

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TP-LINK CORPORATION LIMITED,
Petitioner,

v.

NETGEAR, INC.,
Patent Owner.

IPR2023-01403
Patent 9,468,025 B2

Before LYNNE H. BROWNE, SHEILA F. McSHANE, and
JASON M. REPKO, *Administrative Patent Judges*.

REPKO, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

TP-Link Corporation Limited (“Petitioner”) filed a petition requesting *inter partes* review of claims 1–21 of U.S. Patent No. 9,468,025 B2 (Ex. 1001, “the ’025 patent”). Paper 2 (“Pet.”). Patent Owner did not file a Preliminary Response to the Petition.

To institute an *inter partes* review, we must determine “that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). For the reasons discussed below, Petitioner has met that standard.

A. *Related Matters*

Petitioner indicates that the ’025 patent is a subject the following International Trade Commission investigation: Inv. No. 337-TA-1361 (ITC). Pet. 93.

Petitioner also indicates that the ’025 patent is subject of the following district-court proceeding: *Netgear Inc. v. TP-Link USA Corp. et al.*, Case No. 2:23-cv-02540 (C.D. Cal.). *Id.*

B. *Real Parties-in-Interest*

Petitioner identifies TP-Link Corporation Limited f/k/a TP-Link International Ltd., TP-Link Technologies Co., Ltd., TP-Link USA Corp. and TP-Link Institute USA Corp. d/b/a TP-Link Research America Corp. as the real parties-in-interest. Pet. 93. Patent Owner identifies Netgear, Inc. as the real party-in-interest. Paper 4, 1 (Patent Owner’s Mandatory Notice).

C. *The ’025 Patent*

The ’025 patent is generally directed to wireless-connection management for an extended wireless network. *See* Ex. 1001, 3:39–63. In such a network, there may be multiple paths to reach the Internet through the nodes extending the network (“extenders”). *Id.* at 2:12–15; 3:7–38. The

disclosed system generates connection quality information for each wireless device and stores it in a table. *Id.* at 10:7–10. The table includes information for indirect communication paths, through the extenders, between the gateway router and the wireless device. *See id.* at 10:25–34; 10:61–65. With this information, the system determines the path with the highest-quality wireless connection. *Id.* at 10:25–30.

D. Claims

Claims 1, 7, and 16 are independent. Claims 1 and 7 are reproduced below.¹

1. A gateway router configured to facilitate wireless connection management in an extended wireless network, comprising:
 - [1.1] a network device input connected at least indirectly to an internal network and configured to communicate a plurality of data packets to and from at least one computer system;
 - [1.2] a network device output connected at least indirectly to an external network and configured to communicate the plurality of data packets to and from at least one computer system; and
 - [1.3] a computer processor configured to execute steps, including
 - [1.4] receiving packets from a wireless device,
 - [1.5] identifying the wireless device within a table of wireless devices connected to a wireless access device in an extended wireless network,
 - [1.6] generating wireless connection quality information for the wireless device specific to the wireless access device, the wireless connection quality information including wireless connection quality information for at least one indirect communication path having at least one network extender device to establish the communication path between the gateway router and the wireless access device.

¹ The added limitation numbering follows the numbering used in the Petition.

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Ex. 1001, 15:24–48.

7. An extended network configured to implement an extended management function to identify a wireless access device providing a highest quality wireless connection to a wireless device, comprising:
- [7.1] a gateway device configured to enable communication between the extended network and an external network;
 - [7.2] at least two wireless access devices in the extended network; and
 - [7.3] at least one wireless device having a wireless connection to a at least one of the wireless access devices,
 - [7.4] wherein the gateway device and the wireless access devices include a processor executing the extended management function to identify the wireless access device providing the highest quality wireless connection based on wireless connection quality information, the wireless connection quality information including wireless connection quality information for at least one indirect communication path having at least one network extender device to establish the communication path between the gateway device and the wireless access device, exchanged among the wireless access devices and the gateway device.

Id. at 16:5–26.

E. Evidence

Name	Reference	Exhibit No.
Liu	US 2010/0322141 A1, published Dec. 23, 2010	1005
Dean	US 2008/0080388 A1, published Apr. 3, 2008	1006
Bharghavan	US 7,826,426 B1, issued Nov. 2, 2010	1007

F. Asserted Grounds

Petitioner asserts that claims 1–21 are unpatentable on the following grounds. Pet. 1–2.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–21	103	Liu
7–11, 13–21	103	Dean
1–6	103	Dean, Bharghavan
1–6	103	Liu, Bharghavan

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art “would have had a Bachelor’s degree in electrical 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.” Pet. 3 (citing Ex. 1002² ¶¶ 50–53). Petitioner also asserts that “[a]dditional education might compensate for a deficiency in experience, and vice-versa.” *Id.*

Patent Owner did not file a Preliminary Response to the Petition.

For this decision, we apply the level of skill proposed by Petitioner. If Patent Owner proposes a different skill level in its response, the parties are encouraged to discuss how those differences affect the Board’s assessment of Petitioner’s obviousness analysis.

B. Claim Construction

The Board is required to construe “‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (citing

² Exhibit 1002 is the declaration of Dr. Zhi Ding.

Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999)).

On the current record, no terms are in controversy. And we do not see a need to construe a term to resolve any issues at this stage. Thus, we do not construe any terms in this decision.

C. Obviousness of Claims 1–6 over Liu alone and with Bharghavan

Petitioner asserts that claims 1–6 are unpatentable as obvious over Liu. Pet. 90–91.

1. Liu

Liu's system seeks to maximize network throughput and improve fairness in shared wireless-communication networks. Ex. 1005 ¶ 8. It allocates bandwidth and creates a routing scheme from collected network information. *Id.*, Abstract. Mesh access points (MAPs) measure the link quality and channel conditions. *Id.* ¶¶ 9, 56. The MAPs then report the measured link quality and channel conditions to a controller. *Id.* ¶ 9. The system uses that information to update data-forwarding instructions to maximize network throughput and improve fairness. *Id.*

2. Bharghavan

In Bharghavan's network-communication protocol, access points (APs) are associated with wireless devices. Ex. 1007, Abstract. A handoff reassigns a wireless device from one AP to another. *Id.* at 1:54–57. A handoff can take substantially more time compared to other communications. *Id.* To optimize this handoff, a system coordinator considers multiple characteristics of the communications link between an AP and a wireless device. *Id.* at 7:36–38, 49–53. In particular, Bharghavan stores the characteristics in a data structure that includes an AP identifier, a

set of identifiers for wireless devices, and at least one received signal strength indicator (RSSI). *Id.* at 7:1–8.

3. *Claim 1*

Petitioner asserts that claims 1–21 would have been obvious over Liu alone. Pet. 2 (Ground I). In a separate ground, Petitioner asserts that claims 1–6 would have been obvious over Liu and Bharghavan. *See id.* at 90–91 (Ground IV). For the reasons that follow, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 1 is unpatentable over the Liu-Bharghavan combination (Ground IV) but not over Liu alone (Ground I).

a. *Preamble*

Claim 1, recites in part, “A gateway router configured to facilitate wireless connection management in an extended wireless network, comprising.” Ex. 1001, 15:24–26.

