests’ that the first node controller upgrade a previously selected path.

Ex. 1014 ¶ 72.

Jubin’s PROP packets communicate the current status of a link. The question before us is whether this communication between nodes properly may be seen as a request to make changes to a transmission path. We determine that Jubin’s PROP packets and headers may be seen in such a light. Jubin’s PROP packets and headers send information to the PRs and then implicitly request the receiving PR to upgrade its routing tables based on the information received. The PROP packets would be of no utility if PRs received that information and then took no action based upon that information. Jubin, however, describes PROP packets as the impetus for a number of actions. The reference states that a PROP packet announcing the existence of a new PR in the network causes the PRs to update their neighbor tables to reflect the existence of a new radio and a new PR hears the PROP packets from its neighbors and uses that information to build its table. Ex. 1003, 24. Once their tables have been populated, the PRs continue to use the PROP packets to evaluate the quality of the links listed in their neighbor tables. *Id.* PRs also use PROP packets in order to allow

“every radio [to] know[] its distance in tiers from any prospective destination PR and which PR is the next PR enroute to that destination PR.” *Id.* The PRs update their tables based on the information received in these PROP packets and take actions such as replacing a bad route with a new good route. *Id.* We determine that these actions are instigated by the PROP packets and thus, we find that one of ordinary skill in the art would have understood Jubin’s PROP packets to teach or suggest the “request” recited in the disputed limitation.

We have reviewed Petitioner’s arguments and evidence regarding all of the limitations of claim 1. We adopt Petitioner’s contentions regard the disclosures of the art the rationale for combining the teachings of Jubin and Fifer. For all of the foregoing reasons, we are persuaded that Petitioner has shown that the disclosures of Jubin and Fifer would have taught or suggested the subject matter of claim 1 to one of ordinary skill in the art. As noted in § II.A, we have reviewed Patent Owner’s arguments and evidence regarding secondary considerations of nonobviousness and we find that it should be accorded little weight. Therefore, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over Jubin and Fifer.

C. Analysis of Asserted Ground of Obviousness Based on Jubin, Fifer, APA, and Cerf

Petitioner alleges that independent claim 4 would have been obvious over the teachings of Jubin, Fifer, APA, and Cerf. Pet. 43–51. Petitioner’s allegations are supported by a declaration from Dr. Heppe. Ex. 1014.

1. Overview of Cerf

Cerf is a paper titled “Issues in Packet-Network Interconnection.” Ex. 1008. Cerf “introduces the wide range of technical, legal, and political issues associated with the interconnection of packet-switched data communication networks.” *Id.* at Abstract. One of the issues addressed in Cerf is the interconnection of networks using different protocols. *Id.* at 1387, col. 1. Cerf defines a protocol translator as “[a] collection of software, and possibly hardware, required to convert the high level protocols used in one network to those used in another.” *Id.* at 1387, col. 2. Cerf’s Protocol Translation Gateways translate the packets from one network for use in another network. *Id.* at Fig. 13, 1398, col. 2–1399, col. 1.

2. Claim 4

Petitioner’s allegations regarding claim 4 may be summarized as follows: According to Petitioner, Jubin’s PRs “are associated with gateways to the Internet, wideband satellite, and a local area network (LAN).” Pet. 43 (internal citations omitted). Petitioner contends that Jubin’s gateways allow devices on PRNET to communicate with devices on other networks and thus, one of ordinary skill in the art would have understood that hosts attached to Jubin’s PRs could both send and receive packets across networks. *Id.* at 45. As discussed in Jubin, the hosts run standard protocols “which ensure ‘the end-to-end communication between hosts is reliable and robust.’” *Id.* (quoting Ex. 1003, 22 col. 2). Petitioner also relies on Cerf to teach the use of gateways to connect networks. *Id.* (citing Ex. 1014 ¶¶ 103–104). As described by Petitioner, Cerf’s gateways “translate packets from one protocol on one network to a second protocol on a second network.” *Id.* at 47 (citing Ex. 1008, 1398 col. 2–1399 col. 1). Further, Petitioner argues

that APA “conced[ed] that gateways and other networking devices were ‘well-known to those skilled in the art.’” *Id.* at 46 (quoting Ex. 1001, 7:33–37). Petitioner relies upon APA’s explanation that “server 16 merely performs the function of a prior art gateway including the ‘translation service’ of converting packets to the appropriate format used on differing networks.” *Id.* (citing Ex. 1001, 7:44–54). Petitioner asserts that Jubin teaches the recited changes to a transmission path. *Id.* at 49–50. Petitioner describes Jubin’s routes as bidirectional and contends that Jubin’s routing tables are used to determine the best path to follow for a given destination. *Id.* at 49. Specifically, Petitioner relies on Jubin’s PROP packets, data packet headers, and tier tables as discussed above in relation to claim 1. *See id.* at 49–50. Petitioner asserts that it would have been obvious to one of ordinary skill in the art to incorporate the gateways described in APA and Cerf into Jubin’s packet radio network in order to provide for improved inter-network communication. *Id.* at 47–48.

