UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Emerson Electric Co.,
Petitioner

v.

IP Co, LLC,
Patent Owner

Case IPR2016-01602
U.S. Patent 6,249,516

IP Co, LLC'S PATENT OWNER'S RESPONSE

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EXHIBITS

Exhibit No.	Description
2001	The American Heritage College Dictionary, Third Edition, Houghton Mifflin Company, 1993, p. 827.
2002	Expert Declaration of Dr. Almeroth.
2003	McQuillan, J., The New Routing Algorithm for the ARPANET, IEEE Transactions on Communications (1980) (“McQuillan”)
2004	Second Declaration of Dr. Almeroth.
2005	K. Ramachandran, I. Sheriff, E. Belding, and K. Almeroth, "Routing Stability in Static Wireless Mesh Networks," Passive and Active Measurement Conference (PAM), Louvain-la-neuve, BELGIUM, April 2007
2006	Transcript of Deposition of Mr. Geier.

I. INTRODUCTION

The Board should not cancel any of the challenged claims of this *inter partes review* of U.S. Patent No. 6,249,516 ("the '516 patent") because Petitioner did not establish by a preponderance of the evidence that any of the challenged claims are unpatentable for three separate and independent groups of reasons.

First, one or more of the limitations required by the challenged claims would not have been taught or suggested by the prior art to one of ordinary skill in the art (*infra*, §§ VI.A). For example, the prior art does not teach that a digital controller "changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway," as required by all the challenged independent claims in this proceeding (*i.e.*, claims 1 and 10). Burchfiel instead establishes a path to a packet radio node (PRN) only when a path does not exist (*i.e.*, at network initialization, or when a repeater or station fails). Burchfiel cannot possibly teach optimizing the transmission paths from the client to the gateway as claimed either at initialization or component failure because no such path exists at either time.

In addition, the prior art does not teach choosing any of the transmission paths in the group that is recited in claims 1 and 10 of the '516 patent or "adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network," as recited in claim 10.

Second, the Petitioner's obviousness rejections are all predicated on the false assumption that a skilled artisan could have achieved the particular claimed scheme of optimizing data packet transmission paths from a client to a gateway according to specific criteria by combining the teachings of Burchfiel, Schwartz and Heart. But these references disclose very different structures and approaches. Burchfiel teaches a centralized routing approach in a wireless network while Schwartz teaches a decentralized algorithm (*infra*, § VI.A). Neither Schwartz nor Heart teach any routing approach that was designed for wireless networks (*id.*). Petitioner did not provide any evidence as to why one of ordinary skill in the art would have used Schwartz's decentralized approach with Burchfiel's station or why one of ordinary skill in the art would use within a wireless network algorithms like those in Schwartz and Heart that were not designed for a wireless network (*id*).

Third, secondary considerations bolster the finding of non-obviousness (*infra* § VI.C). The claimed device and method satisfies a long-felt, unmet need by optimizing data packet transmission paths in a wireless network according to particular criteria to decrease data congestion and improve efficiency. Prior art wireless systems such as Ricochet and those that used the AX.25 protocol exhibited a number of drawbacks resulting in packet duplication and proliferation, and data congestion (Exhibit 1001, 2:35-65, 3:10-16). The prior art references asserted in this proceeding suffer from the same inefficiencies because unlike the claimed invention, they do not optimize existing transmission paths to improve network efficiency, thereby reducing packet proliferation and data congestion.

For the reasons mentioned above as explained more fully below, the Petitioner failed to demonstrate by a preponderance of the evidence that any of the challenged claims are unpatentable.

II. TECHNOLOGY BACKGROUND

A. Prior Art Wireless Routing

The ’516 patent is generally directed towards wireless networks and routing data packets within those networks. As discussed in the background of the ’516 patent, there are generally two types of wireless networks: client-server networks and peer-to-peer networks (Ex. 1001, 1:19–28). Client-server networks employ at least one server that “influence[s] data flow within the network and access to certain network functions such as central file repository, printer functions, Internet gateways, etc." (*id.* at 1:23–26). Peer-to-peer networks, on the other hand, do not use servers, but, rather, each node operates independently without central control (*id.* at 1:27–28).