Petitioner asserts that Liu discloses or renders obvious the preamble. Pet. 7–11. According to Petitioner, Liu’s wireless mesh network is an extended wireless network, as recited, “because it has a gateway and one or more relay nodes.” *Id.* at 7–8 (citing Ex. 1005 ¶ 6; Ex. 1001, 2:12–15). Petitioner asserts that Liu’s gateway facilitates wireless-connection management because the gateway’s central controller determines the best mesh access point (MAP) for an end device (STA) from the end-to-end paths to the gateway. *Id.* at 9 (citing Ex. 1005 ¶¶ 56, 59).

At this stage and on this record, Petitioner sufficiently shows that Liu discloses or renders obvious the preamble. According to the ’025 patent, “A network including both a gateway wireless access device and one or more extender wireless access devices is referred to as an ‘extended network.’” Ex. 1001, 2:12–15, *cited in* Pet. 8. Similarly, Liu’s wireless mesh network includes gateway/base station 115 and MAP/relay nodes 105. *See, e.g.,*

Ex. 1005 ¶ 6, Fig. 1, *cited in* Pet. 7–8. Thus, Petitioner sufficiently supports the assertion that Lui teaches the recited extended network. *See* Pet. 7–8.

A municipal-mesh network has an access layer and a relay layer, which operate on different channels to avoid interference. Ex. 1005 ¶ 6. The access layer includes the end devices, such as laptops, computer, and mobile terminals. *Id.* The relay layer includes the mesh access points (MAPs). *Id.* The relay layer’s MAPs are connected to form a multi-hop backhaul, and the path through this layer is referred to as the backhaul path. *Id.* Liu’s gateway collects information, determines the optimal backhaul routing and bandwidth allocation, and sends the routing and allocation to the MAPs and end devices. *Id.* ¶ 59, *cited in* Pet. 9. So, on this record, Petitioner sufficiently supports its assertion that Liu’s gateway facilitates wireless-connection management. *See* Pet. 9.

Thus, on this record, Petitioner sufficiently shows that Liu teaches the preamble. *See id.* at 7–9.

b. Network Device Input and Output

Claim 1, recites in part,

[1.1] a network device input connected at least indirectly to an internal network and configured to communicate a plurality of data packets to and from at least one computer system.

[1.2] a network device output connected at least indirectly to an external network and configured to communicate the plurality of data packets to and from at least one computer system.

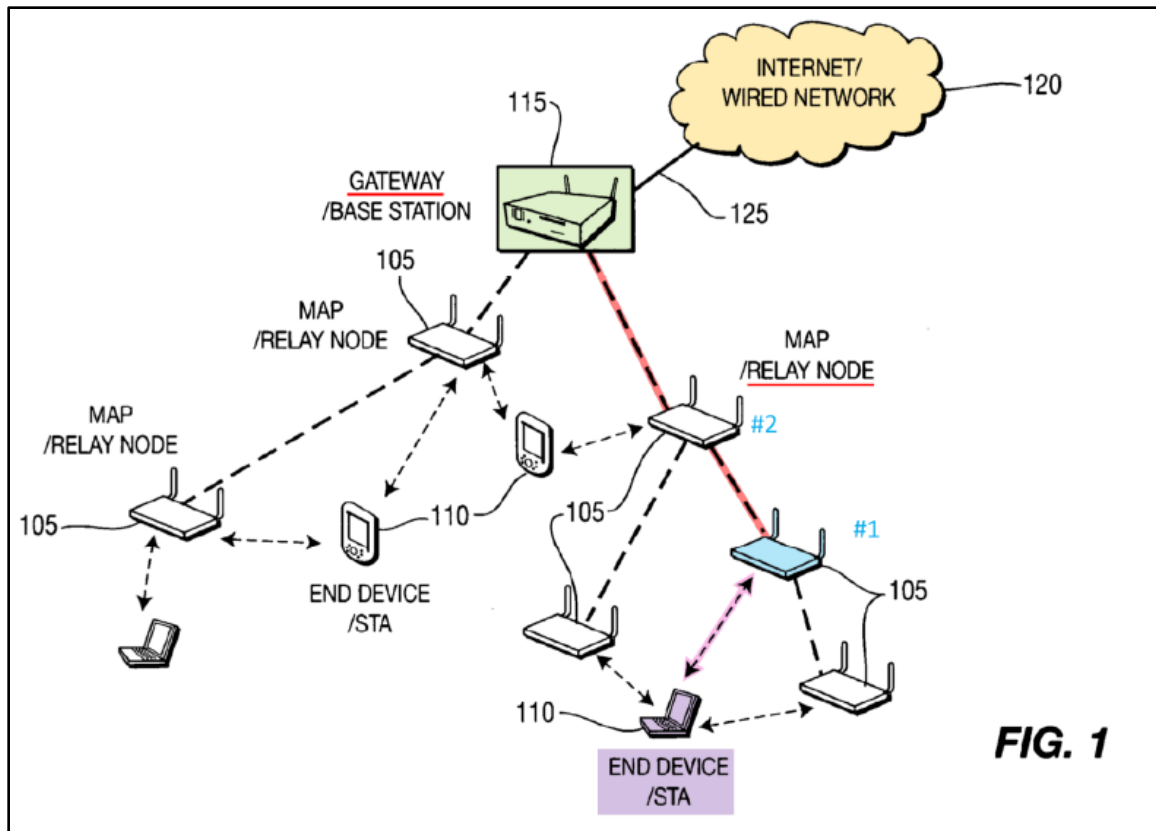
Ex. 1001, 15:27–34 (with Petitioner’s numbering added); *see* Pet. 11, 13.

Petitioner asserts that Liu discloses or renders obvious the recited network-device input and output. Pet. 11, 13. According to the Petition, Liu’s MAPs correspond to the claimed internal network and Liu’s end

device corresponds to the claimed computer system. *Id.* at 12. As for the input, Petitioner asserts that Liu's gateway communicates with the MAPs directly and with the end devices via the MAPs. *Id.* at 11 (citing Ex. 1005 ¶ 62). Petitioner asserts that the gateway does so using radio interface 905. *Id.* Petitioner asserts that radio interface 905 corresponds to the claimed network-device input. *Id.* (citing Ex. 1002 ¶ 64).

As for the output, Petitioner asserts that Liu's gateway is connected to the Internet. *Id.* at 13 (citing Ex. 1005 ¶ 62, Fig. 9). According to Petitioner, one of ordinary skill in the art would understand that the gateway's wired communication interface (910) communicates data packets to and from Internet servers. *See Id.* at 14 (citing Ex. 1005 ¶¶ 6, 25). Petitioner asserts that wired communication interface 910 corresponds to the claimed network-device output. *Id.* at 13.

