

Filed on behalf of: Netgear, Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TP-LINK CORPORATION LIMITED,
Petitioner,

v.

NETGEAR, INC.,
Patent Owner.

Case IPR2023-01469
Patent 10,681,698 B2

**DECLARATION OF ZYGMUNT J. HAAS, PH.D.
IN SUPPORT OF
PATENT OWNER'S RESPONSE**

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I, Zygmunt J. Haas, Ph.D., declare the following:

I. Introduction

1. I am over the age of eighteen and competent to make this Declaration.

2. I have been retained by Netgear, Inc. (“Patent Owner”) to provide my opinion concerning the validity of U.S. Patent No. 10,681,698 (Ex. 1001) (“the ’698 Patent”).

3. I understand that Petitioner TP-Link Corporation Limited filed a Petition for Inter Partes Review of the ’698 Patent. Paper 2. I further understand that on April 2, 2024, the Inter Partes Review was instituted. Paper 10. I submit this declaration in support of Netgear’s Response to that Petition.

4. I have previously provided my opinions in support of the Patent Owner’s Preliminary Response to the Petition for Inter Partes Review of the ’698 Patent. While I believe that that declaration is accurate in all respects, this new Declaration represents my considered opinion and supersedes my previous Declaration.

5. I am being compensated for the time I spent preparing this Declaration at the rate of \$500 per hour. The opinions I express in this Declaration are my own. My compensation does not depend upon the outcome of

this IPR, the contents of this Declaration, or any testimony I may provide in this IPR.

6. This Declaration summarizes the opinions I have formed to date. I reserve the right to modify or update my opinions, if necessary, based on my review and analysis of information or materials that I may receive after this Declaration is submitted. I further reserve the right to respond to any new or updated positions that TP-Link or its expert(s) may take in this IPR.

II. Qualifications

7. I am a Professor and Distinguished Chair in Computer Science at the University of Texas in Dallas. I am also a Professor Emeritus at the School of Electrical and Computer Engineering at Cornell University. In addition, I have provided technical consulting services on intellectual property matters, during which I have written expert reports and provided deposition and trial testimony involving, among others, wireless communication technologies.

8. My academic credentials include a Bachelor of Science Degree in Electrical Engineering, summa cum laude, from Technion (IIT), Israel, in 1979 and a Master of Science Degree in Electrical Engineering, summa cum laude, from Tel Aviv University, Israel, in 1985. I subsequently authored the thesis titled "Packet Switching in Fiber-Optic Networks" as part of earning my Ph.D. in Electrical Engineering from Stanford University in 1988.

9. I have worked or consulted for about 35 years in the fields of Electrical Engineering and Computer Science. My professional focus has been, among a number of fields, on communication and networking systems, with an emphasis on wireless communication networks. I have authored and co-authored numerous technical papers and book chapters related to wireless communication networks. I hold over twenty patents in the fields of high-speed networking, wireless networks, and optical communication/switching. My employment history following my graduation from Stanford University began at the Network Research Department of AT&T Bell Laboratories in 1988. At AT&T Bell Laboratories, I pursued research on wireless communications, mobility management, fast protocols, optical networks, and optical switching. During my tenure at AT&T, I also worked for the AT&T Wireless Center of Excellence, where I investigated various aspects of wireless and mobile networks.

10. In 1995, I joined the faculty of the School of Electrical & Computer Engineering at Cornell University, and in time I was promoted to a Full Tenured Professor. At Cornell, I headed the Wireless Networks Lab, a research group with extensive contributions in the area of wireless communication systems and networks. In 2013, I retired from Cornell University with the title of Emeritus Professor, and I joined the Computer Science Department at the University of Texas at Dallas with the title of Professor and Distinguished Chair in Computer

Science. At Cornell University and at the University of Texas, I have taught dozens of courses related to computer networking and wireless communications. I have also served on various committees for the benefit of the scientific community.

11. I am a member of the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM). In 2007, I was elevated to an IEEE Fellow, and in 2022, I was elevated to an ACM Fellow, both well-known distinctions. For example, the total number of IEEE Fellows which are selected in any given year does not exceed 0.1% of the total number of voting members of IEEE. With respect to the ACM Fellow grade, ACM states that “ACM’s most prestigious member grade recognizes the top 1% of ACM members for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community.” See <https://awards.acm.org/fellows>.

12. I have delivered numerous tutorials at major IEEE and ACM conferences. I served as editor of several publications including the IEEE Transactions on Networking, the IEEE Transactions on Wireless Communications, the IEEE Communications Magazine, the Springer “Wireless Networks” journal, the Elsevier “Ad Hoc Networks” journal, the “Journal of High Speed Networks,” and the Wiley “Wireless Communications and Mobile

Computing” journal. I was also a guest editor of IEEE Journal on Selected Areas in Communications for the issues on “Gigabit Networks,” “Mobile Computing Networks,” and “Ad-Hoc Networks.” Finally, I served as the Chair of the IEEE Technical Committee on Personal Communications (TCPC), today known as Wireless Communications Technical Committee (WTC).

13. I have received several awards in the field of wireless communications and network technology. In 2016, I received the IEEE ComSoc AHSN Recognition Award “for outstanding contributions to securing ad hoc and sensor networks”. In 2012, I received the IEEE ComSoc WTC Recognition Award, which recognizes individuals “for outstanding technical contributions in the field for their service to the scientific and engineering communities.” In 2021, I received the “Best Paper Award” for coauthoring the paper “Engineering a Network in the Sky” from the 35th International Conference on Information Networking, (ICOIN21). In 2012, I received the “Best Paper Award for co-authoring “Collaborating with Correlation for Energy Efficient WSN” directed at Wireless Sensor Networking. I previously received the “Best Paper Award” for co-authoring “Optimal Resource Allocation for UWB Wireless Ad Hoc Networks” directed at personal indoor and mobile radio communications. Finally, in 2003, I received the “Highly Commended Paper Award” for co-authoring “Performance Evaluation of the Modified IEEE 802.11 MAC for Multi-Channel

Multi-Hop Ad Hoc Network,” directed at advanced information networking and applications.

14. Additional information regarding my education, technical experience and publications, including a list of the U.S. patents of which I am an inventor/coinventor, is included in my *Curriculum Vitae*, which I understand is attached at Exhibit 2002.

III. Summary Of Materials Reviewed And Considered

15. The opinions contained in this Declaration are based on the documents that I reviewed, my knowledge, and professional judgment. In forming the opinions expressed in this Declaration, while drawing on my experience in the field of wireless communications, I reviewed the following documents¹:

Ex.	Description
Paper 2	Petition for Inter Partes Review of U.S. Patent 10,681,698 (“Petition”)
Paper 10	Decision Granting Institution of <i>Inter Partes</i> Review of U.S. Patent 10,681,698 (“Institution Decision”)
1001	United States Patent No. 10,681.698 (“the ’698 patent”)
1002	Declaration of Dr. Zhi Ding (“Ding Declaration”)
1003	Curriculum Vitae of Dr. Ding
1004	File History for the ’698 patent (“’698 FH”)

¹ The table of the Exhibits and Exhibit numbers were supplied to me by Counsel.

Ex.	Description
1005	U.S. Patent 9,001,767 (“Gatewood”)
1006	U.S. Patent 7,366,120 (“Handforth”)
1008	U.S. Patent Application Publication No. 2008/0304485 (“Sinha”)
1009	U.S. Patent 9,247,440 (“Ho”)
1014	U.S. Patent Application Publication No. 2016/0007273 (“Farid”)
1016	IEEE Standard for Information Technology, Part 11 Amendment 10: Mesh Networking, IEEE Std. 802.11s-2011
1017	Amended Joint Chart of Agreed and Disputed Claim Terms for Construction (ITC)
1018	Complainant Netgear’s Opening Claim Construction Brief (ITC)
1019	TP-Link’s Initial Claim Construction Brief (ITC)
1020	IEEE Draft Standard for Information Technology, Part 11 Amendment 10: Mesh Networking, IEEE P802.11s/D2.02
1021	Channel Bonding in WiFi: Rules and Regulations (January 25, 2016)
2003	Order Construing Certain Claim Terms (ITC)
2007	Deposition transcript of Zhi Ding, Ph.D., TP-Link Corp. v. Netgear, Inc., IPR2023-01469 (P.T.A.B. May 31, 2024)
2008	Initial Determination on Violation of Section 337 and Recommended Determination on Remedy and Bond, In re Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices, & Hardware & Software Components Thereof, No. 337-TA-1361 (U.S.I.T.C. May 30, 2024) [REDACTED]
2009	TP-Link Respondents’ Petition for Review of the Initial Determination of Violation of Section 337, In re Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices, & Hardware & Software Components Thereof, No. 337-TA-1361 (U.S.I.T.C. June 11, 2024) (Redacted Public Version)

Ex.	Description
2010	Summary of TP-Link Respondents' Petition for Review of the Initial Determination of Violation of Section 337, In re Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices, & Hardware & Software Components Thereof, No. 337-TA-1361 (U.S.I.T.C. June 11, 2024) (Redacted Public Version)
2011	O. Bejarano et al., "IEEE 802.11ac: From Channelization to Multi-User MIMO," <i>IEEE Communications Magazine</i> , vol. 51 issue 10 at 85 (2013).

16. My opinions are additionally guided by my appreciation of how a person of ordinary skill in the art ("POSITA") would have understood the claims of the '698 patent at the time of the invention, which I have been asked to assume is November 10, 2015.²

IV. Understanding of Legal Standards

17. I am not an attorney, and I do not opine on matters of law. However, I have been informed by counsel of certain legal standards, which are set forth below. I have applied those standards in my analysis in this declaration. The material in this section has been supplied to me by counsel.

² I note that my opinions in this declaration would not change if the date of the invention were May 13, 2016 (the filing date of U.S. Provisional 62/336,503) or September 21, 2016 (the filing date of parent application 15/271,912).

18. I have been informed by Counsel that the validity analysis is a two-step process. First, the patent claims are construed to ascertain their proper scope. Second, the construed claims are compared to the identified prior art to determine if the claims are valid over the prior art.

A. Claim construction

19. I have been informed by Counsel that the claims of a patent define the limits of the patentee's exclusive rights. I have been informed by Counsel that to determine the scope of the claimed invention, courts typically construe claim terms, the meaning of which the parties may dispute. I have been informed by Counsel that claim terms should generally be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of filing of the patent application, after reading the patent and its prosecution history. I also have been informed by Counsel that a basic tenet of claim construction presumes that different words in a claim have different meanings, unless there is evidence to the contrary.

20. I have been informed by Counsel that claims must be construed in light of, and consistent with, the intrinsic evidence. In this context, I have been informed by Counsel that intrinsic evidence includes the claims themselves, the written disclosure in the specification, and the patent's prosecution history, including prior art that was considered by the United States Patent and

Trademark Office (“USPTO”). I have been informed by Counsel that the specification is always highly relevant to the claim construction analysis and often is the single best guide to the meaning of a disputed term. I have been informed by Counsel that extrinsic evidence may also be considered when construing claims and may include, for example, technical dictionaries, technical publications and books, treatises, and expert testimony.

B. Obviousness

21. I have been informed by Counsel that patent claims can be deemed invalid 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 pertinent art. While such conclusions are often based on more than one piece of prior art, only one is required. It is not sufficient that a collection of prior art references merely recites the various elements of a challenged patent claim. Rather, as I have been informed by Counsel, the prior art must present the elements in a manner that is consistent with their arrangement or use in the challenged claims. I have been informed by Counsel that obviousness cannot be based on the hindsight combination of components selectively culled from the prior art.

22. I have been informed by Counsel that a person having ordinary skill in the art (POSITA) is a hypothetical person who is presumed to have known the

relevant art at the time the invention was made. I have been informed by Counsel that the condition “at the time the invention was made” is imposed to rule out impermissible hindsight. I also have been informed by Counsel that an expert is to analyze the prior art from the perspective of a person of ordinary skill in the art at the time the invention was made, and not simply to provide his/her own personal conclusions.

23. I also have been informed by Counsel that an obviousness determination includes several factual inquiries, including (1) determining the scope and content of the prior art; (2) ascertaining the differences between the claimed invention and the prior art; (3) resolving the level of ordinary skill in the pertinent art; and (4) taking into consideration any objective indicia of nonobviousness.

24. I have been informed by Counsel that obviousness must be determined as of the date of the invention (i.e., the effective filing date or priority date of the patent). Thus, in considering the reason or motivation to combine references, it is essential to avoid using hindsight. For example, the problem examined when considering obviousness is the general problem that confronted the inventor before the invention was made, not the specific problem solved by the invention. Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness. Further, an

overly narrow statement of the problem can represent a form of hindsight, because often the inventive contribution lies in defining the problem in a new revelatory way. Similarly, an assertion that a person of ordinary skill could combine the references, rather than that they would have been motivated to do so, is an impermissible form of hindsight. Moreover, knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed invention.