Some prior art networks employed point-to-point routing where a data packet followed a specific path through a network from the source node to the destination node. Conventional point-to-point routing may be centralized or decentralized. In centralized routing, typically associated with client-server networks, a central node or server is the only node with general knowledge of the network, and that node selects the routing paths to be used by other nodes or clients in the network (Exhibit 2004, ¶ 56). In decentralized routing, typically associated with peer-to-peer networks, "each node in the network maintains knowledge of the network topology and calculates its own routes to every other node" (*id.* at ¶ 58).

Prior art wireless communication systems such as those asserted in this proceeding as well as the Ricochet system and AX.25 protocol systems discussed in the background section of the '516 patent exhibited a number of drawbacks such as packet duplication and data congestion (Exhibit 2004, ¶ 183).

Similarly, in peer-to-peer digital repeater systems using the AX.25 protocol, "each peer repeats all data packets that it receives, resulting in rapid packet proliferation. In fact, with this protocol, so many packet collisions occur among the peers that the packets may never reach the intended peer" (*id.* at 3:12-16).

Accordingly, there existed a need at the time of the invention of the '516 patent for "a packet-based wireless computer network that is both robust and efficient, wherein … if a better link to a server becomes known to a client, where the link for a client can be updated and improved" (*id.* at 4:40-49).

B. The '516 Patent: Edwin B. Brownrigg and Thomas W. Wilson Invent A New Type Of Wireless Server That Maintains A Map Of Data Transmission Paths From Wireless Clients To The Server And Optimizes The Paths According To Certain Criteria.

The claims of the '516 Patent are directed to a server providing a gateway between two networks, one of which is wireless. This server (also called a gateway) contains a digital controller that is able to communicate wirelessly with a first network using a radio modem and communicate with a second network using a network interface.

In the wireless network, transmission paths from RF capable wireless devices (called clients) to the server can be through one or more other wireless clients. The digital controller maintains a map of the data transmission paths for these wireless clients to the gateway server.

The digital controller "changes the transmission paths of clients to optimize the transmission paths including changing the transmission paths from the clients to the gateway" based on one of four criteria: the path to the gateway through "the least possible number of additional clients," "the most robust additional clients," "the clients with the least amount of traffic," or "the fastest clients." In this way, the claimed invention changes the transmission paths from clients to the gateway, which are on a map being maintained by the gateway, so that these paths are optimized. Thus the claim satisfies one goal of the '516 patent, which is to enable clients and servers to find "better link[s]" to each other (*see, e.g.*, Ex. 1001, 4:40–48).

III. SUMMARY OF THE INSTITUTED GROUNDS FOR REVIEW

For the Board's convenience, below is a summary of the instituted grounds of review:

1. Claims 1, 4, 10, 13, and 14 are alleged to be obvious under 35 U.S.C. § 103(a) over Burchfiel in view of Schwartz and Heart;
2. Claims 2, 5, and 11 are alleged to be obvious under 35 U.S.C. § 103(a) over Burchfiel in view of Schwartz, Heart, and the Online Encyclopedia.

IV. CLAIM CONSTRUCTION.

Claim construction is generally an issue of law. The Petitioner stated in its Petition that the "'516 [patent] will expire no later than December 6, 2016"

(Petition, p. 9). Thus, the '516 patent has already expired. Accordingly, the claims should be construed pursuant to the principle set forth by the court in *Phillips v. AWH Corp*.[1] The PTO expressly acknowledges that the principles set forth in *Phillips* will result in narrower claim constructions: "Once the patent expires, a narrow claim construction is applied." MPEP 2666.01, *citing* MPEP § 2258, subsection I.G.

The terms used in the claims ***bear a heavy presumption that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art***. *Vitronics Corp. v. Conceptronic, Inc*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) (emphasis added), *citing*, *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). The specification is the

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[1] *In re Rambus, Inc.*, F694 F.3d 42 (Fed. Cir. 2012) (the Patent Office must apply the Phillips standard to construe claims of an expired patent during reexamination); *In re CSB-System International, Inc.*, 832 F.3d 1335, 1337 (Fed. Cir. 2016), cert. denied sub nom. CSB-Sys. Int'l, Inc. v. Lee, No. 16-994, 2017 WL 620163 (U.S. Mar. 27, 2017 ("When a patent expires during a reexamination proceeding, the PTO should thereafter apply the Phillips standard for claim construction … regardless of whether this means that the Board applies a different standard than the examiner"). (p. 8).

single best source for claim interpretation. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Claim terms are to be given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure. *Id.* at 1313; *Research in Motion v. Wi-Lan*, Case IPR2013-00126, Paper 10 at 7 (P.T.A.B. June 20, 2013).