At this stage and on this record, Petitioner's showing is sufficient. In Liu, end devices send and receive data packets to and from the MAPs. Ex. 1005 ¶ 6, *cited in* Pet. 14. The interconnected MAPs form a multi-hop backhaul. *Id.* Liu's Figure 1, below, shows a schematic diagram of the network, including the MAPs and Petitioner's annotations. Pet. 11 (citing Ex. 1005, Fig. 1).



Annotated Figure 1 shows a multi-hop network of MAPs (105). *Id.* The MAPs (105) are connected to end devices³ (110). *Id.* The gateway (115) is connected to the MAPs (105) and the Internet or wired network (120). *Id.*

Liu states that most traffic in an infrastructure multi-hop network will be to and from the Internet or wired network. Ex. 1005 ¶ 25, *cited in* Pet. 14. The gateway has radio interface 905 “to communicate with the Internet or any other wired network via wired communication interface 910.” *Id.* ¶ 62 (describing Fig. 9), *cited in* Pet. 13. Because the interfaces 905 and 910 are used in this way for directly and indirectly communicating with the external network (e.g., the Internet/Wired Network 120), Petitioner sufficiently

³ Liu uses a “/” to indicate alternative names for the same thing. Ex. 1005 ¶ 5. For example, Figure 1 labels end device 110 as a “client station” (“STA”) and labels MAP 105 as a “relay node.” *Id.*

shows that Liu’s radio interface 905 and wired communication interface 910 teach the claimed network-device input and output, on the current record and at this stage. *See* Pet. 11–15.

c. Processor

Claim 1, recites in part, “a computer processor configured to execute steps.” Ex. 1001, 15:35.

Petitioner asserts that Liu discloses or renders obvious the processor. Pet. 15. According to the Petition, Liu’s gateway has a “centralized controller,” and one of ordinary skill in the art would understand that the centralized controller is a computer processor implementing decision making module 920 and information collection module 915. *Id.* at 15–17 (citing Ex. 1005 ¶¶ 56, 59, 62, 65, Fig. 6).

At this stage and on this record, Petitioner sufficiently shows that Liu discloses or renders obvious the processor. *See id.* at 15–17. Specifically, Figure 9, below with Petitioner’s annotations, shows Liu’s gateway. *Id.* at 17.

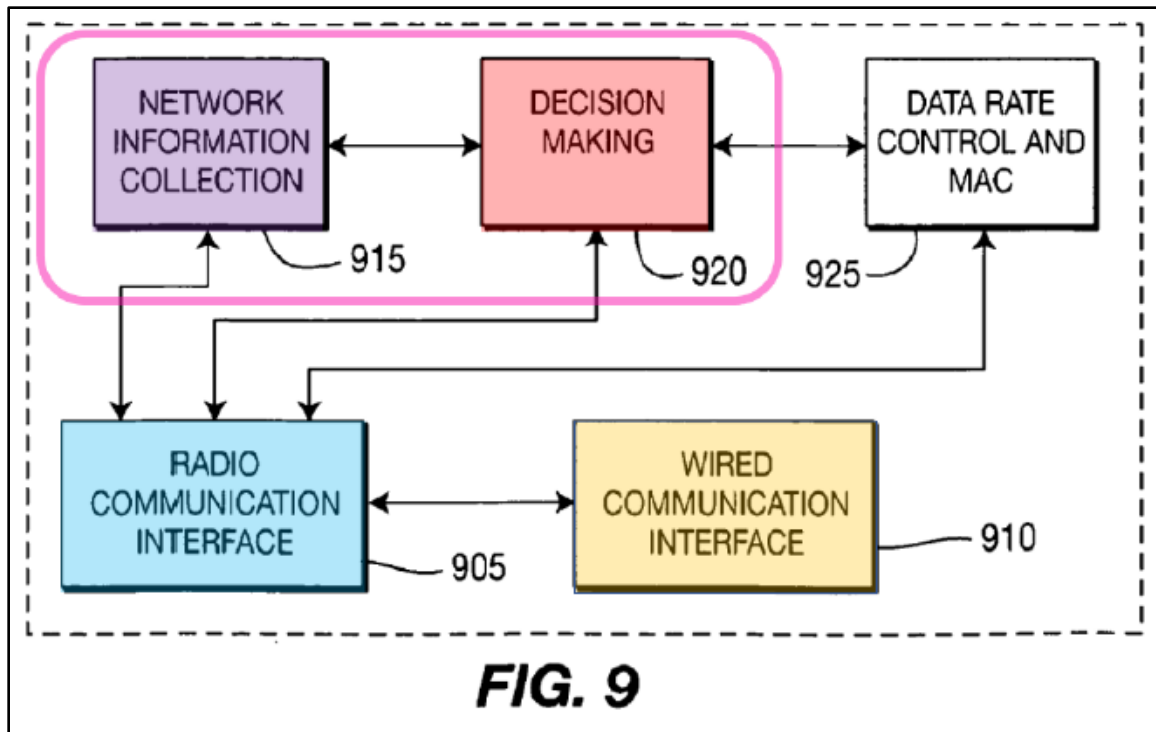


Figure 9 shows a network-information collection module 915 and decision-making module 920 in a block diagram of an “exemplary embodiment of a gateway.” Ex. 1005 ¶ 21. Liu explains that the invention may be implemented in software, firmware, special-purpose processors, or some combination of hardware or software. *Id.* ¶ 65.

d. Receiving Packets

Claim 1 recites, in part, “a computer processor configured to execute steps, including *receiving packets from a wireless device*.” Ex. 1001, 15:35–37 (emphasis added).

Petitioner asserts that Liu discloses or renders obvious this limitation. Pet. 17–18. Petitioner argues that Liu’s gateway, including a processor (*see supra* § II.C.3.c), receives packets from the end devices (STAs). *Id.* (citing (Ex. 1005 ¶¶ 25, 62). At this stage and on this record, we preliminarily agree because Liu states that the “MAPs relay packets between the STAs and the gateway.” Ex. 1005 ¶ 25, *quoted in* Pet. 17. Thus, on this record, Petitioner

sufficiently shows that Liu’s processor is configured to receive packets from a wireless device. *See* Pet. 17–18.

e. Identifying the wireless device

Claim 1 recites, in part, “identifying the wireless device within a table of wireless devices connected to a wireless access device in an extended wireless network.” Ex. 1001, 15:38–40.

Petitioner asserts that this limitation is obvious in view of Liu alone (“Ground I”) or Liu modified by Bharghavan’s database tables (“Ground IV”). Pet. 18–20, 90–91. Both Ground I and Ground IV rely on Bharghavan to some extent. *See id.* at 19, 20.

As for Ground I, Petitioner argues that Liu’s centralized controller has one or more databases, and that it would have been obvious to use tables in the databases to store and retrieve each STA’s records. *Id.* at 18 (citing Ex. 1005 ¶ 61; Ex. 1002 ¶¶ 74–75). According to Petitioner’s obviousness rationale, each row of the table represents an STA’s record and the columns contain information related to that STA. *See id.* at 19 (citing Ex. 1002 ¶¶ 74–78). Petitioner cites Bharghavan to show that a skilled artisan would have had a reasonable expectation of success using tables in this way because STA-related information in databases as tables “have long been commonly used to store and retrieve (look up) relational data, as described in Bharghavan.” *Id.* at 19–20 (citing Ex. 1007, 5:22–34; 7:1–8). But Petitioner does not propose modifying Liu with Bharghavan’s teachings in Ground I. *See id.* at 18–20.