25. I have been informed by Counsel that a motivation to solve a problem (or issue) is not the same as a motivation to have combined references. I have been informed by Counsel that whether a skilled artisan would be motivated to make a combination includes whether he/she would select particular references in order to combine their elements.

26. I have been informed by Counsel that the analysis of the motivation to combine should be explicit. Additionally, it must include articulated reasoning with rational underpinnings to support the conclusion of obviousness. Providing a full explanation of the motivation to combine the references and the reasonable expectation of success is a necessary component of the obviousness inquiry, as inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. However, conclusory statements fail to

adequately explain why a person of ordinary skill would have a motivation to combine the potential prior art references.

27. I have been informed by Counsel that common sense, common wisdom, and common knowledge may be used to support a motivation to combine, so long as the use of common sense in the analysis is explained with sufficient reasoning. But, common sense can only be used to supply a limitation missing from the prior art where the technology is unusually simple and straightforward.

28. I also have been informed by Counsel that evidence suggesting reasons to combine cannot be viewed apart from evidence suggesting reasons not to combine. In analyzing motivation, both advantages and disadvantages must be considered. Teaching away, for example, is a statement in the prior art that either (i) discourages one from following the path of the claimed invention, or (ii) encourages one to follow a path that diverges from the path of the claimed invention. The concept of teaching away bears directly on whether there was a reason to combine prior art. Known disadvantages in prior art technology or devices which would naturally discourage a search for new inventions may also be taken into account in determining obviousness.

V. Level of Ordinary Skill in the Art

29. For the '698 patent, a person of ordinary skill in the art ("POSITA") would have had a bachelor's degree in a technical field such as electrical engineering, computer engineering, computer science, or physics, and/or 2-3 years of relevant practical experience in data communication, wireless communication, or wireless networking systems. Additional education may substitute for experience, and vice versa.

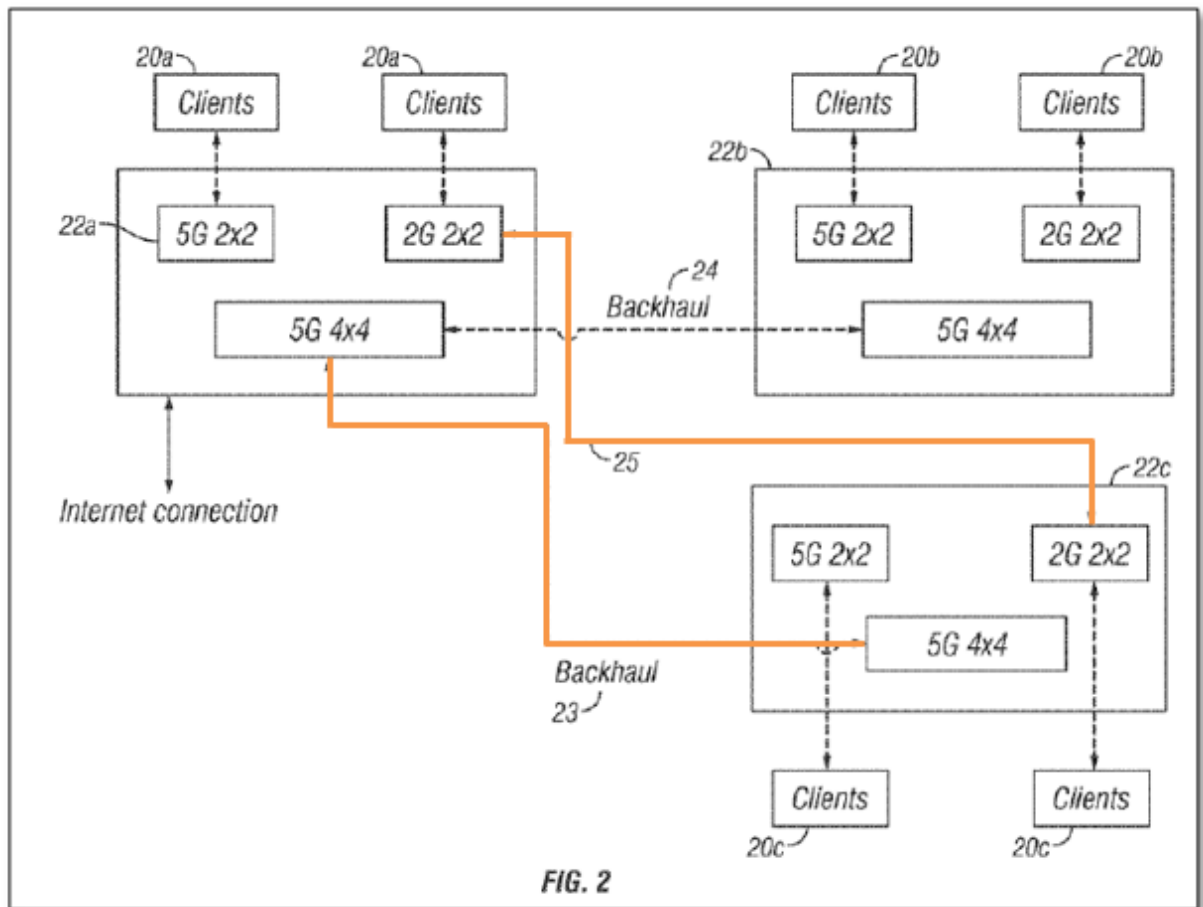
30. Dr. Ding asserts that a POSITA "would have had a Bachelor's degree from an accredited program in electrical engineering, computer engineering, computer science, or a related field, and three years of experience in the design and analysis of wireless communication systems or equivalent work experience. Additional education might compensate for less experience, and vice-versa." Ex. 1002 ¶ 55. The Board adopted this definition in its Institution Decision. Paper 10 at 4-5. My opinions in this declaration would not change under the definition of POSITA provided by Dr. Ding.

VI. Overview of the '698 Patent

31. The '698 Patent is titled "Dedicated Backhaul for Whole Home Coverage." Ex. 1001, Cover. As I described in my first declaration, the '698 Patent generally relates to wireless mesh networks and their ability to provide Internet services to clients via one or more mesh points, or nodes. '698 Patent,

1:31-37, 3:52-65, Fig. 2. The link established between the mesh nodes in the network is known as backhaul. *Id.*, 1:31-37, 2:36-47, 3:52-4:7, Figs. 1, 2. Client devices, such as smartphones or laptops, can connect to any one of the mesh points for access to the Internet. '698 Patent, 1:32-34, 3:52-65, Fig. 2. These connections are referred to as front haul.

32. For example, Figure 2, annotated below, shows two backhaul connections between nodes 22a and 22c. One backhaul 23 uses a “5G 4x4” radio that constitutes “a dedicated 5 GHz backhaul connection[.]” '698 patent, 3:56-58. In other words, it is not used for front haul and therefore does not service client connections. The other connection (25) between nodes 22a and 22c uses “2G 2x2” radios that can also service clients (e.g., clients 20a and 20c). When this connection “is used as the backhaul it is shared for both clients and for the backhaul.” '698 patent, 3:59-61.



33. The '698 Patent describes “[a] dedicated backhaul for whole home coverage variously applies optimization techniques, e.g. using the 5 GHz high band or low band as a dedicated backhaul; using the 2.4 GHz band as backup if the 5 GHz band fails to reach between nodes; using Ethernet when it is better than the 5 GHz and 2.4 GHz bands and it is available; and using a spanning tree protocol or a variant to avoid loops.” ’698 patent, 1:43-51.

34. Based on the results of a search of Exhibit 1001, I observed that the term “dedicated backhaul” appears at least 35 times in Exhibit 1001. I also observed that the term “dedicated” appears more than 60 times in Exhibit 1001.

35. Although a dedicated backhaul is the preferred method of communication between access points, the '698 Patent teaches that there can be backup connections that can be attempted for backhaul in case the dedicated backhaul fails. Specifically, the '698 Patent teaches “using the 5 GHz high band or low band as a dedicated backhaul; using the 2.4 GHz band as backup if the 5 GHz band fails to reach between nodes; using Ethernet when it is better than the 5 GHz and 2.4 GHz bands and it is available; and using a spanning tree protocol or variant to avoid loops.” '698 Patent, 1:47-51, 2:48-54.

VII. Claim construction

A. Claims 1 and 12 require a dedicated backhaul.

36. Claims 1 and 12 both recite “performing an attempt to *utilize a first channel in a default frequency band as a backhaul* with second node in the network, wherein the *backhaul is* to provide communication of management functions between the nodes in the network, *as opposed to a front haul* that provides wireless data communication to clients *in the network*.”³

37. As discussed below, a POSITA would have understood this limitation to require a dedicated backhaul. Although the claims do not use the

³ All emphases in cited materials are added in this Declaration, unless stated otherwise.

words “dedicated backhaul,” the language plain language of this limitation requires that the “attempt to utilize a first channel in a default frequency band” is as a backhaul with the second node, as opposed to a front haul. In other words, the channel in the default frequency band is used as a backhaul and not as a front haul. Thus, it is used as a dedicated backhaul. Although Dr. Ding asserts, incorrectly, that the claims do not recite a dedicated backhaul, I agree with his assertion that a band is “dedicated for backhaul communication” when “it is not also used for front-haul client-facing communication.” Ex. 1002 ¶ 47. That is precisely what claims 1 and 12 require.

38. Dependent claims 2-3 and 13-14 reinforce this understanding of the claims. Claims 2 and 13 recite “wherein said attempts [of claim 1/12] are performed on a first radio” and “upon failure of all said attempts, performing an attempt to establish the backhaul with the second node utilizing a different radio.” Claims 3 and 14 recite “wherein said different radio is the same radio as the front haul.” Thus, the front haul is a radio of the network that is different than the radio used for the first attempt to establish the backhaul in claims 1 and 12. Thus the channel and/or frequency band used for “a front haul” radio is different than that of the radio attempted for use for the “default frequency band.”

39. A POSITA reading the specification would have understood the phrase “as opposed to a front haul” in the context of the specification’s extensive

and exclusive discussion of using a dedicated backhaul when available. The importance of a dedicated backhaul to the invention is also shown in the title of the '698 Patent, "Dedicated Backhaul for Whole Home Coverage." A POSITA reading the title would have expected the claimed inventions to require a dedicated backhaul.

40. I understand that in the Institution Decision, the Board preliminarily found that "the claim limitation 'as opposed to a front haul' sets up a comparison between the communications that the backhaul provides ('management functions') and those provided by the front haul ('wireless data communication to clients in the network')." Institution Decision at 15. The Board also stated that "[a]lthough Patent Owner identifies some *embodiments in which the dedicated backhaul is not used for front-haul communications*, at this stage, our view is that the identified embodiments described in the challenged patent should not be imported as limitations into the claim." Institution Decision at 16.

41. However, as I mentioned above, a dedicated backhaul by definition is not used for front-haul communication. For example, although Dr. Ding asserts that the claims do not recite a dedicated backhaul, I agree with his statement that "the default frequency band can be a band dedicated for backhaul communication (i.e., it is not also used for front-haul client-facing communication)." Ex. 1002

¶ 47.

42. Further, a POSITA would have understood a dedicated backhaul is a core aspect of the inventions disclosed in the '698 Patent. The '698 Patent includes a section called "Field" which states: "The invention relates to telecommunications networks. More particularly, the invention relates to a dedicated back haul for whole home coverage." '698 Patent 1:21-23. The '698 Patent also includes a section called "Summary" that describes "[a] dedicated backhaul for whole home coverage [that] variously applies optimization techniques." '698 Patent 1:45-46. The Summary further describes that "[t]he dedicated backhaul is used if the received signal strength indication (RSSI) of the dedicated channel is above a threshold." '698 Patent 1:51:53. In the first sentence of the "Description" section, the '698 Patent teaches "[e]mbodiments of the invention provide several techniques for establishing and maintaining a dedicated backhaul for whole home coverage." '698 Patent 2:36-38.

43. Every figure and embodiment discussing backhaul in the '698 Patent includes a dedicated backhaul. For example, "FIG. 1 is a schematic diagram showing a dedicated backhaul for whole home coverage according to the invention." '698 Patent, 1:63-65; *see also* 2:4-12 (similar for Figures 4-6), 2:16-27 (similar for Figures 8-11). Additionally, "FIG. 2 is an example in which the dedicated 5 GHz band is used as a method of communication between two devices." '698 Patent 3:52-53. Further, "FIG. 3 is an example in which the

dedicated 5 GHz band is used for one satellite and the 2.4 GHz is used for another satellite.” ’698 Patent 3:66-4:1. “FIGS. 4-11 are flow diagrams showing operational phases of a dedicated backhaul for whole home coverage according to the invention.” ’698 Patent 4:8-10. As mentioned above, based on the results of a search of Exhibit 1001, I observed that the term “dedicated backhaul” appears at least 35 times. I also observed that the term “dedicated” appears more than 60 times in Exhibit 1001. The overall and repeated description of “the invention” in the ’698 patent specification, particularly in view of the title of the ’698 patent, as including a dedicated backhaul would have confirmed a POSITA’s understanding that the claim phrase “*a backhaul* with second node in the network, wherein *the backhaul is* to provide communication of management functions between the nodes in the network, *as opposed to a front haul* that provides wireless data communication to clients *in the network*” in claims 1 and 12 is directed to and requires a dedicated backhaul.