Any term not construed below should be given its ordinary and customary meaning as would be understood by one of ordinary skill in the art. Patent Owner proposes the following claim constructions for the purposes of this *inter partes* review proceeding.

A. "transmission path of a client of said first network to said server" (claim 1); and "transmission path from the client to the gateway" (claim 10).

Each of claims 1, and 12 includes language requiring the transmission path to include the entire path from the client in a first or wireless network to a server or gateway. For example, claim 1 recites that "a transmission path of a client of said first network to said server can be through one or more of other clients of said first network." Claim 10 recites a "path to the gateway through the least possible number of additional clients."

Therefore, the "transmission path a client of said first network to said server" of claim 1; and the "transmission path from the client to the gateway" of claim 10 should be construed as a "description of the entire path of clients from the client to the server or gateway."

The Specification of the '516 patent supports Patent Owner's proposed construction (Exhibit 2004, ¶ 97). The Specification uses the term path and link interchangeably: "the client will communicate with a 'neighbor' client which has its own ***path*** ('***link***') to the server. Therefore, a client can communicate with the server along a link that includes one or more other clients" (Ex. 1001, 4:56–59 (emphasis added)). And the Specification clearly states that the "link" or "path" includes all the nodes along the path from the client to the server:

> It will therefore be understood that when speaking of a link to an adjacent client, that this also implicitly includes all necessary links from that adjacent client to the server, i.e. a link is ***the entire path description from a given client to a given server.***

(Ex. 1001, 9:52–58 (emphasis added)).

The Petitioner's proposed construction of link or path as "the identification of each of the hops to be traversed by the data message packet en route to the server" (Petition, p. 10) is wrong because it is limited to only one of many ways of describing a path. As explained by the Patent Owner's expert, Dr. Almeroth, one of ordinary skill at that time would also have known that a path could have been identified by neighbor numbers (Ex. 2002, ¶¶ 97-

99). As further explained by Dr. Almeroth, one of ordinary skill at that time would also have known that a path could be described by identifying the neighboring nodes to which data should not be sent (*id.*).

The Petitioner's expert in a related IPR agreed that there were many ways of describing a path known as of the priority date of the '516 patent; he testified that a path could be described by "neighbor tables that list their nearest neighbors" (IPR2015-01901, Ex. 2004, p. 109, ll. 1-2).[2] Petitioner's expert admitted that there were many ways to describe a path known to one of ordinary skill as of the priority date of the '516 patent (*id.* at pp. 107-111).

Thus, the Patent Owner's construction of the transmission path limitations of claims 1 and 10 is the ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure. The Board largely agreed with Patent Owner's construction by construing "the terms 'link' or 'path' as 'connections between adjacent

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[2] Indeed, the Petitioner's counsel was so concerned that Dr. Heppe would testify that there were many ways to describe a path that the counsel interrupted Dr. Heppe's deposition to ask the Board to stop Patent Owner's counsel from asking questions on this topic (*id.* at pp. 93-103). Not surprisingly, the Board allowed the questions to be asked (*id.* at p. 103).

nodes and the entire path description from a given client to a given server.'"

Paper No. 10, p. 8.

B. "a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network" (claim 1 and similarly in claim 13).

As explained above, a transmission path in the context of independent claims 1 and 10 is a description of the entire path from a client to either a first node or a gateway (*supra* § IV.B). A map of transmission paths as recited in claim 1 and as similarly recited in claim 13 (dependent from claim 10) is properly construed as "a data structure containing a representation of a plurality of transmission paths from a client to the server through one or more other clients" (Exhibit 2004, ¶ 103). This proposed interpretation is the broadest reasonable construction because it is supported by the dictionary definition of the term "map" as "a representation usually on a plane surface, of a region of the earth or heavens" (Ex. 2001, p. 827).