In Ground IV, though, Petitioner argues that a person of ordinary skill in the art would have “looked for ways to efficiently store the relational network information discussed in Liu and would have been motivated to consult Bharghavan, which teaches the use of tables for that purpose.” *Id.* at

90 (citing Ex. 1007, 7:1–8; Ex. 1002 ¶ 215). According to the Petition, Liu already stores network information, including the STA-MAP association. *See id.* at 90. For example, Liu’s databases store link-quality and channel-condition information, and decision-making module 920 makes decisions using the stored information. Ex. 1005 ¶ 62, *cited in* Pet. 18. The Petition does not identify any express disclosure of a table in Liu. Pet. 18, 90–91.

As for the recited table, Ground IV relies on Bharghavan. *See id.* According to Dr. Ding, Bharghavan’s data structure 270 is a table, and its entries are rows. Ex. 1002 ¶ 215. The cited Engineering Dictionary describes a relational database as having tables with rows representing records and columns representing fields. Ex. 1009, 649, *cited in* Ex. 1002 ¶ 199. Similarly, Bharghavan describes data structure 270 as having a set of entries with associated values:

The data structure 270 preferably includes a set of entries, each entry preferably including an AP identifier, a value for a state of the AP, a set of identifiers for wireless devices (here shown as BSSIDs), a value that identifies the AP currently actively communicating with each wireless device, and at least one value that indicates a received signal strength indicator (RSSI), i.e., a measure of received signal strength, for that communication

Ex. 1007, 7:2–9. At this stage, we are persuaded by Petitioner’s argument that Bharghavan’s entries associate an access point (AP) identifier with other information, like a row, and data structure 270 is a set of such entries, like a table. *See* Pet. 84 (quoting Ex. 1007, 7:2–9). At this stage, we determine that Dr. Ding’s assertions about data structure 270 (Ex. 1002 ¶ 215) are credible in light of the cited evidence (Ex. 1009, 649; Ex. 1007, 7:2–9).

In Ground IV, the Petition asserts that adding Bharghavan’s table to Liu would store the data efficiently. Pet. 90. In deciding whether to institute here, we find that Dr. Ding’s un rebutted testimony on this point is credible.

See Ex. 1002 ¶¶ 214–216. Thus, on this record and at this stage, Petitioner sufficiently shows that Bharghavan uses tables to store network information, and it would have been obvious to incorporate database tables in Liu for that same purpose, as discussed in Ground IV. *See* Pet. 90–91.

Unlike Ground IV, the obviousness rationale in Ground I does not propose modifying Liu with Bharghavan. Instead, Petitioner argues in Ground I that one of ordinary skill would have known that Liu uses a specific organization of information in its database tables:

a POSITA would have understood and found obvious that Liu’s network information databases include tables where each row represents a record of an STA, and where the columns contain information *related* to that STA, such as (1) the identity of the STA, (2) the identity of the serving MAP, (3) the link quality and channel conditions measured and reported by the STA, and (4) the bandwidth allocated to the STA by the controller.

Id. at 19 (citing Ex. 1002 ¶¶ 74–78).

As for Ground I only, we preliminarily determine that Liu’s disclosures are insufficient to support Petitioner’s argument about the details of Liu’s database, even in view of the knowledge of a person of ordinary skill in the art as reflected in cited evidence. *Id.* Specifically, apart from Liu’s statement about “one or more databases,” Petitioner has not identified any teachings from Liu that describe the database’s organization. *See id.* at 18–20. So one of ordinary skill in the art would have had to modify Liu to arrive at tables with rows representing STAs and columns containing the related information described in the Petition. *See id.* The Petition, however, provides insufficient reasoning and supporting evidence why one of ordinary skill in the art would have done so. *See id.* at 19. Although Petitioner cites Bharghavan and other references discussing databases generally, Petitioner does not propose modifying Liu with any specific features from those

references in Ground I. *See id.* at 20 (citing Ex. 1007, 5:22–34, 7:1–8, Fig. 2; Ex. 1009, 649; Ex. 1010, 510).

Rather, in Ground I, Petitioner asserts that it would have been obvious to design the database table having specific rows and columns, citing only Dr. Ding’s testimony. *Id.* at 19. We preliminarily determine that Dr. Ding’s assertions about the database structure (Ex. 1005 ¶ 77) are insufficiently supported because Liu does not expressly disclose how its database is organized, and the other cited references only discuss relational data generally (*see* Ex. 1009, 649; Ex. 1010, 510). On this record and at this stage, we preliminarily determine that the Petition provides insufficient reasoning and supporting evidence showing that claim 1 is unpatentable in Ground I. *See* Pet. 18–20.

f. Generating wireless connection quality information

Claim 1 recites, in part:

generating wireless connection quality information for the wireless device specific to the wireless access device, the wireless connection quality information including wireless connection quality information for at least one indirect communication path having at least one network extender device to establish the communication path between the gateway router and the wireless access device.

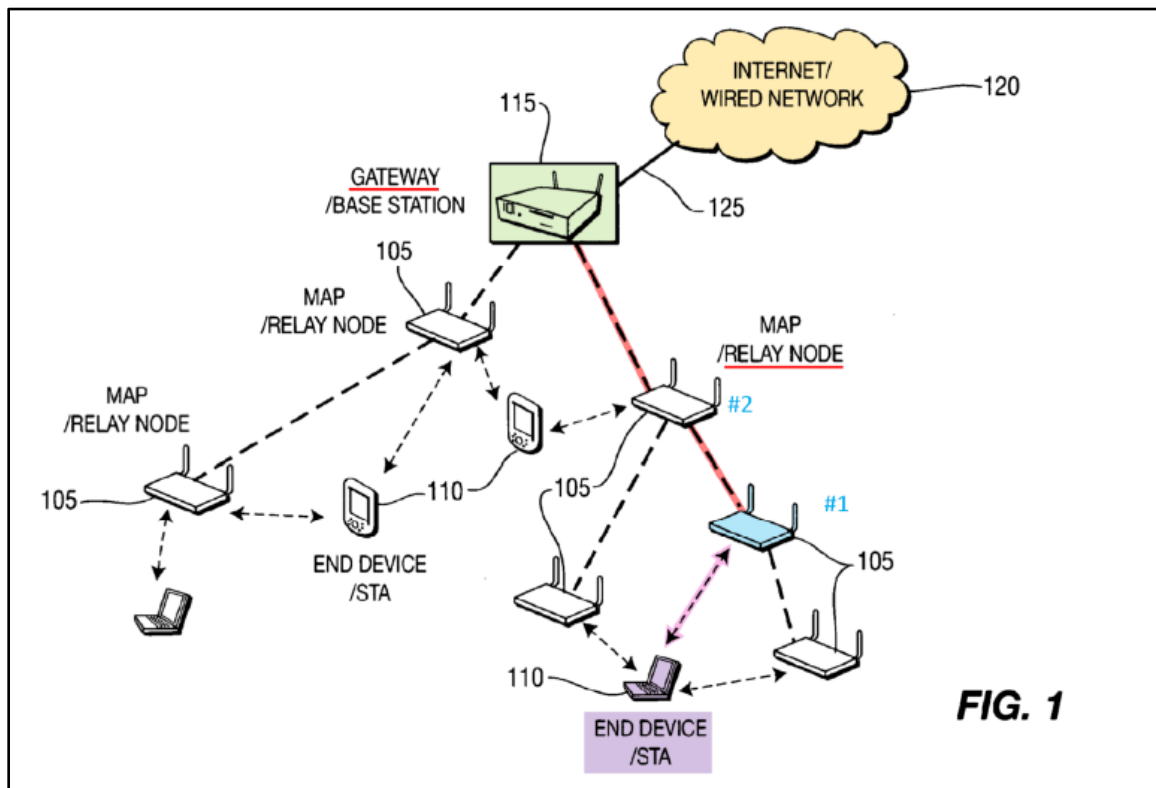
Ex. 1001, 15:41–48.