44. I understand that an Administrative Law Judge at the United States International Trade Commission construed this limitation of claim 12 (which is identical to the limitation in claim 1) to require a dedicated backhaul. Ex. 2008 99-102. I have reviewed the portion of that opinion construing the claim as requiring a dedicated backhaul, and it is consistent with my opinion about how a POSITA would have understood this limitation in the context of the ’698 Patent.

B. “default frequency band” (claims 1 and 12)

45. I understand that the Administrative Law Judge at the International Trade Commission construed the term “default frequency band” as “first selected frequency band.” Ex. 2003 at 27-32. This construction is consistent with the claims, which require a first “attempt to utilize a first channel in a default frequency band as a backhaul with second node in the network.” If a “received signal strength of the first channel from the second node is below a threshold,” there is a second “attempt . . . to establish the backhaul with the second node.” ’698 Patent claims 1 and 12. It is also consistent with how a POSITA would have read the term in view of the specification. Although the specification does not use the term “default frequency band” specifically, it discloses operations like those recited in the claims that would have informed the meaning of “default frequency band” to be a first selected band. This includes, for example, explaining how a “[a] dedicated wireless band is the preferred method of wireless communication if the dedicated band is available for communication and the quality of the dedicated link is better than a defined threshold.” Ex.1001, 4:28-31. For example, a “5 GHz dedicated band is preferred if the [received signal strength indicator] RSSI meets predetermined thresholds,” but “if 5 GHz does not work . . . , the system tries using 2.4G as a last resort.” *Id.*, 5:3-7. This is consistent with the claim language requiring an attempt on the default (or first selected) frequency

band like 5GHz and then attempting it on a “frequency band with lower frequency range” when the received signal strength is below a threshold. Various operational flows in the specification are similarly consistent with the claim, and would have informed a POSA that the default frequency band refers to requiring an attempt made on a first selected frequency band before resorting to an alternative. *Id.* 4:51-66, 5:10-28.

VIII. Overview of Ho

46. Ho is titled “Automatic Configuration of a Network Device.” Ho discloses “[h]ybrid communication networks [that] typically comprise multiple network devices that implement multiple networking technologies (e.g., wireless local area network (WLAN) technologies, powerline communication technologies, Ethernet, etc.).” Ho, 1:9-13. For example, as shown in Ho’s Figure 1, reproduced and annotated below, hybrid devices can have multiple connections to each other over multiple interfaces. In Figure 1, for example, hybrid devices 102, 118, and 120 are connected via powerline communication (PLC) (green); hybrid devices 102 and 120 are also connected via WLAN (blue), and hybrid devices can also be connected via Ethernet (orange). The hybrid devices can be laptops, mobile phones, gaming consoles, or other client equipment. Ho, 4:9-14.

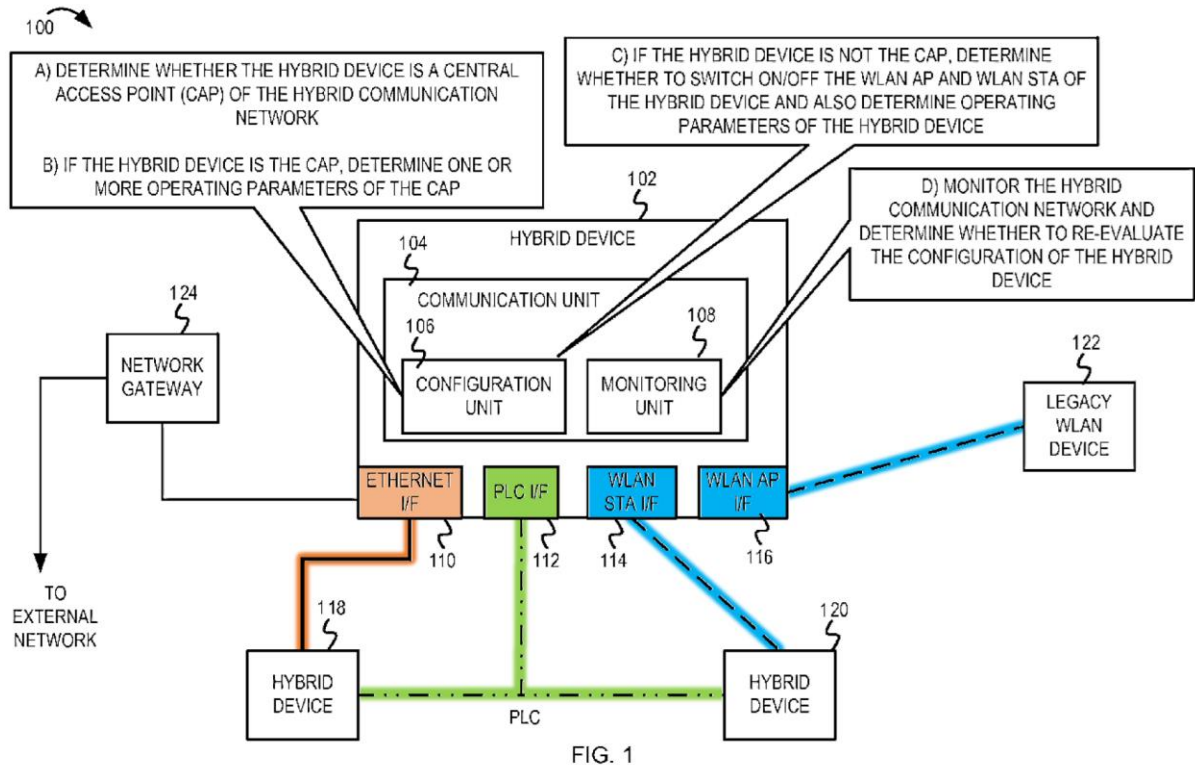


FIG. 1

Ho, Figure 1 (annotated)

47. Ho relates to automatic configuration of the hybrid devices in the network. For example, a hybrid device can configure itself to be one of two main personalities: a central access point (CAP) or a non-CAP hybrid device. Ho, 8:1-9. There is generally only one CAP in the network. Ho 6:43-45. The CAP is connected to the network gateway over a single hop, e.g., by an Ethernet connection. Ho, 4:66-5:8.

48. Configuration of the CAP is shown below in reproduced Figure 4. For each band that the CAP can operate in, the CAP selects “a [] communication channel for operation of the CAP.” Figure 4, box 404, 410; Ho 12:32-44, 12:64-

13:9. The CAP therefore operates on only one channel per band. This channel selection is performed before any non-CAP connects to the CAP, and non-CAP devices are not involved in this selection. After configuration, Ho's CAP broadcasts its selected channel on each band to other devices, which can connect (or not) to the CAP on that preselected channel. Ho, 13:39-41. There is no disclosure of any kind of selection of a backup channel in case of failure. Ho, 13:24-41. Nor is there any disclosure in Ho that the CAP operates on multiple channels to allow for selection of a best channel by non-CAP devices. *Id.*, 12:32-13:41.

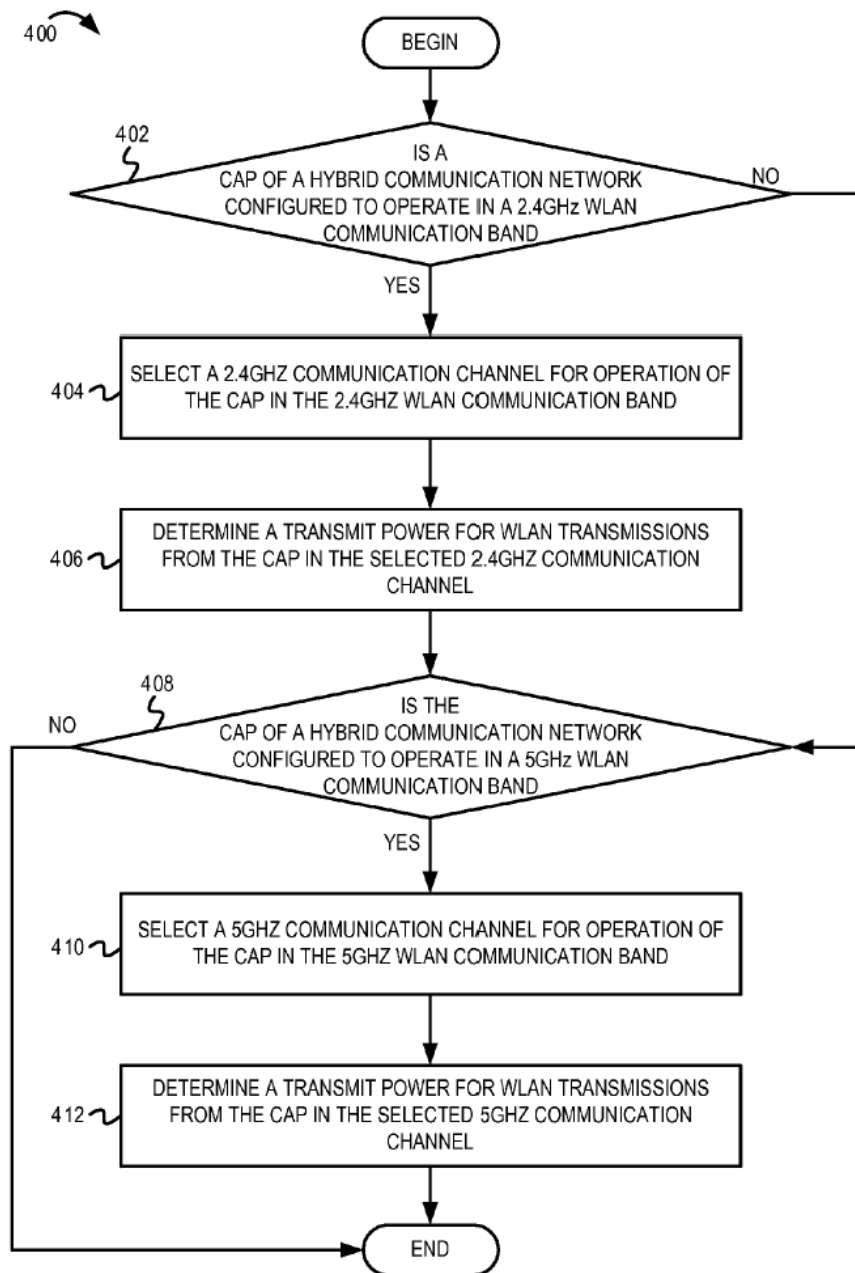


FIG. 4

49. In one passage of Ho relating to 40 MHz operation, Ho discloses the CAP selecting “the operating channel(s).” Ho 13:24-41. But Ho never discloses that a non-CAP can connect to the CAP on multiple channels within a given band, such as the 5GHz band. Instead, this passage of Ho relates to the possibility

of choosing a channel in multiple bands: “e.g., the 2.4 GHz WLAN communication band or the 5 GHz WLAN communication band.” Ho 13:30-33.

50. A non-CAP device can connect to the Internet through the CAP. Ho 5:43-46; 6:45-49. Ho describes configuration of a non-CAP hybrid device into four second-level personalities: 1) access point; 2) relay; 3) sink, and 4) disabled. Ho, 8:13-21. The differences in these personalities generally relate to whether the non-CAP hybrid device has its WLAN STA and WLAN AP modules enabled or disabled. Ho, 8:13-23; 16:43-50; 2:54-65. The AP module of a hybrid device provides network access to other devices, which connect to the AP module via their own STA modules that receive wireless network access for the non-CAP device. Ho 3:58-62.

51. Ho lists four second-level personalities of a non-CAP device, each with express requirements and restrictions:

1) an access point (e.g., a WLAN AP module of the hybrid device is enabled and a WLAN STA module of the hybrid device is disabled), **2) a relay** (e.g., the WLAN AP module and the WLAN STA module of the hybrid device are enabled and are operating on the same communication channel/band), **3) a sink** (e.g., the WLAN AP module of the hybrid device is disabled and the WLAN STA module of the hybrid device is enabled), or **4) disabled** (e.g., the WLAN AP module and the WLAN STA module of the hybrid device are disabled).

Ho, 8:13-23.