Patent Owner disputes Petitioner’s contentions and argues that the cited art does not teach at least two of claim 4’s limitations. PO Resp. 23–36. First, Patent Owner contends that the cited art does not teach a gateway that performs packet format conversion or protocol translation. *Id.* at 23–27. Second, Patent Owner argues that the cited art does not teach “a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node.” *Id.* at 27–36.

As to the gateway, Patent Owner asserts that “arguments from Petitioner and Dr. Heppe are misleading because they are based on the portions of Cerf that are not used by the PRNET-ARPANET, PRNET-

SATNET, PRNET-ETHERNET connections shown in Jubin (*see, e.g.*, Figure 4).” *Id.* at 24 (citing Ex. 2011 ¶ 141). Patent Owner directs us to Cerf’s discussion of formal gateways between two networks in which “[s]ufficient agreement is obtained that end-to-end protocols (even high level ones) are common in the two networks. In this case, less activity is required in the gateway.” Ex. 1003, 1403. According to Patent Owner, Cerf teaches that the networks discussed in Jubin all “share the same end-to-end protocol and therefore, do not perform any translation or conversion.” PO Resp. 24 (citing Ex. 2011 ¶ 141).

Dr. Almeroth testifies that “[a] gateway connecting the PRNET and the ARPANET/SATNET/ETHERNET(LAN) do not need to perform any translation, because, as Cerf teaches, the PRNET and ARPANET/SATNET/ETHERNET share the same end-to-end protocols.” Ex. 2011 ¶ 141. Dr. Almeroth cites Cerf’s discussion of the efforts to standardize the protocols used in several networks. *Id.* ¶ 143 (citing Ex. 1003, 1404). The portion cited by Dr. Almeroth states that the standardized host protocol “includes an ‘Internet Header’ which is kept invariant as the packet crosses different networks.” *Id.* According to Dr. Almeroth, this clearly shows that data packets traveling between these networks would not require conversion from one format to another. *Id.* ¶ 144.

Dr. Heppe, however, focuses his testimony on lower level protocols and he explains that these protocols would differ between the wired ARPANET network and the wireless PRNET. Ex. 2010, 63:23–64-1. Thus, those differences would require Jubin’s gateways to convert data packets that pass between those networks. Ex. 1028 ¶ 44. In addition, Petitioner argues that networks that use the same protocol still use protocol conversion

as packets are sent from one network to another. Reply 12. Dr. Heppe testifies that all of Jubin's packets would contain several headers that correspond to different protocol layers. Ex. 1028 ¶ 45. The end-to-end headers would be kept and the other headers would be stripped from the packets once the packets leave the PRNET for the ARPANET. *Id.* In addition, Dr. Heppe notes that PRNET routing headers would need to be added to packets when they entered the PRNET from the ARPANET. *Id.* Thus, Petitioner asserts that Jubin's gateways would perform the required translation in order to account for the necessary changes that needed to be made to packets as they traversed between networks. Reply 12.

We credit Dr. Heppe's testimony and find his explanation of the disclosures of Cerf to be more persuasive than the testimony of Dr. Almeroth. Dr. Heppe has provided credible evidence that certain portions of the data packets would require conversion. As such, we find Petitioner's arguments to be persuasive. We note that Cerf does not teach that protocol conversion is not performed between these networks. Indeed, the portion of Cerf relied upon by Patent Owner states that "*less activity* is required in the gateway." Ex. 1003, 1403 (emphasis added). A reduction in activity is not the same thing as the absence of an activity. Dr. Heppe provides credible evidence to show that packets moving between ARPANET and PRNET require conversion in order to traverse between these networks. Thus, we are persuaded that the cited art teaches the recited gateways.