Petitioner asserts that Liu discloses or renders obvious this limitation. Pet. 21 (citing Ex. 1002 ¶¶ 79–83). Petitioner asserts that Liu’s “logical communication topology” and STA bandwidth allocation are examples of the recited connection quality information. *Id.* (citing Ex. 1001, claim 6, 11:26–28; Ex. 1005 ¶¶ 8, 48, 52–53).

At this stage, Petitioner has shown that Liu’s connection quality includes wireless connection quality information for at least one indirect

communication path, as recited. *See id.* at 21–23. For example, Liu associates STAs with serving MAPs and backhaul paths, which defines its logical communication topology. *See Ex. 1005 ¶ 52.* Liu performs rate allocation within the topology. *Id.* ¶¶ 52–53.

Petitioner annotates Liu’s Figure 1, below, to show that the topology has an indirect multi-hop backhaul. Pet. 22.



Annotated Figure 1, above, shows Liu’s two-hop backhaul communication path (red) between a MAP (blue) and the gateway (green). *Id.* Petitioner annotates the MAP corresponding to the recited “network extender” with blue “#2.” *Id.* MAP #2 carries traffic between MAP #1 and the gateway. *Id.* (citing Ex. 1002 ¶ 81). We find Dr. Ding’s testimony credible at this stage and on this record. *See Ex. 1002 ¶¶ 80–81.* Thus, at this stage, Petitioner sufficiently shows that Liu teaches that the path has at least one network extender device (MAP #2) to establish the communication path between the

gateway router (green) and the wireless access device (the serving map–MAP #1). Pet. 22.

Thus, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 1 is unpatentable over the Liu-Bharghavan combination (Ground IV).

4. *Claims 2–6*

Claims 2–6 depend from claim 1. We have reviewed Petitioner’s arguments and evidence submitted in connection with Ground IV and find them to be sufficient at this stage and on this record. *See id.* at 23–30 (Ground I), 91 (Ground IV incorporating the reasoning from Ground I by reference).

We note that claim 6 recites “connection *patch* quality.” Ex. 1001, 16:4 (emphasis added). Petitioner interprets patch quality as path quality. *See* Pet. 30. For the purposes of institution, we adopt this interpretation in our analysis of the challenge to claim 6.

As for the challenge identified as Ground I, we preliminarily determine that the Petition provides insufficient reasoning and supporting evidence showing that claims 2–6 are unpatentable for the reasons discussed in § II.C.3.e. *See id.* at 23–30.

D. *Obviousness of Claims 7–21 over Liu Alone*

1. *Claim 7*

Petitioner asserts that Liu discloses or teaches the subject matter recited in independent claim 7. Pet. 30–41. Claim 7 recites features that are similar, but not necessarily identical, to those in claim 1: a gateway device,⁴

⁴ Claim 7 recites “a gateway device” (Ex. 1001, 16:9), whereas claim 1 recites “the gateway router” (*id.* at 15:47).

an extended network,⁵ wireless access devices, a wireless device, an external network, and wireless connection quality information for indirect communication paths. *See* Ex. 1001, 16:5–26. For these limitations, Petitioner relies on the same features from Liu as the corresponding limitations in claim 1: gateway 115 (gateway device, Pet. 30–31), the mesh network (extended network, *id.* at 30), MAP 105 (wireless access device, *id.* at 31), STA 110 (wireless device, *id.*), the Internet/wired network 120 (external network, *id.* at 33), and collected network information (connection quality information, *id.* at 39). For reasons similar to those in our analysis of claim 1, we determine that, at this stage and on this record, Petitioner’s showing with respect to these limitations is sufficient. *See supra* § II.C.3.⁶

Unlike claim 1, claim 7 recites the “highest quality wireless connection”:

wherein the gateway device and the wireless access devices include a processor executing the extended management function to identify the wireless access device providing the *highest quality wireless connection* based on wireless connection quality information.

Ex. 1001, 16:15–26 (emphasis added). The Petition uses an interpretation for the term “highest quality wireless connection” that is allegedly based upon Patent Owner’s position in the related ITC proceeding: a calculation “by the system based on ‘certain objective criteria.’” Pet. 32 (citing Ex. 1015, 23; Ex. 1002 ¶¶ 100–101).

⁵ Claim 7 recites “the extended network” (Ex. 1001, 16:10), whereas claim 1 recites “an extended wireless network” (*id.* at 15:25).

⁶ Claim 7 does not include a limitation directed to “a table of wireless devices” as recited in claim 1.

Petitioner asserts that, according to the '025 patent, the highest quality connection depends on the connection's intended use. *Id.* (citing Ex. 1001, 13:58–61). Claim 13, which depends from claim 7, recites that the wireless connection-quality criteria include wireless-signal strength and a noise level, among other things. Ex. 1001, 16:52–57. Likewise, the '025 patent describes a wireless connection quality table entry 212 in table 208 can include a signal strength data field 216 for a wireless access device identifier 214 and a noise field 22 for each wireless band. *Id.* at 10:51–65. Table entry 212 corresponds to a wireless connection between one wireless access device and one wireless device. *Id.* at 10:48–51. In view of these descriptions, the Petition's construction (Pet. 32) is adequately supported for determining whether to institute, and we preliminarily adopt it here.

To the extent that the parties disagree with the interpretation of “highest quality wireless connection,” as required to resolve the patentability challenge here, the parties are encouraged to address this issue during trial.