52. Thus, Ho's hybrid devices are not necessarily mesh access points, for example, as they might not have any WLAN connection to the CAP, or might not serve as an access point to any other clients. A sink, for example, acts as a client device because it has its WLAN STA connection enabled but disables its WLAN AP module. Ho, 8:19-22. In this configuration, it does not provide access to other devices, and its connection to the CAP would be a front haul connection. When a non-CAP hybrid device is configured as an access point, its WLAN STA module is disabled. Ho, 8:14-17. In this case, the non-CAP hybrid device can use its PLC connection to communicate with the CAP, which is why Ho discloses disabling a non-CAP's AP module when the PLC connection to the CAP is weak. Ho, 17:31-34; 18:58-60. Thus, in some configurations (e.g., access point), a non-CAP has its WLAN STA module disabled, and therefore no wireless connection to a CAP, and therefore no wireless backhaul. In other configurations (e.g., sink/client), a non-CAP can be connected to a CAP as front haul and therefore has no wireless backhaul.

53. The non-CAP is configured as a "relay" when both its WLAN STA and AP modules are enabled. Ho 8:13-23. Both modules of a relay operate on the same communication channel/band—i.e., the same channel that the CAP operates on. Ho 8:13-23; 16:53-64; 17:37-60. Its connection to the CAP could be

considered a backhaul connection, and its connection to clients is used for front haul.

IX. A POSITA would have not found claims 1-22 obvious based on Ground II.

54. The Institution Decision addresses Ground II before Ground I.

Institution Decision at 10. For convenience I address the Grounds in the same order as the Institution Decision.

55. To summarize my opinions, discussed in detail below, Ho does not disclose or render obvious the first two elements of claims 1 and 12. Specifically, Ho does not disclose or render obvious a dedicated backhaul. Instead, Ho uses the same communications channel/band for front haul and backhaul. Further, even if the claims were interpreted not to require a dedicated backhaul, Ho also does not disclose or render obvious the second attempt to establish backhaul, either. Ho's hybrid network does not use different channels or bands for backup backhaul links to the CAP. Instead, if the link to the CAP is "inadequate," the non-CAP either disables its WLAN STA module or connects to a different device as a client device. Ho 17:25-29; 14:30-41; 19:35-43.

A. Petitioner's application of Ho in Ground II does not disclose or suggest utilizing a first channel as a backhaul as opposed to a front haul as recited in [1.1]/[12.1].

56. Claims 1 and 12 recite "performing an attempt to utilize a first channel in a default frequency band as a backhaul with second node in the

network, wherein the backhaul is to provide communication of management functions between the nodes in the network, as opposed to a front haul that provides wireless data communication to clients in the network.” As I described above in Section VII.A, a POSA would have understood this limitation to require a dedicated backhaul.

57. The Petition and Dr. Ding’s declaration do not appear to try to identify any dedicated backhaul in Ho. Petitioner and Dr. Ding instead assert that the claims do not require dedicated backhaul. Petition at 4; Ex. 1002 ¶ 47. The Petition and Dr. Ding’s declaration also do not contend that it would have been obvious to modify Ho to include a dedicated backhaul.

58. Ho does not disclose or suggest any band or channel used as a dedicated backhaul. For example, during configuration of the CAP, the CAP selects a band, channel, and power of operation. Figure 4, reproduced below, illustrates operations for selecting the band, channel, and power of the CAP’s WLAN AP module, which will provide network access to other devices. Ho, 1:54-56, 12:22-25. Specifically, for each frequency band that the CAP is configured to operate in, the CAP selects its own “communication channel for operation of the CAP” (steps 404, 410) and determines its transmit power for the selected channel (steps 406, 412). Ho 12:32-57, 12:64-13:23; *see also id.* 9:5-10.

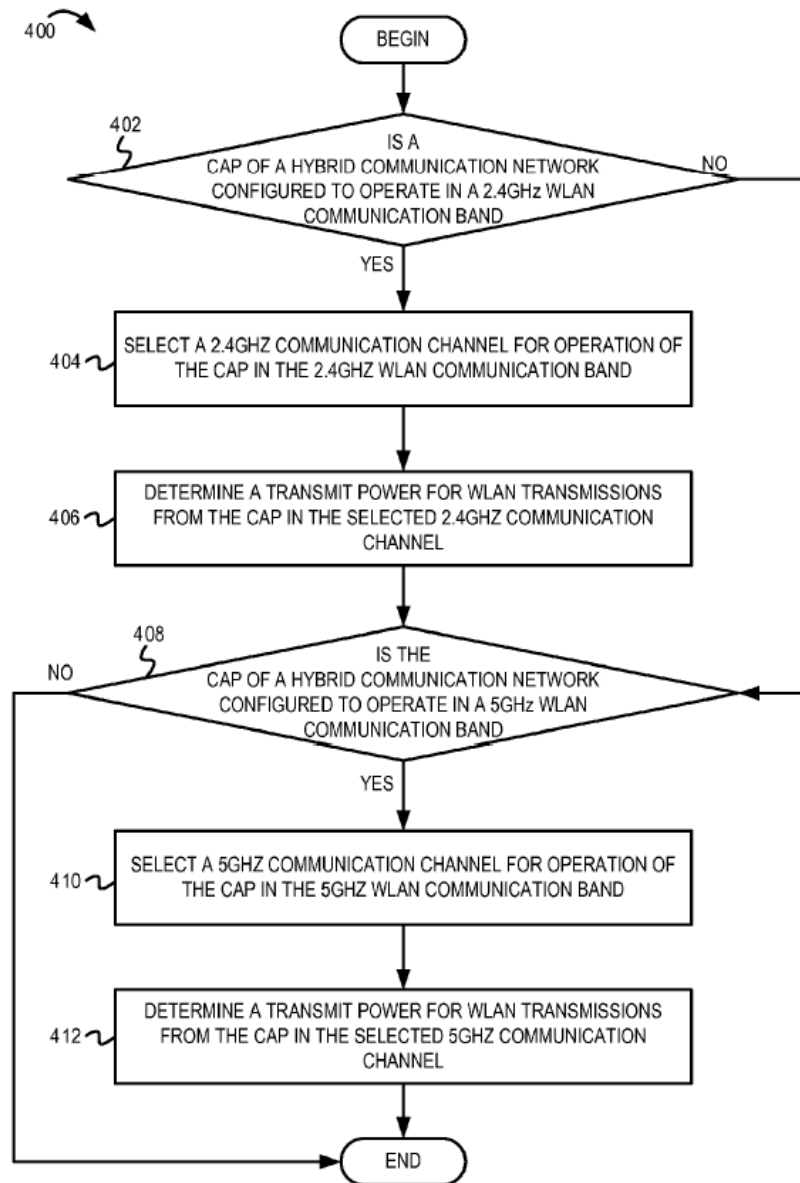


FIG. 4

59. The CAP does not select any band or channel specifically for backhaul or front haul. *See* Ho 12:22-13:23. The Petition cites Ho's 5GHz band as the "default frequency band." Petition at 49 ("The frequency band (e.g., 5 GHz band) selected by the non-CAP hybrid device (network device) for backhaul communication with the CAP (second node) is the claimed 'default frequency

band’’). But no band in Ho, including 5GHz, is dedicated to backhaul. Instead, any selected channel is simply the “channel for operation of the CAP” in that band regardless of its use. Ho Figure 4. For example, “[t]he CAP can be configured to operate on the preferred communication channel in the 2.4 GHz WLAN communication band” and/or “in the 5 GHz WLAN communication band” for any purpose—not just backhaul. Ho, 12:42-45, 13:7-9, Figs. 1, 4, 5.

60. Ho’s ad hoc hybrid communication network is flexible in that it aims to serve “legacy” and single-band radios that might only connect on one band and not the other. Ho 4:18-23, 3:41-47, 8:50-55, 2:14-18, 17:18-23, 18:38-46. Further, Ho’s total configuration algorithm does not distinguish between whether the hybrid device is a laptop, a gaming console, or an access point—a laptop, for example, can act as an access point, relay, or a client depending on network conditions. Ho 4:9-14; 8:13-23; 24:38-42. In order for a device to be able to connect to a band as either a relay or client, any available band and channel in a network is available for both backhaul and front haul. See Ho 13:52-17:2 (describing how non-CAP hybrid devices operating as a client/sink use the same band as “access points” and “relays”). This is further evidenced by the fact that Ho does not even distinguish front haul or backhaul when discussing WLAN connections.

61. As discussed further below, it would not have been obvious to use dedicated backhaul in Ho at least because Ho's network—including all four non-CAP personalities—is incompatible with using a dedicated backhaul as claimed by the '698 Patent.

1. Ho's "sinks"/clients are not capable of forming a wireless backhaul.

62. When a non-CAP device has its AP module disabled and its STA module enabled, Ho refers to this device configuration as a "sink" or a client. Ho 8:13-23; *see also* Ho claim 5; *see also* Ho 3:35-41 (the STA module is the "WLAN client station . . . interface"). The term sink refers here to the fact that the device is a destination for data—the device does not pass on or route received data to another device. In this configuration, the non-CAP connects to the AP module of, e.g., the CAP, but does not provide access to other devices. This is a typical client setup. For example, a laptop device typically connects to an access point and does not serve as an access point to other devices. As such, the connection between a CAP and a non-CAP configured as a sink/client constitutes a front haul, not a backhaul.

63. Ho does not disclose that a sink/client connects via front haul on a different channel or band than any other non-CAP device, nor does Ho disclose that a sink/client is limited to any particular channel or band. Instead, Ho states that a "STA module of the non-CAP hybrid device can attempt to connect to the

CAP via the 2.4 GHz or the 5 GHz WLAN communication band.” Ho 18:38-46.

A dual-band device “may be assigned multiple personalities—one for each communication band.” Ho 18:46-49. These bands can operate “independently of each other such that the WLAN AP modules in none, one, or both the WLAN communication bands may be active and operating channels may be selected independently.” Ho 18:28-35. In other words, a non-CAP can be a client/sink on any channel or band such that each channel or band is used for front haul and none are dedicated to backhaul.

2. Ho’s “relays” are not capable of forming a dedicated wireless backhaul.

64. As mentioned above, a relay has both AP and STA modules enabled. Ho 8:13-23. As such, the relay can provide wireless access to another device via a front haul connection (using its AP module), and obtain wireless access from the CAP via a backhaul connection (using its STA module). But although a connection between a CAP and a relay can be considered a backhaul, that connection is not on a channel or band that is dedicated for backhaul. In fact, a POSA would have understood that a relay’s front haul and backhaul use the same channel and band, which is incompatible with being a dedicated backhaul. Specifically, Ho discloses that to have a relay personality, the hybrid device provides access to devices via a front haul connection *on the same channel and band* as its backhaul connection to the CAP. Ho 8:17-19 (a “relay” has “WLAN

AP module and the WLAN STA module . . . enabled and are operating on the same communication channel/band”).

65. During his deposition, Dr. Ding appears to have opined that Ho’s description of a relay in column 8 lines 17-19 having the same communication channel/band is only an example because the parenthesis starts with “e.g.” Ex. 2007 73:14-74. Dr. Ding appears to have taken from this that relay devices could also “operate on different channels of the same band.” Ex. 2007 73:14-74:1; *see also id.* 70:22-73:9 (discussing Ho’s second level personalities in column 8 lines 13-23). I disagree. There is no disclosure in Ho of a relay device operating on different channels or bands. The only discussion that Dr. Ding referred to as purportedly showing a relay can be on different channels and bands was Ho’s Figure 5. Ex.2007 75:2-76:2. Ho’s description of Figure 5, however, directly contradicts Dr. Ding’s assertion that a relay can be on different channels and bands for front haul and backhaul. Specifically, the only disclosure relating to Figure 5 of a non-CAP being “configured as a relay” is when the non-CAP operates on a “preferred channel” that ***matches*** the operating channel of the CAP. Ho 16:60-64 (“If the preferred channel of the non-CAP hybrid device ***matches*** the channel on which the CAP currently operates, the non-CAP hybrid device can be configured as a relay.”), 15:55-58 (non-CAP can “become a relay” only if the “preferred channel...is the same as the CAP’s channel.”). Conversely, if the non-

CAP does **not** operate on the same channel as the CAP, i.e., “[] the preferred channel of the non-CAP hybrid device does **not match** the channel on which the CAP currently operates, [then] the non-CAP hybrid device can be configured as an access point [].” *Id.* 16:64-17:2; *see also* Ex. 2007 79:7-81:21. I note that Dr. Ding agreed that columns 15 and 16 referenced above are describing Ho’s Figure 5 operation. *Id.* 76:3-79:6.