Second, Patent Owner asserts that the cited art does not teach "a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node." *Id.* at 27–36. Patent Owner contends that this limitation

requires “changing a transmission path from the second node to the first node, which must provide a gateway. That is, the transmission path that is changed must terminate at the same node that provides a gateway.” PO Resp. 27. According to Patent Owner, “claim 4 has the additional limitation that the first node is both a gateway and the node that changes a transmission path to itself. And Petitioner failed to identify any node in Jubin that performs either of these tasks, let alone a node that performs both of these tasks as is required.” Tr. 19:16–20. Petitioner’s argument, however, is that “[t]he gateways of Jubin and attached packet radios satisfy the requirement of a ‘first node’ (Pet. 44)—not the gateway alone.” Reply 13. As discussed above in relation to claim 1, we are persuaded that Jubin’s PRs use PROP packets to change the transmission paths used to travel to that PR. *See supra* § II.B.3. In addition, as previously discussed in this section, we are persuaded that Jubin’s PRs also teaches the recited gateways. Thus, we are persuaded by Petitioner’s assertion that the recited art teaches this limitation.

We find Petitioner’s contentions regarding claim 4 to be persuasive and we determine that Petitioner has made a sufficient showing that the disclosures of Jubin, Fifer, APA, and Cerf would have taught or suggested the subject matter of claim 4 to one of ordinary skill in the art. As noted in § II.A, we reviewed Patent Owner’s arguments and evidence regarding secondary considerations of nonobviousness and we found that it should be accorded little weight. Therefore, we determine that Petitioner has shown by a preponderance of the evidence that claim 4 would have been obvious over Jubin, Fifer, APA, and Cerf.

D. Analysis of Asserted Ground Based on Kahn, Burchfiel, Schwartz, and Cerf

Petitioner argues that claim 4 is unpatentable under 35 U.S.C. § 103(a) over Kahn, Burchfiel, Schwartz, and Cerf. Pet. 65–75. Petitioner’s assertions are supported by a declaration from Dr. Heppe. Ex. 1014.

1. Overview of Kahn

Kahn discusses “the basic concepts of packet radio.” Ex. 1006, Abstract. In particular, Kahn describes PRNET, a multi-hop, multiple access packet radio network. *Id.* at 1469, col. 1. Kahn notes that the network “should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding.” *Id.* at 1470, col. 1.

In PRNET, “all network control protocols which can have global effect are specifically initiated by one or more entities in the network called *stations*.” *Id.* at 1477, col. 1. Each station “is aware of all operational radios in the network.” *Id.* “The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize [packet radio (‘PR’)] cost and complexity.” *Id.* Each station “deduces the overall connectivity of the network . . . and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as *labeling*.” *Id.* Radio-on-packets (“ROPs”) are used to communicate information necessary to this labeling process. *Id.* at 1481, col. 2. A PR announces its existence on the network by sending out a ROP. *Id.* After a PR is established on a network, it “would send summary

ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." *Id.* PRs use ROPs to determine link quality, changes in position, and updates that should be made to their routing tables. *Id.* By examining the ROPs, "each radio is able to determine the set of local radios with which it can communicate reliably." *Id.* In the event of a failure or condition change in the network, "routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." *Id.* at 1480, col. 1.

2. Overview of Burchfiel

Burchfiel is titled "Functions and Structure of a Packet Radio Station." Ex. 1007, Title. The prototypical station in Burchfiel is implemented in a Digital Equipment Corp. PDP-11, which is interfaced to ARPANET. *Id.* at 246, col. 1. As described in the reference, "control functions performed by a station include initialization of the [Packet Radio Network ("PRN")], dynamic routing changes, and multi-station coordination." *Id.* at 247, col. 1. Packet Radio Units ("PRUs") are "labelled" by stations and once a PRU is labelled it then contains routing parameters. *Id.*

Once the station has labelled all PRU's and established connections to them, the information for maintaining these connections is entered into the station's *connection table*. This contains the status information described above for handling the connection protocol. As terminals come 'on-line' within the PRN, each terminal is also given a connection to its controlling station, and this information is added to the station's connection table.