As for the connection itself, Petitioner argues that Liu's multi-hop backhaul path is an indirect communication path, as recited. *Id.* at 40–41 (citing Ex. 1002 ¶¶ 118–119). Petitioner argues that the quality and channel conditions of Liu's links correspond to the recited wireless connection quality information. *Id.* at 41 (citing Ex. 1005 ¶ 63). According to the Petition, the MAPs on the path measure and exchange the quality information. *Id.* Petitioner argues that Liu's gateway identifies the MAP that provides the optimal STA-MAP association. *Id.* at 39 (citing Ex. 1005 ¶¶ 53–54, 59).

At this stage and on this record, Petitioner has sufficiently shown that Liu's process identifies the serving MAP that provides the highest quality wireless connection, as recited, to an STA. *See id.* at 30–33, 39–41. For our

institution decision, we credit Dr. Ding’s testimony on this issue because it is sufficiently supported by Liu on this record. *See, e.g.*, Ex. 1002 ¶¶ 100–104. Specifically, Liu seeks to maximize “the network throughput with a guaranteed max-min rate allocation.” Ex. 1005 ¶ 51, *cited in* Ex. 1002 ¶ 104. According to Liu, its method achieves “joint optimization of association, routing and rate allocation.” *Id.* On this record and at this stage, Petitioner has shown that, under its adopted construction, Liu teaches an objective criterion: maximized throughput accounting for fairness. *See* Pet. 31–33; Ex. 1002 ¶ 100.

Thus, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 7 is unpatentable over Liu (Ground I). *See* Pet. 30–41.

2. Claim 16

Petitioner asserts that Liu discloses or teaches the subject matter recited in independent claim 16. *Id.* at 47–51. Claim 16 is similar to claim 7 and recites features that are similar, but not necessarily identical, to those in claim 1: a gateway router, an extended network,⁷ wireless access devices, a wireless device, an external network,⁸ wireless connection quality information, and indirect communication.⁹ *See* Ex. 1001, 16:5–26. For these limitations, Petitioner relies on the same or similar features from Liu as the corresponding limitations in claim 1: gateway 115 (gateway device, Pet. 50), the mesh network (extended network, *id.*), MAP 105 (wireless access

⁷ Claim 16 recites “an extended network” (Ex. 1001, 17:7), whereas claim 1 recites “an extended wireless network” (*id.* at 15:25).

⁸ Claim 16 recites “a network external to the extended network” (Ex. 1001, 17:22), whereas claim 1 recites “an external network” (*id.* at 15:31–32).

⁹ Specifically, claim 16 recites “a gateway router communicating indirectly using a network extender device.” Ex. 1001, 17:18–20.

device, *id.* at 48), STA 110 (wireless device, *id.*), the Internet/wired network 120 (external network, *id.* at 50–51), and collected network information¹⁰ for indirect communication (connection quality information, *id.* at 49). For reasons similar to those in our analysis of claim 1, we determine that, at this stage and on this record, Petitioner sufficiently shows that Liu discloses or teaches these limitations. *See supra* § II.C.3.¹¹

Like claim 7, claim 16 recites “a highest quality wireless connection.” Ex. 1001, 17:6. For reasons similar to those in our analysis of claim 7, we determine that, at this stage and on this record, Petitioner sufficiently shows that Liu discloses or teaches this limitation. *See supra* § II.D.1.

Claims 1 and 7 also recite a router and a network. *See* Ex. 1001, 15:24–48, 16:5–26. Claim 16, though, recites a method with steps for receiving data, generating information, and transmitting it. *See id.* at 17:3–22. We have reviewed Petitioner’s arguments about the features that are specific to the method in claim 16 and preliminarily determine that the arguments are sufficient at this stage and on this record. *See* Pet. 47–51.

Thus, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 16 is unpatentable over Liu (Ground I). *See id.*

3. *Claims 8–15 and 17–21*

Claims 8–15 and 17–21 depend from claims 7 and 16. We have reviewed Petitioner’s arguments and evidence submitted in connection with

¹⁰ Here, Petitioner asserts that a person of ordinary skill would have found obvious that each MAP makes link quality/channel conditions measurements on both access and relay interfaces. Pet. 49 (citing Ex. 1002 ¶ 135).

¹¹ We note that claim 16 does not expressly require a table, as recited in claim 1. *See* Ex. 1001, 15:38–39 (claim 1).

the challenges to claims 8–15 and 17–21 and find them to be sufficient at this stage and on this record. *See id.* at 42–46, 51–52.

E. Obviousness of Claims 1–6 over Dean with Bharghavan

Petitioner asserts that claims 1–6 are unpatentable as obvious over Dean and Bharghavan. *Id.* at 75–90.