3. Ho’s “access point” non-CAPs are not capable of forming a wireless backhaul.

66. In Ho, a non-CAP configured as an “access point” personality has its STA module disabled and its AP module enabled. Because only its STA module could connect to the CAP’s AP module, the “access point” non-CAP has no wireless connection to the CAP and thus no wireless backhaul. Ho 8:13-17. The “access point” non-CAP can use its other interfaces, such as a wired PLC connection, for network access. Ho 17:31-34; 18:58-60 (AP module can be enabled when there is a good PLC connection to the CAP). The Petition and Dr. Ding rely only on a wireless link between a non-CAP and CAP as the claimed backhaul—a link using a channel/band that is not dedicated for backhaul. *See* Petition 49 (annotating Figure 1); *see also* Ex. 2007 (Ding Deposition) 71:28-72:5 (stating he relied on the relay personality in his declaration). And although it is not relied on, I note that a wired connection cannot meet the claim limitations which require attempts to use a channel as a backhaul that “provide[s]

communication of management function between *the nodes in the network*.” ’698 Patent claims 1, 12. The phrase “the nodes in the network” refers to the earlier phrase “establishing a backhaul communication among *nodes in a mesh wireless network*.” *Id.* Thus, claims 1 and 12 require a wireless backhaul that cannot be satisfied by a wired PLC connection.

4. Ho’s “disabled” non-CAP’s cannot satisfy the claims

67. A “disabled” non-CAP has both WLAN AP and STA modules disabled. Ho 8:22-23. A “disabled” non-CAP does not wirelessly connect to any other device, including a CAP, and cannot form a wireless backhaul as claimed.

B. Petitioner’s application of Ho in Ground II does not disclose or suggest the second attempt to establish backhaul with the second node [1.2]/[12.2]

68. Claims 1 and 12 further recite “upon detecting that a received signal strength of the first channel from the second node is below a threshold, performing an attempt to utilize a different channel in the default frequency band and/or a channel in a different frequency band that has a lower frequency range than the default frequency band, to establish the backhaul with the second node.”

69. Thus, there are two ways to satisfy this step. First, a node could attempt to utilize a different channel in the same default frequency band as the first attempt. Second, a node could attempt to utilize a channel in a different (lower) frequency band than the default frequency band of the first attempt. Ho

does not disclose either attempt for a backup backhaul—regardless of whether the first attempt was for a dedicated backhaul. That is, even if the claims were not interpreted to require a dedicated backhaul, Ho still does not render them obvious.

1. Ho does not disclose or render obvious “performing an attempt to utilize a different channel in the default frequency band ... to establish the backhaul with the second node.”

70. First, Ho does not disclose or render obvious “performing an attempt to utilize a different channel in the default frequency band . . . to establish the backhaul with the second node.” The Petition asserts that when the signal received from the CAP is “deemed inadequate,” the “non-CAP hybrid device will again attempt to select another ‘preferred channel’ (claimed different channel) having the ‘highest RSSI’ to re-establish backhaul communication with the CAP.” Petition 55-56 (quoting Ho 14:38-41, 16:30-33, 16:54-57). I disagree.

71. As an initial matter, a non-CAP can enable its WLAN STA module when the WLAN link to the CAP is “adequate.” Ho 14:38-41, 17:25-29. It follows logically that, when the link from a non-CAP to the CAP is “inadequate,” Ho’s total configuration algorithm can disable the non-CAP’s WLAN STA module. *Id.* Alternatively, the non-CAP can configure itself as a sink and connect to a different non-CAP (acting as access point), as the Petition asserts in relation to dependent claims 6, 8, 17, and 19. Petition 64 (“Ho teaches that a network

device would connect to another non-CAP network device acting as a relay/network extender (‘mode B’) if the signal strengths of signals it receives from the CAP are too weak.”), *see also* Petition 68; *see* Ho 14:38-41. Ho does not disclose multiple attempts to wirelessly connect to the CAP in the event of failure or link inadequacy.

72. There is no backup channel in the default frequency band for the non-CAP to try to use as an alternative backhaul. This is demonstrated, for example, by the fact that the CAP chooses its own “channel” for operation. Ho 8:30-34, 12:22-14:51, Figure 4. Ho does not describe a non-CAP having the capability to tell the CAP to change channels (*see, e.g., id.* 13:53-17:2 (describing non-CAP channel selection), Figure 5)—indeed, doing so would greatly disrupt the network because all of the devices connected to the CAP would have to change to the new channel. A POSITA would not have implemented such a burdensome design in Ho, which already has solutions for when the WLAN connection to the CAP is “inadequate,” including using available wired connections to the CAP, as discussed above.

73. I discussed above in Section VIII that Ho’s CAP selects its own operating channel—one per band—and there is no disclosure of a selection of a backup channel or that a non-CAP device could select from multiple channels within a band to communicate with the CAP. Although a non-CAP performs

channel selection, only *one* of the candidate channels matches the CAP's channel and can be used to connect to the CAP; the non-CAP devices can select its own channel on which to wirelessly connect to **client** devices, i.e., where the non-CAP is acting as an "access point"—but this would be front haul, not backhaul to the CAP.

74. The Petition asserts that "the non-CAP hybrid device will again attempt to select another 'preferred channel' (claimed different channel) having the 'highest RSSI' to re-establish backhaul communication with the CAP." Petition 56. I disagree. The preferred channel is from a set of candidate channels resulting from the non-CAP's channel selection process. Ho 16:50-60. This channel selection process relates to the "preferred channel on which the WLAN **AP module** of the non-CAP hybrid device should operate." Ho 18:63-37. Thus, the preferred channel does not specify the channel that the non-CAP connects to the CAP, but rather the channel on which other devices will connect to this non-CAP as clients (i.e., front haul). See Ho 18:63-19:27. In fact, when selecting a channel, "the non-CAP hybrid device . . . may apply a penalty to a primary

channel currently used by the CAP and may avoid using the secondary channel used by the CAP” to avoid using the same channel as the CAP.⁴ Ho 19:28-35.

75. The candidate channels (and preferred channel) are from a scan of all channels including those on which CAP is not operating. And in fact, if the preferred channel for its AP module does not match the channel on which the CAP is operating, the non-CAP would be configured as an access point that, as discussed above, does not wirelessly connect to the CAP.

“For example, the configuration unit 106 can identify a preferred channel (e.g., a channel with the best performance, such as a highest RSSI, lowest error rate, etc.) from the candidate channels, compare the preferred channel with the channel on which the CAP currently

⁴ Here a POSITA would understand that WLAN transmissions aggregated “primary” and “secondary” channels to form one wideband channel for larger bandwidth and higher data rate transmissions. Ex. 2011 at 002 (discussing primary and secondary subchannels in IEEE 802.11n and 802.11ac to form higher bandwidths up to 160 MHz); see Ho 13:24-51 (describing that a CAP can be configured to select channel bandwidths ranging from 20 MHz to 160 MHz); see also Ex. 1021 (similarly discussing “channel bonding” to form these higher bandwidths in IEEE 802.11n and 802.11ac). These are not alternative channels for connecting to the CAP.

operates, and determine whether to configure the non-CAP hybrid device as an access point or a relay. If the preferred channel of the non-CAP hybrid device matches the channel on which the CAP currently operates, the non-CAP hybrid device can be configured as a relay.... ***If the preferred channel of the non-CAP hybrid device does not match the channel on which the CAP currently operates, the non-CAP hybrid device can be configured as an access point.***

Ho 16:53-67.

76. In either case (access point or relay), the claim is not satisfied. As an access point, as I discussed above, the STA module is disabled and there is no attempt to establish wireless backhaul with the CAP. As a relay, the non-CAP has not chosen a “different channel” but merely selected the channel that the CAP was already operating on. Thus, each time a non-CAP runs the total configuration algorithm, it either 1) connects to the CAP on the same channel that the CAP is already operating on, or 2) connects to a non-CAP as a client device (therefore not forming a backhaul), or 3) disables its STA module and does not form a wireless backhaul at all, relying on its wired connections for network access.

2. **Ho does not disclose or render obvious “performing an attempt to utilize ... a channel in a different frequency band that has a lower frequency range than the default frequency band, to establish the backhaul with the second node.”**

77. Second, Ho does not disclose or render obvious “performing an attempt to utilize . . . a channel in a different frequency band that has a lower

frequency range than the default frequency band, to establish the backhaul with the second node.” The Petition asserts that “[i]f the CAP establishes backhaul in both the 2.4 GHz and 5 GHz bands, and the non-CAP established backhaul with the CAP over the 5 GHz band in its first attempt, as discussed above, the new ‘preferred channel’ is a channel in the 5 GHz band or in the lower 2.4 GHz band.” Petition, 56 (citing Ho, 18:38-46). I disagree.

78. The Petition construed “default frequency band” as “a preset frequency band used automatically in the absence of a choice made by the user.” Petition 6 (citing Ex. 1017, Attachment A at 4). The Petition relies on Ho’s CAP being “only . . . configured to use the 5 GHz band for backhaul, and therefore *cannot use* the 2.4 GHz band.” Petition 50. As such, the non-CAP could not use a lower frequency band as a backup backhaul to the CAP as recited in claims 1 and 12 under Petitioner’s construction of “default frequency band.” See Petition 51 (annotating Figure 4 of Ho), reproduced below.

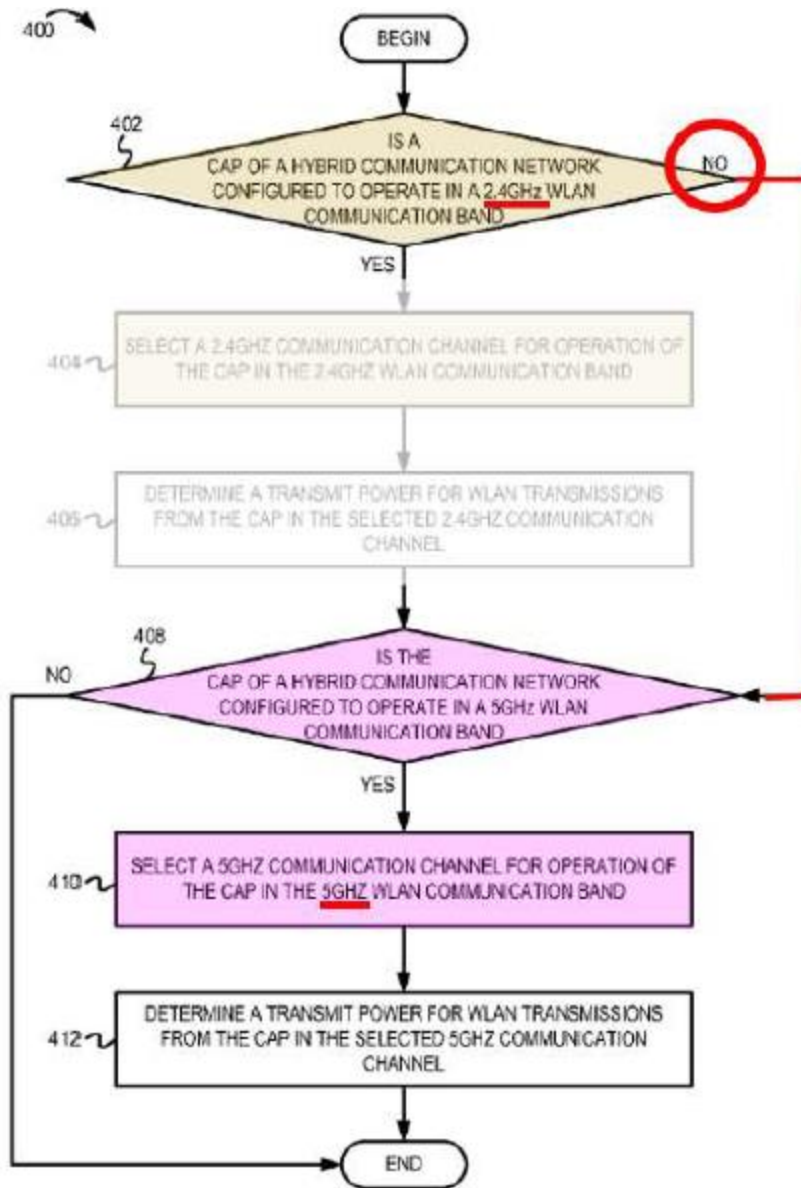


FIG. 4

Petition 51

79. Further, the Petition's annotation of Figure 4, above, shows that the 2.4GHz band is the first selected band, and therefore the 5GHz band is not the default frequency band under the construction of "default frequency band" discussed above in Section VII.B. Because the 5GHz band is not the "default

frequency band,” Ho does not disclose a second attempt to establish backhaul at a lower frequency band as recited in claims 1 and 12. See Petition 56 (relying on 2.4GHz as being a lower frequency band than 5GHz). Although the Petition argues that the 5 GHz band is “default” because it is most likely to provide a successful link to the CAP, even if that were true, it does not establish that it is the first attempted band, as shown by Petitioner’s own annotation of Figure 4, reproduced above. In the above flow chart, the first step 402 is to determine whether a CAP of the network is configured to operate on a 2.4GHz WLAN communication band. Only after that step is a 5GHz band considered (e.g., step 408). By attempting the lower band first, Ho’s system attempts the bands in the opposite order of the claims, which require the lower band to be attempted after the higher band.