Id. at 247, col. 2. The station's connection table "holds all status information for every connection being maintained by the station." *Id.* at 250, col. 1. The station constructs routes for each device and each "route is stored as part of the connection status in the connection table when the connection is established." *Id.*

3. Claim 4

Petitioner alleges that claim 4 would have been rendered obvious by the combined teachings of Kahn, Burchfiel, Schwartz, and Cerf. Pet. 65–75. Petitioner's assertions may be summarized as follows: "Kahn discloses a station node (i.e., the claimed 'first node') that serves as a gateway and also contains a radio section that corresponds to the claimed 'data packet receiver.' It also contains a 'gateway process' that corresponds to the claimed 'first converter' and the 'first transmitter.'" Pet. 69. Burchfiel provides further information regarding Kahn's stations. *Id.* at 65. "Burchfiel teaches that a single PDP-11 computer comprises the station and gateway." *Id.* Petitioner further relies upon Burchfiel to teach forwarding packets into another network after their header format is converted into that of the destination network. *Id.* at 68. Kahn cites Cerf as part of its discussion of gateways. Ex. 1006, 1494, col. 2 n.34. Petitioner relies upon Cerf to teach the concept of a gateway that translates packets for use on a second network and transmits the translated packets to a second network. Pet. 69. Schwartz provides specific algorithms that could be used to optimize routing based on "shortest-path, least-cost and minimum delay, and specifically addresses a minimum-hop routing algorithm where the weight or cost of each link (hop) is set equal to 1." *Id.* at 74 (internal citations omitted) (citing Ex. 1009, 260–262, 275, 280, 285, 295). Petitioner relies

upon Kahn’s teaching that “[a]s network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria.” *Id.* at 71 (quoting Ex. 1006, 1480). Petitioner asserts that Kahn’s routing changes are based on each PR’s observation of links. *Id.* at 72; *see* Ex. 1006, 1477 (“[E]ach radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios.”). According to Petitioner, it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Burchfiel and Cerf into Kahn “in order to provide communications between networks, expanding the usefulness of networks.” *Id.* at 69 (citing Ex. 1014 ¶¶ 123–124). Petitioner asserts that one of ordinary skill in the art would have looked to Schwartz for further information on routing algorithms to use in Kahn. *Id.* at 74.

Patent Owner asserts that the cited references do not teach “implement[ing] changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node.” PO Resp. 36. As stated by Patent Owner, this limitation requires the gateway to change the transmission path from the second node to the gateway and it requires that this change be made based upon the viable paths observed by the second node. *Id.* Patent Owner contends that this is not taught by Kahn because Kahn’s ROPs do not contain the entire path from the second node to the first node/gateway. *Id.* (citing Ex. 2011 ¶ 160).

Petitioner points out that claim 4 recites “a controller configured to implement *changes to a transmission path* from the second node to the first

node *based upon viable network paths* observed.” Ex. 1001, 24:3–5 (emphasis added); Reply 17–18 (citing Ex. 1028 ¶ 55). As discussed above, we determined that the claim term “selecting a radio transmission path” is at least broad enough to encompass “choosing the entire path from the client to the server including the identification of all nodes in the path.” *See supra* § II.B. Patent Owner seeks to require that the recited “viable network paths” include an entire path from the second node to the gateway. *See* PO Resp. 36.

An inference arises that the phrases “transmission path” and “viable network path” have different meanings because the patentee chose to use different words. *Bancorp Servs., LLC v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1373 (Fed. Cir. 2004) (“the use of both terms in close proximity in the same claim gives rise to an inference that a different meaning should be assigned to each”). Although such an inference is not always conclusive, *id.*, the evidence of record supports applying the inference to this claim. For example, we find no evidence in the specification that these terms have the same scope. Claim 4 contains the ’314 patent’s one and only mention of a “viable network path” or “network path.” Further, Patent Owner and its declarant both fail to provide a sufficient explanation as to why a “viable network path” must contain the entire path. *See* Ex. 2011 ¶ 160. On its face, the ordinary meaning of network path is a path through a network. The addition of the word “viable” indicates that the path is available, known, reliable, or capable of being used. *See* Ex. 1028 ¶ 50 (asserting that viable could mean “‘reliable’ or simply ‘known’”). Thus, we determine that observing “viable network paths” does not require the receipt of a packet that contains the entire path; instead, we are persuaded that this claim

limitation is met by perceiving or otherwise detecting the existence of other usable paths through a network.

Petitioner asserts that Patent Owner mischaracterizes Kahn and the arguments in the Petition and contends that Kahn's labeling and relabeling process meet this limitation. Reply 17. Kahn states that "[o]ne of the requirements for controlling the PRNET is assessing the reliability of radio links between PR's and using the information to assign good routes." Ex. 1006, 1477 col. 1. As described in Kahn, "each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios." *Id.* "A primary source of link information is the *PR neighbor table* whose *entries are collected by each radio, summarized, and regularly sent to the station . . . [t]o determine[] good routes to itself from each of the radios in its subset.*" Reply 17 (quoting Ex. 1006, 1477 col. 1). Based on that information the station (gateway) "determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Ex. 1006, 1477 col. 1.