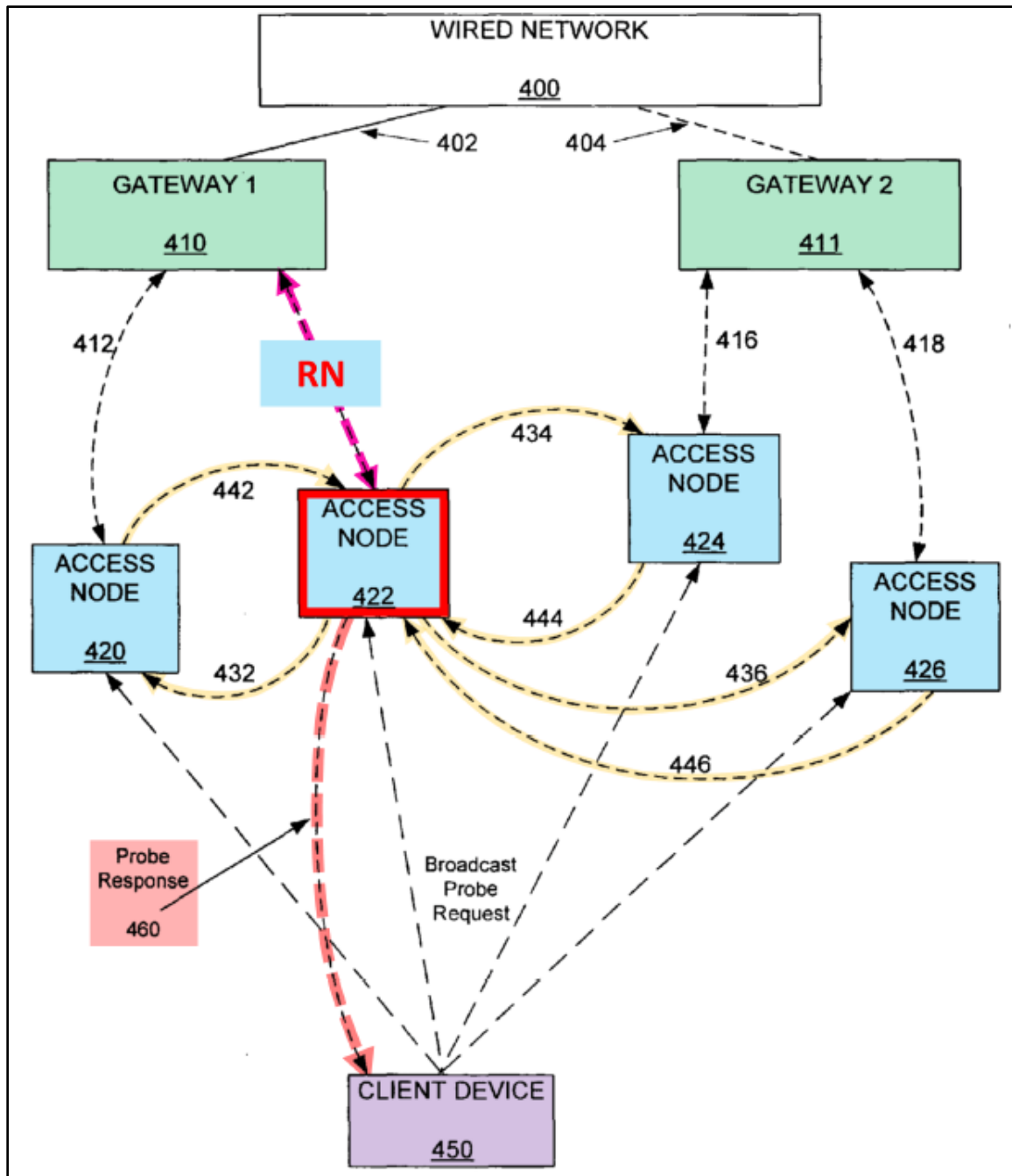
1. Dean

Dean discloses a method for probe-response suppression. Ex. 1006, Abstract. Client devices in Dean’s wireless network use access points to connect to the Internet. *Id.* ¶ 2. A client device initiates the connection by broadcasting probe requests to the access points, and the access points send back probe responses. *Id.* Dean seeks to improve performance by suppressing some probe responses based on a “comparative link quality analysis.” *Id.* ¶¶ 5, 16. Specifically, an access point estimates the quality of a wireless link between a client device and an access point. *Id.* ¶ 18. The quality information is transmitted to other network devices. *Id.* ¶ 20. To improve performance, the access point responds to probe requests associated with the best quality indicators. *Id.* ¶ 21.

2. Claim 1

a. The Petition’s Mapping of Dean to the Claim

In its challenge to claim 1, Petitioner annotates Dean’s Figure 4, reproduced below, to illustrate its mapping to the claimed subject matter. *See* Pet. 86.



The figure above shows client device 450 in purple (wireless device, *id.* at 86), four access nodes 424 in blue (wireless access device, *id.*), gateways 410 and 411 in green (gateway router with a processor, *id.* at 75), and wired network 400 (external network, *id.* at 77). Figure 4 shows links (402, 404, 412–418) between client device 450 and wired network 400. *Id.*

at 86. Links 432 through 446 connecting the access nodes are highlighted in yellow. *Id.* Probe response 460 from access node 422 to client device 450 is highlighted in red. *Id.* Petitioner highlights the indirect, two-hop communication path in magenta. *Id.* at 61 (analysis of claim 7 in § B.1.e); *id.* at 79 (incorporating by reference § B.1.e in the analysis of claim 1). Petitioner explains that the path includes an access point acting as a relay node, labeled “RN” between gateway 410 and access node 422. *Id.* (§ B.1.e). According to the Petition, all devices cooperate to suppress these probe responses, allowing the access point with “the best link quality” to respond. *Id.* at 75–76 (citing Ex. 1006 ¶¶ 15–16).

Having reviewed the record, we preliminarily determine that Petitioner’s arguments corresponding to the mapping described above and Dean’s teachings are adequately supported. *See id.* at 75–86.

b. The Combination with Bharghavan

In the proposed combination, Petitioner argues that a person of ordinary skill in the art would have been motivated to use processors and database tables, as taught by Bharghavan, in Dean’s system. *See id.* at 79–82 (discussing the processor), 84–85 (discussing tables).

As for the processors, Petitioner argues that one of ordinary skill would have been “motivated to use processors and software in Dean’s network devices because that would provide greater flexibility to handle the different methods of estimating and transmitting link quality parameters and the different routing algorithms taught in Dean.” *Id.* at 79–80 (citing Ex. 1002 ¶ 193; Ex. 1006 ¶¶ 21, 30–41). Petitioner argues that Bharghavan uses processors for probe-response suppression, which is also performed in Dean. *Id.* at 80–81 (citing Ex. 1007, 5:21, 6:17–22, Fig. 1; Ex. 1002 ¶¶ 193–195).

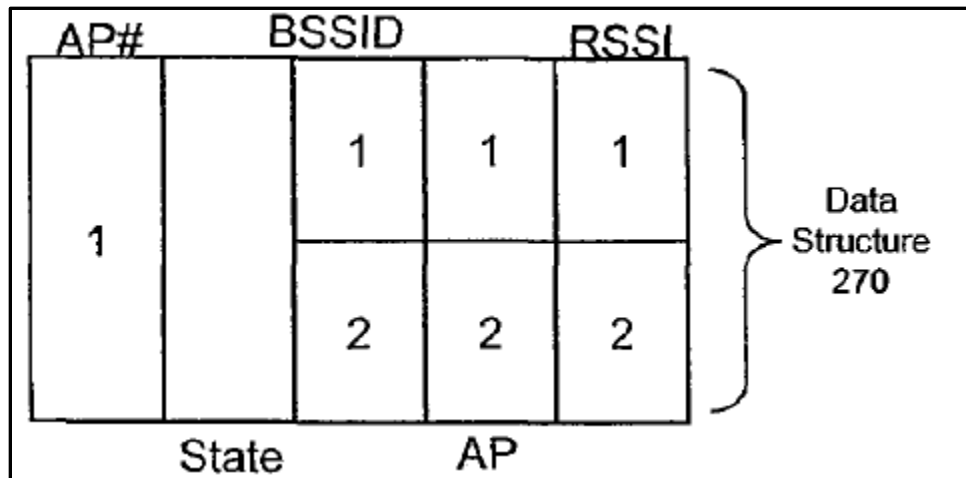
At this stage and on this record, Petitioner’s obviousness rationale is sufficient. *Id.* For example, Dean uses several different quality parameters: “an indicator of a bandwidth of a backhaul connection” (Ex. 1006 ¶ 33), “an indicator of whether the access node is a mobile access node or a fixed access node” (*id.* ¶ 34), among others (*see id.* ¶¶ 30–35). According to Dr. Ding, using processors and software, instead of pure hardware, would provide flexibility. Ex. 1002 ¶¶ 193–194. At this stage and on this record, we find Dr. Ding’s testimony credible. *See id.* Thus, we determine that Petitioner has provided sufficient articulated reasoning with some rational underpinning to support its conclusion of obviousness. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

As for the table, Petitioner relies on Bharghavan’s data structure 270, which is also cited in the combination with Liu (Ground IV). *See* Pet. 84–85 (citing Ex. 1007, 5:22–34, 7:1–8, Fig. 2; Ex. 1009, 649; Ex. 1010, 510). For the reasons discussed in § II.C analyzing the Liu-Bharghavan combination, Petitioner sufficiently shows that Bharghavan’s data structure 270 is a table, at this stage and on this record. *See id.*

In the Dean-Bharghavan combination, Petitioner explains that a person of ordinary skill in the art “would have looked for ways to efficiently store the relational network information discussed in Dean and would have been motivated to consult Bharghavan, which teaches the use of tables for the same purpose.” *Id.* at 84.