80. Further, dual band non-CAP devices have independent second-level personalities on the two bands. Ho 18:28-35. Ho does not disclose, e.g., moving a connection to a CAP from 5GHz to 2.4GHz. To the contrary, if the non-CAP loses its WLAN connection to the CAP on 5GHz, it disables its STA module and its 2.4GHz personality is not affected at all. Ho 18:28-35; 17:25-29; 18:55-57; 14:30-41.

81. Although Ho discloses an embodiment where a non-CAP can choose to connect to the CAP via whichever band has “better connectivity” (Ho, 18:38-

46), that embodiment does meet the claim limitations. Specifically, in that embodiment, the non-CAP only operates the WLAN AP interface on **one** band—either 2.4 GHz or 5 GHz. Ho, 18:38-46. Specifically, the non-CAP device “can switch ON the WLAN AP device to transmit on the 2.4 GHz WLAN communication band, to improve the 2.4 GHz WLAN coverage, and to **transmit on the 5 GHz WLAN communication band after the 2.4 GHz WLAN communication band is filled/occupied.**” Ho, 18:38-46 (emphasis added). Even assuming there is a transition of the STA connection from 5GHz to 2.4GHz in this scenario, this still cannot satisfy the claims because the STA connection is not a backhaul in both bands. For example, when the hybrid device has its 2.4 GHz WLAN AP enabled, then in the initial 5GHz band the non-CAP operates as a **sink** with its 5GHz WLAN STA connected but with its WLAN AP turned off. See *e.g.*, Ho at 8:11-23. This scenario does not satisfy the claims because this initial 5GHz link is a front haul, not a backhaul, because it provides client communication to the non-CAP operating as a sink. Conversely, if the 5GHz WLAN AP is initially enabled, then when the STA transitions to 2.4GHz its link to the CAP is a front-haul only and cannot be a backhaul because it is operating as a sink/client in 2.4GHz. There is no scenario in Ho in which a *backhaul* moves from one band to another. This makes sense because Ho is describing a hybrid network where devices assume their personalities including whether they are an

access point, relay, or client based on network conditions, rather than a mesh network like described in the '698 patent that has wireless mesh nodes and clients.

C. Dependent claims

82. In addition to their dependence on claims 1 and 12, Ho does not render obvious any dependent claims for the additional reasons discussed below.

1. Ho does not disclose or render obvious "performing an attempt to establish the backhaul with the second node utilizing a different radio" (claims 2 and 13).

83. Claims 2 and 13 depend from claims 1 and 12, respectively, and recite “wherein said attempts are performed on a first radio, the [method/operations] further comprising: upon failure of all said attempts, performing an attempt to establish the backhaul with the second node utilizing a different radio.”

84. Petitioner relies on the dual-band dual-concurrent radio embodiment of Ho, where, according to Petitioner, a non-CAP would switch its connection to a CAP from a 5GHz band to a 2.4GHz band. Petition 58-59. But for the reasons describe above for claim element [1.2]/[12.2], Ho does not disclose switching its connection in this manner, or that a subsequent connection would be a backhaul. In other words, even if a connection to the CAP moved between bands, that

connection would not be a backhaul in both bands—rather it would necessarily be a front haul and not a backhaul in one of the two bands.

2. Ho does not disclose or render obvious measuring signal strengths using “probes” or for “all nodes” (claims 4 and 15)

85. Claims 4 and 15 depend from claims 1 and 12, respectively, and recite “measuring received signal strengths of probes from all nodes within a communication range; and selecting the second node based on the measured received signal strengths of the probes.”

86. The Petition cites to Ho’s disclosure of measuring “connection quality *to the CAP*.” Pet. 60 (quoting Ho 14:11-27). But measuring connection quality to the CAP cannot satisfy claims 4 and 15 because these claims require the use of “probes” to measure signal strengths “from all nodes within a communication range”—not just one.

87. The Petition asserts that a “POSITA would understand and find obvious that the signals received at a non-CAP hybrid device include probe requests that are broadcasted by every mesh point of a wireless mesh network . . . as part of mesh discovery and backhaul peer link management process, as described in the IEEE mesh networking standards.” Petition 60-61 (citing Ex. 1020 at 109) (Draft 802.11s Amendment). But I note that this Draft Amendment in Exhibit 1020 states that mesh discovery requires detection of potential mesh neighbors but does not require probes or Probe Requests—rather it could also be

done with Beacons. Ex. 1020 at 109. Further, the final Amendment 802.11s does not use the term “probes” or “probe requests” in the corresponding section. See Ex. 1016 at 235 (Section 11C.2.1).

88. The Petition does not provide any reason why a POSITA would have been motivated to use Probe Requests from the Draft IEEE 802.11s Amendment in Ho, which does not mention that Draft Amendment. Ho does not disclose a mesh network that is to be compliant with 802.11s (Draft or Final), nor would a POSA have been motivated to pick and choose various requirements (or all requirements) from different IEEE 802.11 standards/amendments—let alone this specific disclosure from a Draft 802.11s Amendment—other than for reason of hindsight.

3. Ho does not render obvious causing a number of nodes to form a “daisy chain topology” (claims 6/8 and 17/19)

89. Claims 6 and 17 depend from claims 1 and 12, respectively, and recite “measuring a link quality among one or more of the nodes in the network; and selectively causing a number of nodes in the network to form a particular connection topology based on the measured link quality.” Claims 8 and 19 depend from claims 6 and 17, respectively, and recite “wherein the formed connection topology is a daisy chain topology if the link quality does not exceed a predetermined threshold.”

90. For these claims, the Petition cites to a “mode B” operation of a non-CAP device, where it connects to another non-CAP device (acting as a relay in “mode A”) with its WLAN STA module instead of connecting to the CAP. Petition 63-69. But even in this scenario, there is not necessarily a “daisy chain topology.” For example, Ho does not use the term “daisy chain” to describe this scenario.

91. In “mode B” the non-CAP disables its WLAN AP module and is therefore not a “node in the network.” Ho 19:35-43. In this configuration, it is a sink/client device, which is recited separately from nodes in the network in the claims. ’698 Patent claims 1 and 12 (“wherein the backhaul is to provide communication of management functions between ***the nodes in the network***, as opposed to a front haul that provides wireless data communication to ***clients in the network***”). In other words, the daisy chain topology relates to nodes—not clients. But Ho’s “mode B” scenario only connects a client indirectly to the CAP through a “mode A” non-CAP.

92. Further, Ho describes that a “mode B” non-CAP connects to an “access point that is not the CAP,” implying that it connects to a non-CAP configured as an access point. Ho 19:35-43. However, as I previously discussed, a non-CAP configured as an access point does not have a wireless connection to

the CAP and therefore cannot form a daisy chain topology among the “nodes” in the wireless “network.”

4. Ho does not render obvious claims 3, 5, 7, 9-11 and 14, 16, 18, 20-22.

93. The remaining dependent claims 3, 5, 7, 9-11, 14, 16, 18 and 20-22 are valid for at least the reasons of the claims they depend from being valid, as discussed above. Specifically, claims 3 and 14 depend from claims 2 and 13, respectively; claims 5 and 16 depend from claims 1 and 12, respectively; claims 7 and 18 depend from claims 6 and 17, respectively; claims 9 and 20 depend from claims 8 and 19, respectively; and claims 10 and 21 depend from claims 1 and 12, respectively; and claims 11 and 22 depend from claims 10 and 21, respectively.

X. A POSITA would have not found claims 9 and 20 obvious based on Ground III.

94. In Ground III, the Petition challenges dependent claims 9 and 20. Petition, 2, 72-74. These dependent claims depend on either claim 1 or claim 12 and are therefore not obvious for the same reasons that claims 1 and 12 are not obvious.

XI. A POSITA would have not found claims 1-6 and 12-17 obvious based on Ground I.

A. Overview of Gatewood's use of backhauls to different nodes.

95. Gatewood is titled "Selection of Wireless Backhaul Links Based on Uptime Factors." Figure 1 of Gatewood, reproduced below, shows a communication system with user devices 110-112 that communicate over WLAN 140 with WLAN access node 120. Gatewood, 2:23-27.

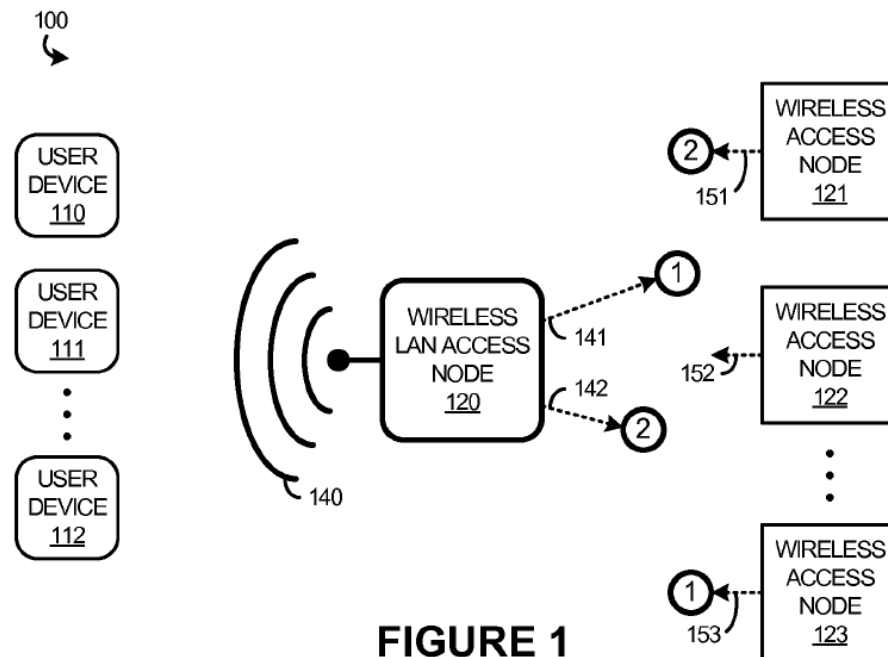


FIGURE 1

Gatewood, Figure 1

96. The WLAN access node communicates with wireless access nodes 121-123 over wireless backhaul links 141-142. Gatewood, 2:27-29. "In some examples, WLAN access node 120 and wireless access nodes 121-123 comprise similar devices or equipment, such as in a mesh wireless local area network." Gatewood, 2:29-32.

97. Figure 3 of Gatewood, reproduced below, illustrates communication system 300 including “various user devices 310-312 and wireless local area network (WLAN) access nodes 330-334.” Gatewood, 3:45-49. “WLAN access node 330 comprises a wireless local area network access point and wireless router, such as an IEEE 802.11 wireless router.” Gatewood, 3:49-52. “In some examples, WLAN access nodes 331-334 comprise similar devices or equipment as WLAN access node 330, such as in a mesh wireless local area network. In other examples, WLAN access nodes 331-334 can comprise cellular voice and data base station equipment, or other wireless equipment.” Gatewood, 3:52-57.