Dr. Heppe testifies that "[t]he neighbor table information in a summary ROP (link quality information for PR's potentially accessible via a single hop from the reporting PR) comprises information that describes 'viable network paths' as that term is used in claim 4." Ex. 1028 ¶ 57. According to Dr. Heppe this is true because a summary ROP "contains the link quality information for PRs in the neighbor table as well as labeling information." *Id.* ¶ 56. He goes on to note that "Kahn teaches that 'each radio is able to determine the set of local radios with which it can communicate reliably' by measuring the 'percentage of packets successfully

communicated on each link.”” *Id.* (quoting Ex. 1006, 1481). We credit Dr. Heppe’s testimony and find it to be persuasive. Based on our review of the evidence, we determine that the summary ROP would provide the information necessary to observe viable network paths because it would indicate the subset of PRs to which that station can communicate reliably and the station’s receipt of information about each of these PRs is an indicator of a viable route through the network. Thus, we are persuaded that Kahn’s labeling/relabeling process, which uses these summary ROPs, would have taught one of ordinary skill in the art the recited gateway that comprises a controller to implement changes to a transmission path based upon viable network paths observed by the second node.

Patent Owner contends that the cited art does not teach the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.

PO Resp. 45–46. Patent Owner argues that Kahn’s discussion of choosing routes in order to satisfy “minimum-delay criteria” does not meet this limitation. *Id.* at 47. Patent Owner asserts that “a route with minimum delay is not necessarily a route through [the] fastest client nodes.” *Id.* Petitioner argues that “[m]inimum delay corresponds to the claimed ‘fastest nodes’ because over-the-air transmission always occurs at the speed of light. Any delay is attributable to one or more conditions within the radios/nodes.” Pet. 73.

Patent Owner persuasively argues that Kahn’s “minimum delay criteria” can be associated with things other than the fastest nodes. PO Resp. 47. For example, Patent Owner notes that delay can be minimized by taking into account the traffic loads of specific nodes in the system. *Id.* Patent Owner notes that Kahn describes acceptable “delays on the order of 0.1 s” and thus, argues that a person of ordinary skill “would understand that the minimum-delay criteria in Kahn is a minimum upper limit on delays allowed for routes selected by the station but not the minimum possible delay that can be achieved by a given route (i.e., the route through the fastest client).” *Id.* at 47–48. Thus, we are not persuaded that Kahn alone would teach the route through the fastest client.

Petitioner also argues that Kahn teaches selecting the route with the least number of possible second nodes. Pet. 73.

Kahn’s labeling process assigns the minimum number of hops as the route to the station. Kahn explains that as each packet radio is added to the network, it is labeled with a route that is the ‘minimum number of radio hops to the station’ (corresponding to the claimed ‘least possible number of additional second nodes’).

Id. (citing 1006, 1482, col.1; Ex. 1014 ¶¶ 152–55). Patent Owner disputes this contention by arguing that the labeling process’s discussion of “minimum number of hops” is directed to the minimum number of levels and is not related to routing. PO Resp. 48. Patent Owner’s argument does not take into account the proper context for this discussion of levels. Kahn defines the “minimum number of hops” as this term is used in the labeling process by stating

The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station

are said to be at level 1 with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing.

Ex. 1006, 1482 col. 1. Dr. Heppe testifies that the labeling process is progressive and it starts with the level 0 radios and then moves on to level 1 and so on until it reaches the last level. Ex. 1028 ¶ 65.

Further, because the station initially labels the radios on the lowest levels (i.e., level 1 PRs would be labeled before level 2 PRs) the route reassignments would go to the routes on the lowest level and thus, those routes are by definition the routes that go through the minimum number of hops. *See id.* We credit Dr. Heppe's testimony and as such, we are persuaded that Kahn teaches choosing the route through the least possible number of second nodes.

Petitioner also relies on the disclosures of Schwartz in combination with Kahn to teach changing network routing using fewer hops, faster or more robust nodes. Pet. 73. Schwartz teaches

[m]ost [routing] algorithms are based on assigning a 'cost' measure to each link (or possibly even each node) in the network. The 'cost' could be a fixed quantity related to such parameters as link length, speed, or bandwidth of link (transmission capacity), whether secure or not, propagation delay, or some combination of these. The cost could include the average traffic expected at a given hour on a given day, it could include measured estimates of link traffic, buffer occupancy, measured error conditions on the link, and so forth. The classification might then be made according to the amount of information used in running the algorithm and how often this information changes.