At this stage and on this record, Petitioner’s obviousness rationale is sufficient. *Id.* Specifically, Dean’s APs receive a probe request from a client device, and the AP estimates the device’s link quality by measuring the request’s received signal-strength indicator (RSSI). *See* Ex. 1006 ¶ 16 (describing estimating link quality), ¶ 20 (discussing RSSI and estimating

quality). Dean's AP transmits that information to other network devices. *See id.* ¶ 20. Petitioner argues that one of ordinary skill in the art would have found it obvious to use Bharghavan's data structure to efficiently store the information. Pet. 84. As shown in Figure 2, show in part below, Bharghavan's data structure 270 stores RSSI. *See id.* at 84–85 (citing Fig. 2).



The figure above shows that data structure 270 has entries containing an AP identifier (AP#), identifiers for wireless devices (BSSIDs), and RSSI.

Ex. 1007, 7:1–8, *cited in* Pet. 84. On this record and at this stage, Petitioner's assertion that Bharghavan teaches a table storing network information, such as RSSI, is sufficiently supported. Pet. 84. At this stage, Petitioner has provided sufficient articulated reasoning with some rational underpinning to support its conclusion of obviousness. *KSR*, 550 U.S. at 418.

Thus, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 1 is unpatentable over the Dean-Bharghavan combination. *See* Pet. 75–87.

3. Claims 2–6

Claims 2–6 depend from claim 1. We have reviewed Petitioner's arguments and evidence submitted in connection with the challenges to

claims 2–6 and find the challenges to be sufficient at this stage and on this record. *See id.* at 87–90.

Petitioner relies on the reasoning presented in its challenge to claim 13 in the challenge of claim 6 under the Dean-Bharghavan combination. *See id.* at 90 (referring to Section VII.B.6 analyzing claim 13). Claim 6 recites “connection *patch* quality,” whereas claim 13 recites “connection *path* quality.” *Compare* Ex. 1001, 16:4 (claim 6), *with id.* at 16:57 (claim 13) (emphasis added). Petitioner interprets patch quality as path quality. *See* Pet. 30. At this stage, we adopt this interpretation.

F. Obviousness of Claims 7–11 and 13–21 over Dean

Petitioner asserts that claims 7–11 and 13–21 are unpatentable as obvious over Dean. *Id.* at 52–74.

1. Claim 7

Petitioner asserts that Dean discloses or teaches the subject matter recited in independent claim 7. *Id.* at 52–64. Claim 7 recites features that are similar, but not necessarily identical, to those in claim 1: a gateway device,¹² an extended network,¹³ wireless access devices, a wireless device, an external network, and wireless connection quality information for indirect communication paths. *See* Ex. 1001, 16:5–26. For reasons similar to those in our analysis of claim 1, we determine that, at this stage and on this record, Petitioner sufficiently shows that Dean discloses or teaches these limitations. *See supra* § II.E.2.

¹² Claim 7 recites “a gateway device” (Ex. 1001, 16:9), whereas claim 1 recites “the gateway router” (*id.* at 15:47).

¹³ Claim 7 recites “the extended network” (Ex. 1001, 16:10), whereas claim 1 recites “an extended wireless network” (*id.* at 15:25).

Unlike claim 1, claim 7 recites that the “highest quality wireless connection” is identified. *See* Ex. 1001, 16:15–26. The Petition uses an interpretation for the term “highest quality wireless connection” that is allegedly based upon Patent Owner’s position in the related ITC proceeding: a calculation “by the system based on ‘certain objective criteria.’” Pet. 32 (citing Ex. 1015, 23; Ex. 1002 ¶¶ 100–101). Under this interpretation, Petitioner sufficiently shows that Dean discloses or renders obvious this feature for at least the reason that Dean’s quality analysis sets the criteria for assessing the access point with the “best link quality.” *See* Ex. 1006 ¶ 16, *quoted in* Pet. 59.

From our review of Petitioner’s arguments and evidence submitted in connection with the challenges to claim 7, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 7 is unpatentable over Dean. *See* Pet. 52–64.

2. Claim 16

Petitioner asserts that Dean discloses or teaches the subject matter recited in independent claim 16. *Id.* at 70–74. Claim 16 recites features that are similar, but not necessarily identical, to those in claim 1: a gateway router, an extended network,¹⁴ wireless access devices, a wireless device, external network,¹⁵ wireless connection quality information, and indirect communication.¹⁶ *See* Ex. 1001, 16:5–26. For reasons similar to those in our analysis of claim 1, we determine that, at this stage and on this record,

¹⁴ Claim 16 recites “an extended network” (Ex. 1001, 17:7), whereas claim 1 recites “an extended wireless network” (*id.* at 15:25).

¹⁵ Claim 16 recites “a network external to the extended network” (Ex. 1001, 17:22), whereas claim 1 recites “an external network” (*id.* at 15:31–32).

¹⁶ Specifically, claim 16 recites “a gateway router communicating indirectly using a network extender device.” Ex. 1001, 17:18–20.

Petitioner sufficiently shows that Dean discloses or teaches these limitations. *See supra* § II.E.2.

Like claim 7, claim 16 recites “a highest quality wireless connection.” Ex. 1001, 17:6. For reasons similar to those in our analysis of claim 7, we determine that, at this stage and on this record, Petitioner’s showing with respect to this limitation is sufficient. *See supra* § II.F.1.

Claims 1 and 7 recite a router and a network. *See* Ex. 1001, 15:24–48, 16:5–26. Claim 16, though, recites method with steps for receiving data, generating information, and transmitting it. *See id.* at 17:3–22. We have reviewed Petitioner’s arguments about the features that are specific to the method in claim 16 and preliminarily determine that they are sufficient at this stage and on this record. *See* Pet. 70–74.

Thus, at this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing in showing that claim 16 is unpatentable over Dean. *See id.*

3. *Claims 8–11, 13–15, and 17–21*

Claims 8–11, 13–15, and 17–21 depend from claims 7 and 16. We have reviewed Petitioner’s challenges to claims 8–11, 13–15, and 17–21 and determine that Petitioner has shown a reasonable likelihood of prevailing. *See id.* at 65–69, 74.

III. CONCLUSION

Petitioner has shown a reasonable likelihood of prevailing as to the unpatentability of at least one of the challenged claims. Thus, we institute an *inter partes* review on all claims challenged in the petition and on all grounds in the petition.

IV. ORDER

It is

ORDERED that, under 35 U.S.C. § 314(a), an *inter partes* review of claims 1–21 of the '025 patent is instituted for all grounds in the Petition; and

FURTHER ORDERED that, under 35 U.S.C. § 314(a), *inter partes* review of the '025 patent is instituted on this Decision's entry date, and under 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the trial's institution.

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Patent 9,468,025 B2

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