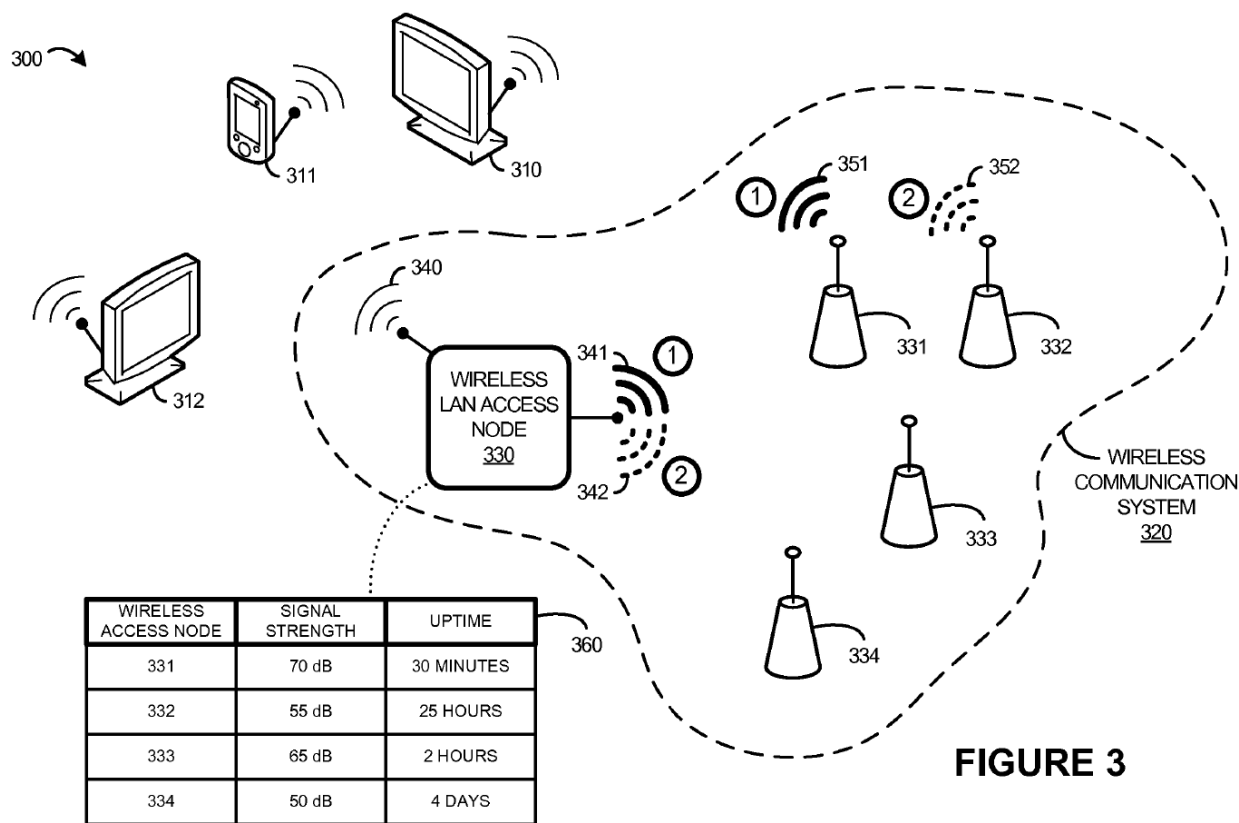


FIGURE 3

Gatewood, Figure 3

98. A POSITA would have understood that Gatewood's network in Figure 3 does not use or need multi-hop paths between WLAN access node 330 and any other WLAN access node 331-334, because each of the WLAN access nodes 331-334 already provides connectivity to other networks such as the Internet. As Gatewood discloses, "WLAN access nodes 331-334 are also communicatively coupled to further networks, communication links, and systems which can provide communication with other networks such as the Internet, corporate networks, Internet service providers, cellular voice and data core networks, and the like." Gatewood, 3:58-62. "Although not shown in FIG. 3, each of WLAN access nodes 331-334 can have one or more additional wired or wireless links for communication with these further networks or communication links." Gatewood, 3:63-66. "Thus, any communications backhauled through ones of WLAN access nodes 331-334, as discussed in FIG. 4, can be further exchanged over these additional wired or wireless links with the further networks or communication links." Gatewood, 3:66-4:3.

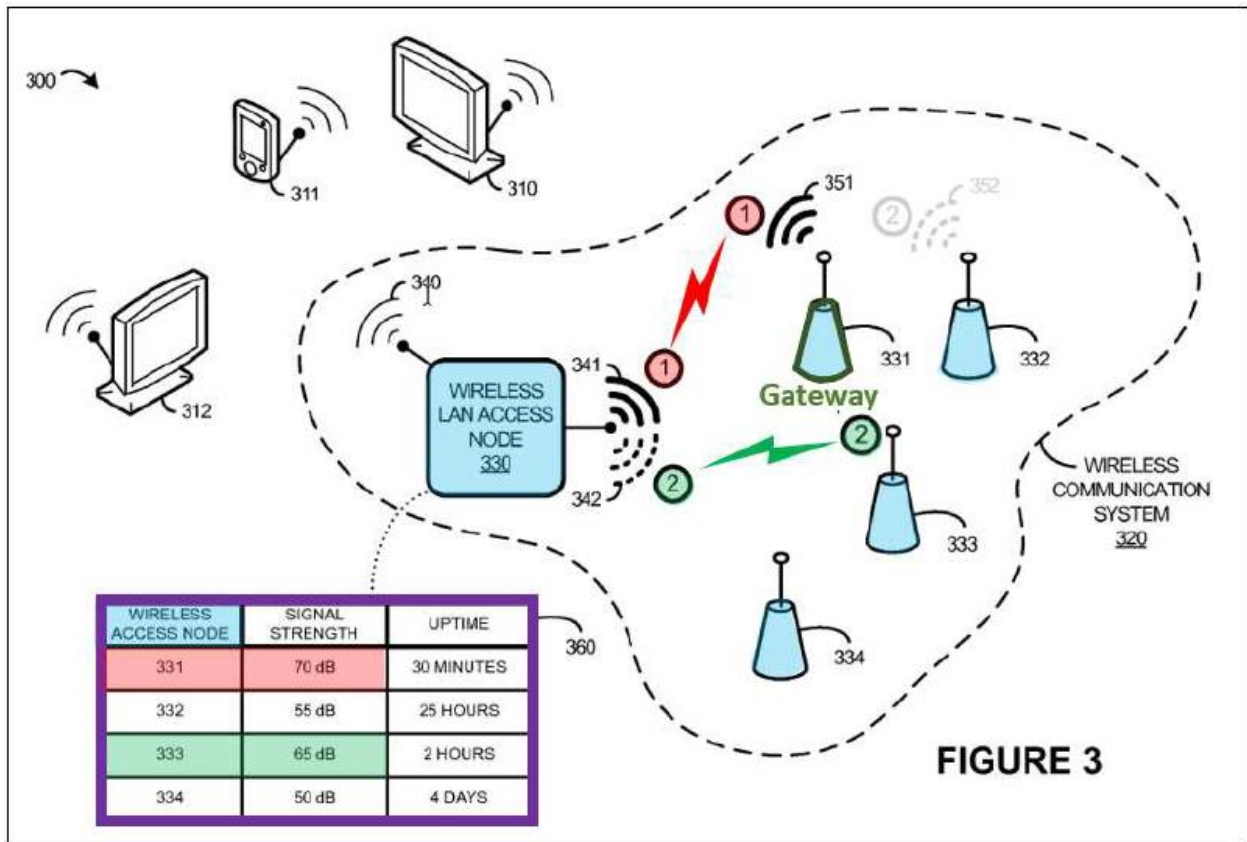
B. A POSITA would have not found independent claims 1 and 12 obvious based on Ground I.

1. Petitioner's combination of Gatewood and Ho does not disclose or suggest two attempts to establish a backhaul between the same two nodes ([1.1]/[12.1] and [1.2]/[12.2]).

99. Claims 1 and 12 recite two attempts to establish a backhaul with the same "second node." These claims both recite a first attempt: "performing an

attempt to utilize a first channel in a default frequency band as a ***backhaul with second node*** in the network”; and a second attempt: “performing an attempt to utilize a different channel in the default frequency band and/or a channel in a different frequency band that has a lower frequency range than the default frequency band, to establish ***the backhaul with the second node.***”

100. Gatewood does not disclose multiple attempts to establish backhaul with the same “second node.” Rather, Gatewood uses backhaul links to different nodes for redundancy. This is shown in the Petition, which maps the claimed “attempt to utilize a first channel” for the backhaul to a “first wireless backhaul link 341” in Figure 3. Petition, 18. Petitioner’s annotation of Figure 3 is reproduced below showing that the first wireless backhaul link is to node 331 (annotating this link with a red (1)). I note that the label “Gateway” was added by Petitioner to node 331—this label does not appear in Gatewood’s Figure 3. Petition, 27.



Petitioner's annotation of Gatewood Figure 3. Petition, 27.

101. For the second attempt—the claimed “attempt to utilize a different channel in the default frequency band”—Petitioner cites to “second wireless backhaul link 342” which terminates at node 333, shown above annotated with a green (2). Petition, 29. As clearly shown in Petitioner’s annotation, these two backhaul links are with different nodes (331 and 333, respectively). Petition, 26-27, 29 (“[T]he first wireless backhaul link and second wireless backhaul link connect MAP.330 to MAP.331 and MAP.333, respectively.”) This does not satisfy the claim requirement that the “attempt to utilize a first channel” and the

“attempt to utilize a different channel in the default frequency band” are to establish a backhaul with “the [same] second node.”

102. Petitioner asserts that the second wireless backhaul link (2) is actually a backhaul communication to node 331 where node 331 acts as a gateway and the link (2) to node 333 is used as a first hop to gateway node 331. Petition, 29 (“The second wireless backhaul link 342 is part of a multi-hop backhaul path (*e.g.*, MAP.330-to-MAP.333-to-MAP.331) to the same gateway.”). I disagree that the link (2) is part of a two-hop path to node 331. As I explained in my Overview of Gatewood above, each of the WLAN access nodes 331-334 has connections to other networks such as the Internet, thus there is no disclosure or need for two-hop communication in Gatewood’s network. *See* Gatewood, 3:58-4:3. Not only does Gatewood not designate node 331 as any different than any other node, to the extent Petitioner calls node 331 a gateway, all of the nodes 331-334 are gateways, and no communications are needed between them for the client data to get to other networks, *e.g.*, the Internet, as each of these nodes already has a connection to the other networks, *e.g.*, the Internet.

103. Petitioner next asserts that apart from Figure 3, which illustrates a single link between WLAN access node 330 and the other respective nodes, “Gatewood teaches forming multiple parallel wireless links (channels) between any two MAPS—such as between MAP.330 (first node) and MAP.331 (second

node).” Petition, 30. Petitioner cites column 10, lines 23-31 of Gatewood (Petition, 30), which states:

Although one main wireless link for each of wireless links 140-142 and 151-153 is shown in FIG. 1, it should be understood that wireless links 140-142 and 151-153 are merely illustrative to show communication modes or wireless access pathways for user devices 110-112 and associated backhaul. *In other examples, further wireless links can be shown, with portions of the further wireless links shared and used for different communication sessions or different content types, among other configurations.*

Gatewood, 10:23-31 (emphasis added).

104. I disagree that this passage of Gatewood teaches “multiple parallel wireless links (channels) between any two MAPs—such as between MAP.330 (first node) and MAP.331 (second node).” Petition, 30. Although Gatewood discloses that “further wireless links can be shown” in Figure 1 (and does not reference Figure 3 in this passage), Gatewood does not disclose that these “further wireless links” are between the WLAN access node and the same other wireless nodes; i.e., duplication of the labeled links.

105. Nor does Gatewood disclose that these “further wireless links” are for backhaul, but rather discloses that when “further wireless links” are shown, “portions of the further wireless links [are] shared and used for different communication sessions or different content types, among other configurations.”

Gatewood, 10:28-31. But even if this passage of Gatewood did disclose multiple links between access nodes, and even if those multiple links were for backhaul, there is no teaching or suggestion that they would be alternative backhaul links such that if one failed, Gatewood's system would choose another link *to the same node* as the backup wireless backhaul. For example, although Petitioner equates these links as being on different "channels," Gatewood does not use the term "channel" in this context. *See* Petition, 30. Gatewood does not provide a POSITA with any reason that such links would even be serviceable as backups (e.g., that they would have enough capacity to serve as backhails, that they would have performance decoupled from the other links such that they would still be serviceable if a first link to the node failed, etc.). Petitioner reads much more from this single sentence of Gatewood than a POSITA would have understood.