Ex. 1009, 260; *see also id.* at 285 (discussing the “least-cost” algorithm including the customization of this algorithm to deal with overloading of nodes and selecting paths with the least number of links and highest transmission speed). Thus, Schwartz teaches the use of a broad array of criteria to determine the cost associated with routing through a particular link or node. Petitioner asserts that Schwartz “specifically addresses a minimum-hop routing algorithm where the weight or cost of each link (hop) is set equal to 1.” Pet. 74 (citing Ex. 1009, 275 (“for the special case of minimum-hop routing (the weight or cost of each link is 1), that the algorithm does converge to the minimum-hop path”), 280, 285 (“the algorithm tends to select the shortest path (least number of links) with the highest transmission speed. . . . The minimum-hop paths . . . also tend to be more reliable than ones with more links”), 295 (noting that routing tables are constructed using a minimum-cost, i.e. shortest path criterion)).

Patent Owner argues that Schwartz alone does not teach this limitation. PO Resp. 49. Patent Owner directs us to an example in Schwartz in which the fastest route available would not be the route with the least number of second nodes. *Id.* According to Patent Owner, this establishes that Schwartz’s algorithms do not teach routing through the path with the least number of second nodes. *Id.* Patent Owner’s argument does not take into account Schwartz’s discussion of minimum hop routing wherein each link is set to an equal weight. Nor does Patent Owner persuasively argue against the purported interplay between the teachings of Schwartz and Kahn. Petitioner relies upon Schwartz to teach an algorithm to be used by Kahn’s system. Pet. 73–74. We find persuasive Petitioner’s arguments regarding Schwartz alone (as related to Schwartz’s discussion of routing wherein all

links are equal weight) and we find persuasive Petitioner's arguments as to the combination of Schwartz and Kahn.

We are persuaded that Schwartz's discussion of routing algorithms in which links are of equal weight would teach routing based on the least number of second nodes, because in that circumstance the differentiating factor between two paths would be the number of links to be traversed. This is true because if all links are equal then in order to reduce the cost of transmission it would be necessary to reduce the number of links. We also determine that the combination of Kahn and Schwartz would teach this limitation because Schwartz's textbook would have provided implementation details to allow one of ordinary skill in the art to improve Kahn's labeling process through the use of these known algorithms for determining the best path through a network.

Finally, Patent Owner argues that Petitioner failed to provide a sufficient motivation to explain why one of ordinary skill in the art would have combined the teachings of these references in the manner described in the Petition. PO Resp. 56–63. Patent Owner contends that Petitioner has provided no reason to explain why a person of ordinary skill in the art would change Kahn's routing protocol to use Schwartz's algorithms. *Id.* at 57. Petitioner responds by asserting that a person of ordinary skill in the art “would have been motivated to apply Schwartz's algorithms in Kahn's PRNET to achieve the ‘changes to transmission path.’” Reply 14–15. Petitioner argues with the support of Dr. Heppel that it “was well-known to adapt any routing protocols to PR networks” and thus, Petitioner's allegation is that the use of Schwartz's textbook would have been expected, routine, and predictable during the relevant time period. *Id.* at 15; Ex. 1028 ¶ 51.

We are persuaded that one of ordinary skill in the art would have looked to such a textbook for insight as to ways to improve the routing discussed in Kahn.

Thus, for all of the foregoing reasons, we are persuaded that Petitioner has presented sufficient evidence to show that the subject matter of claim 4 was taught by the combined disclosures of Kahn, Burchfiel, Cerf, and Schwartz, and that a person of ordinary skill in the art would have combined the references in the manner asserted by Petitioner. Therefore, we determine that Petitioner has shown by a preponderance of the evidence that claim 4 would have been obvious over the teachings of Kahn, Burchfiel, Cerf, and Schwartz.

IV. CONCLUSION

Based on the arguments in the Petition, as well as the evidence of record, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 1 would have been obvious over Jubin and Fifer; claim 4 would have been obvious over Jubin, Fifer, APA, and Cerf, and claim 4 also would have been obvious over Kahn, Burchfiel, Cerf, and Schwartz.

V. ORDER

For the reasons given, it is

ORDERED that claims 1 and 4 of the '314 patent are held unpatentable;

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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