106. Petitioner states that "Ho further confirms Gatewood's teachings" and characterizing that reference as "forming multiple parallel backhaul connections ('upstream links') between a non-CAP hybrid device and a CAP using different frequency channels." Petition, 31 (citing Ho, 21:7-12). I disagree with Petitioner's assertion that Ho teaches multiple parallel backhaul connections "using different frequency channels." Petition, 31. Rather, Ho teaches using a variety of network interfaces to establish "redundant upstream links." Ho, 20:66-21:12; *e.g.*, 24:42-46. These different interfaces include powerline

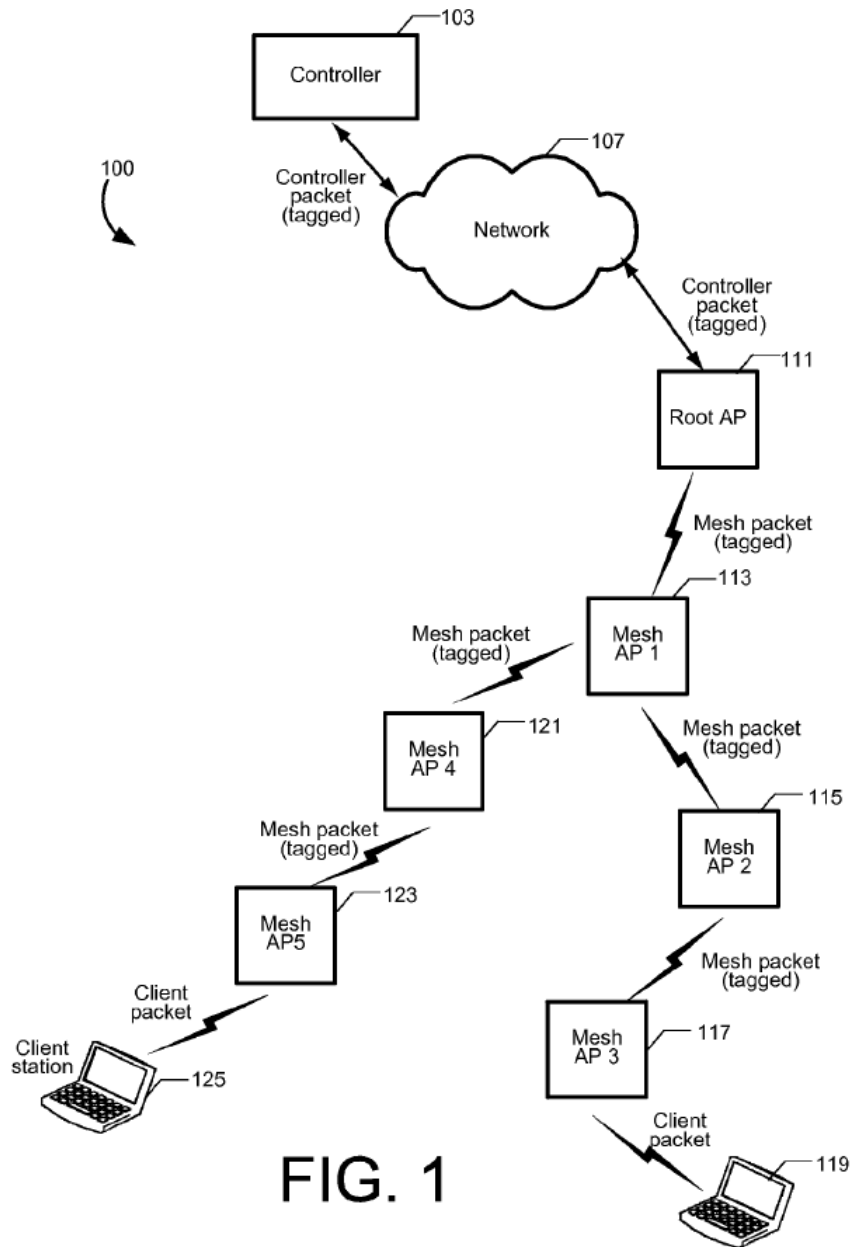
communication (PLC) and Ethernet connections. Ho, 24:58-63. Ho does not teach availability of multiple connections to a central access point (CAP) on different channels within the same band. To the contrary, the CAP selects its operating channel (*see, e.g.*, Figure 4), and if the WLAN quality from the non-CAP to the CAP is inadequate, the non-CAP operates without a link to the CAP by turning off its WLAN STA module. *See* Ho, 15:38-43. It can do this because it has other connections to the CAP such as PLC. *See* Ho, Figure 1, 11:58-12:2; 14:47-63; 18:58-60. The specific passage of Ho that Petitioner cites for “redundant upstream links” supports that these links are formed by different network interfaces, not different channels within the same frequency band.

Although examples refer to determining the personality of the non-CAP hybrid device based on the WLAN connection quality to the CAP, the PLC connection quality to the CAP, the 2.4 GHz (and/or the 5 GHz) WLAN coverage, embodiments are not so limited. In other embodiments, in addition to the aforementioned inputs, the operations for determining the personality of the non-CAP hybrid device can also take into consideration whether the non-CAP hybrid device is connected to an end-device. For example, if the non-CAP hybrid device is connected to an end-device (e.g. an Ethernet device) that will consume data generated by (or relayed by) the non-CAP hybrid device, the non-CAP hybrid device may choose to establish redundant upstream links over improving WLAN coverage.

Ho, 20:66-21:12. Thus, in this passage Ho discloses that the non-CAP personality can be based on information besides “WLAN connection quality to the CAP” or WLAN coverage at 2.4 GHz or 5 GHz. Specifically, the non-CAP device “can also take into consideration whether [it] is connected to an end-device” for example via Ethernet. In such a case, the non-CAP device may choose to “establish redundant upstream links over improving WLAN coverage” which a POSITA would have understood to mean that the non-CAP may choose to turn off its WLAN access point in this scenario instead of “improving WLAN coverage.” This does not teach or suggest forming multiple WLAN connections to the CAP over different channels in a frequency band.

107. Petitioner also cites Sinha and Handforth as supporting its assertion that “[e]stablishing multiple redundant parallel backhaul links (over different frequency channels) between two nodes of a mesh network was in fact well-known and described in many other prior art references, and thus within the knowledge of a person of ordinary skill.” Petition, 31 (citing Sinha, ¶ 103 and Handforth, 4:54-63). I note that Petitioner does not assert that a POSITA would have modified Gatewood based on Sinha or Handforth, and in my opinion a POSITA would have not made any such a modification based on Sinha or Handforth.

108. Sinha discloses redundant paths between nodes over multiple hops. See Sinha, ¶ 103 (“Several **routes** may be calculated between two end points....”) (emphasis added). This cited passage does not teach or suggest multiple direct backhaul links between two nodes on different frequency channels (which Petitioner asserts to be taught by Gatewood). For example, Figure 1 of Sinha, reproduced below, shows multi-hop paths from various mesh APs to a Root AP.



Sinha, Figure 1

109. Gatewood, however, does not need multiple hops as I explained above, and does not need additional redundancy. Notably, a POSITA would have understood that Gatewood already provides redundancy through the deployment of multiple wireless nodes 331-334, each having a separate link to the WLAN

access node 330 that serves client devices. *See* Gatewood, Figure 3. Additional redundancy is not needed when a single link fails, because WLAN access node 330 can choose a link to a different wireless node for backhaul, as Gatewood explicitly teaches. *See* Gatewood, 4:59-61 (“WLAN access node 330 selects (403) a second wireless backhaul link as a backup for first wireless backhaul link 341 based on signal strength and uptime information.”).

2. Petitioner’s combination of Gatewood and Ho does not disclose or render obvious a “backhaul . . . to provide communication of management functions between the nodes in the network” as recited in [1.1]/[12.1].

110. Petitioner asserts that “[a]s would be understood and found obvious by a POSITA, a backhaul communication provides MAP-to-MAP communication and is not a front-haul client-facing communication that provides wireless data communication to clients in the network.” Petition, 21-22.

Petitioner further states that “[a] backhaul also carries control and management information that communicate management functions such as MAP coordination functions, which Gatewood refers to as ‘overhead communications,’ between the nodes in the network.” Petition, 22 (citing Gatewood, 7:31-40). In other words, Petitioner asserts that every backhaul necessarily meets the claim element. I disagree. For one, Petitioner’s interpretation of “backhaul” would render the rest of the claim element superfluous—i.e., if every backhaul is “to provide communication of management functions between the nodes in the network, as

opposed to a front haul that provides wireless data communication to clients in the network,” then the inventors would have just claimed a “backhaul” without this extra language.

111. Second, Gatewood does not describe its backhaul links as being “to provide communication of management functions between the nodes in the network” Nor does Gatewood disclose backhaul that “carries control and management information that communicate management functions such as MAP coordination functions.” Petition, 22. Gatewood describes that “backhaul link[s] can be employed to transport the communications of the wireless local area network to other networks, such as the Internet or other local area networks and wide area networks.” Gatewood, 1:29-33.

112. Petitioner also asserts that “as would be well-known in the art and described in the IEEE 802.11s mesh networking standards, many management messages (frames) are exchanged between access points (APs) of a wireless mesh network over the backhaul to convey management function information, such as Root Announcement, Path Request/Reply, Mesh Link Metric Report, Probe Request/Response frames, etc.” Petition, 22 (citing Ex. 1016, 30-38). But neither Gatewood nor Ho disclose the use of IEEE 802.11s and Petitioner does not provide any motivation to apply any teachings of IEEE 802.11s to modify Gatewood and Ho.

- 3. Petitioner's combination of Gatewood and Ho does not disclose or render obvious "an attempt to utilize a different channel in the default frequency band and/or a channel in a different frequency band that has a lower frequency range than the default frequency band" as recited in [1.2]/[12.2].**

113. The Petition assumes that the different links in Gatewood are on different channels in the default frequency band. Petition, 28 ("[] Gatewood teaches that the second wireless backhaul link is established using a different channel of the default 5 GHz band . . .") (original emphases omitted). I disagree. Gatewood does not disclose that the different links constitute different channels in the same band—either in Gatewood embodiment where the links go to different nodes, or in Petitioner's added embodiment where multiple links connect the same two nodes together. Gatewood does not disclose using different channels for different links, and Petitioner makes no attempt to cite to Gatewood for such disclosure. See Petition, 28-29.

- C. Petitioner's combination of Gatewood and Ho does not disclose or suggest performing an attempt to establish the backhaul with the second node utilizing a different radio (claims 2 and 13).**

114. Claims 2 and 13 depend from claims 1 and 12, respectively, and further recite "wherein said attempts are performed on a first radio, the [method/operations] further comprising: upon failure of all said attempts, performing an attempt to establish the backhaul with the second node utilizing a different radio."

115. Section XI.B.1 discusses that Gatewood does not attempt to establish a backhaul “with the second node” upon failure of a previous attempt. Rather, Gatewood attempts to use a backhaul with a different gateway. *See* Gatewood, Figure 3. For the same reasons, Gatewood, alone or in view of Ho, does not render claims 2 and 13 obvious. Specifically, claims 2 and 13 recite a third “attempt” to establish “the backhaul with the second node.” But each attempt by Gatewood to establish backhaul is with a different gateway, and Gatewood does not disclose multiple attempts to establish backhaul with a second node, let alone utilizing a different radio as recited in claims 2 and 13.

116. Petitioner states that Gatewood “can be implemented” with Ho’s “dual-band dual concurrent (DBDC) radio” for claims 2/13. Petition 36-37. Petitioner does not appear to provide a reason for doing so. Nevertheless, even if Gatewood were implemented with Ho’s DBDC radio, it would have not disclosed multiple attempts to establish backhaul “with the second node.”

D. Petitioner’s combination of Gatewood and Ho does not disclose or render “measuring received signal strengths of probes from all nodes within a communication range” as recited in claims 4 and 15.

117. Claims 4 and 15 depend from claims 1 and 12, respectively, and further recite “measuring received signal strengths of probes from all nodes within a communication range; and selecting the second node based on the measured received signal strengths of the probes.”

118. Petitioner reproduces Figure 3 of Gatewood showing signal strengths from other nodes in the network, describing them as “the signal strength measured at access node 330 (claimed network device) of signals transmitted by other access nodes.” Petition at 39. Petitioner further asserts that “[a] POSITA would understand and find obvious that those signals include probe requests that are broadcasted by every mesh point of a wireless mesh network (such as Gatewood’s mesh network) as part of the mesh discovery and backhaul peer link management process, as described in the IEEE mesh networking standards.” Petition at 39-40 (citing Ex. 1020 at 109).

119. But a POSITA would have understood that probes were not “required” in IEEE mesh networking standards, and Petitioner does not explain why a POSITA would have found them to be obvious. Petition 39-40; see Ex. 1020 at 114⁵ (“This process request detection of potential mesh neighbors through Beacons or through active scanning using Probe Requests.”).

E. Petitioner’s combination of Gatewood and Ho does not disclose or render obvious “selectively causing a number of nodes in the

⁵ This citation refers to the page number added by Petitioner’s stamping and not the page of the original document.

network to form a particular connection topology based on the measured link quality” as recited in claims 6 and 17.

120. Claims 6 and 17 depend from claims 1 and 12, respectively, and further recite “measuring a link quality among one or more of the nodes in the network; and selectively causing a number of nodes in the network to form a particular connection topology based on the measured link quality.”

121. Petitioner has two different theories to satisfy these claims. Specifically, Petitioner asserts that either “the single-hop path MAP.330-to-MAP.331 or the two-hop path MAP.330-to-MAP.333-to-MAP.331” constitute the “particular connection topology” of the claims. Petition at 43-44.

122. However, Section XI.B.1 above showed that Gatewood does not disclose or suggest two-hop communications, including because each node can be a gateway. In addition, a single connection between two nodes is not a “topology” within the context of claims 6 and 17 because it would mean any connection satisfies the claimed particular connection topology, rendering the claim meaningless.

F. Claims 3, 5, 14, and 16.

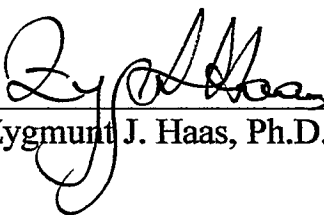
123. Claims 3 and 14 depend from claims 2 and 13, respectively, and are patentable at least for their reliance on those claims. Claims 5 and 16 depend from claims 1 and 12, respectively, and recite “utilizing a spanning tree based

protocol to avoid loops in said attempts.” These claims are patentable at least for their dependence on patentable claims 1 and 12.

XII. CONCLUSION

124. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 9, 2024 (date), in Richardson, TX (city, state).



Zygmunt J. Haas, Ph.D.