Moreover, a term ending in a letter "s" like the claim term "paths" would ordinarily be understood as being plural (*i.e.*, a plurality). Indeed, the Petitioner's expert in a related IPR admitted that terms ending in the letter "s" are ordinarily understood to be plural: "***the word is plural***, so I think in many cases, you know, ***the presumption is that it would be more than one path*** but you've said in general without reference to this particular document and probably without narrowing it even to this case, so it's, ***there may be some example you can come up with that is kind of strange, but most people would recognize the word spelled P-A-T-H-S is plural*** and probably refers to more than one path unless the context indicates otherwise" (IPR2015-01901, Ex. 2004, p. 75, ll. 5-22 (emphasis added)). The '516 patent does not provide a "kind of strange" definition of the claim term "paths." That is, the '516 patent does not define the claim term "paths" ending in an "s" in a strange way to indicate that it includes just one path (*i.e.*, that it is not plural) (*see e.g.*, Exhibit 1001, cols. 1-6).

Thus, the Patent Owner's construction of the map of transmission paths, as recited in claims 1 and 13 is the ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure and is consistent with Federal Circuit precedent.

The Board's construction is incomplete because it specifies what the "map" contains but does not specify what the claimed "map of data packet transmission paths" is (Paper No. 10, p. 8). In particular, the Board construed "the term 'map' as containing the paths or links to a node in the network" (*id.*). Patent Owner therefore respectfully proposes that its construction should be adopted.

C. "changing the transmission path from the client to the gateway so that the path to the gateway is chosen …" (claims 1 and 10).

Claim 1 recites a controller in a server "changing the transmission path from the client to the gateway so that the path to the gateway is chosen …" The claim language itself, therefore, requires the controller within the server to change the selection of a transmission path including an identification of an entire path from the client to the server. Petitioner's expert Mr. Geier agreed:

> **Q. Does the digital controller change the transmission paths of clients to optimize transmission paths from the client to the gateway?**
>
> A. Again, Claim 1 says that the server has a controller that changes the transmission paths of clients to optimize the transmission paths, including changing the transmission path from the client to the gateway.

(Exhibit 2006, 32:4-12).

In another IPR against a related patent, the Board stated with respect to the claim term "select" (which is a synonym of the term "chosen" in the claim limitation quoted above) that "Patent Owner is correct in noting that the ordinary and customary meaning of 'select' is to make a choice between alternatives" (IPR2015-01901, Institution Decision, Paper No. 9, pp. 8-9). That Board was "not persuaded that the claim term when viewed in light of the specification should be construed to have a meaning other than the ordinary and customary meaning of the term" (*id.* at p. 9). Like the claim term "select," the ordinary and customary meaning of "chosen" is to make a choice among alternatives.

Further, the Specification of the '516 patent supports Patent Owner's proposed construction that "a transmission path from the client to the gateway" must describe a path from the client node to the gateway. The Specification uses the term path and link interchangeably: "the client will communicate with a 'neighbor' client which has its own ***path*** ('***link***') to the server. Therefore, a client can communicate with the server along a link that includes one or more other clients" (Ex. 1001, 4:56–59 (emphasis added)). And the Specification clearly states that the "link" or "path" describes an entire path from the client to the gateway (*supra*, § IV.A.).

Thus, the Patent Owner's construction of "changing the transmission path from the client to the gateway so that the path to the gateway is chosen …" as "changing the selection of a transmission path including an identification of an entire path from the client to the server," is the ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure and should be adopted in this proceeding.

D. "reverse link" (claims 10 and 12).

The proper construction of the claim term "reverse link" is a "path from a gateway to a client through the same nodes as a link from the client to the gateway, in the opposite order."

This construction is consistent with the claim language itself and the specification. Claim 10 itself recites a "method providing a gateway between a wireless network and a second network comprising: … receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network" (Exhibit 1001, 24:66-25:67). That is, the claim itself indicates that the reverse link is added to the data packet that is received from the second network and destined for a client. Because the claim also specifies a gateway between a wireless network and a second network, this data packet must necessarily pass through a path from the gateway to the client.

Each and every description of the reverse link in the Specification indicates that the path from the gateway to a client through the same nodes as a path from the client to the gateway, in the opposite order: "The simplest way of determining the reverse address is simply reverse the link section of the header portion of the data packet of FIG. 21b to provide a return address of

21c" (*id.* at 22:62-65). FIGs 21b and 21c (reproduced below) show how the list of addresses of the nodes of the forward link from the client to the gateway is put in the reverse or opposite order to form the reverse link from the gateway to the client:

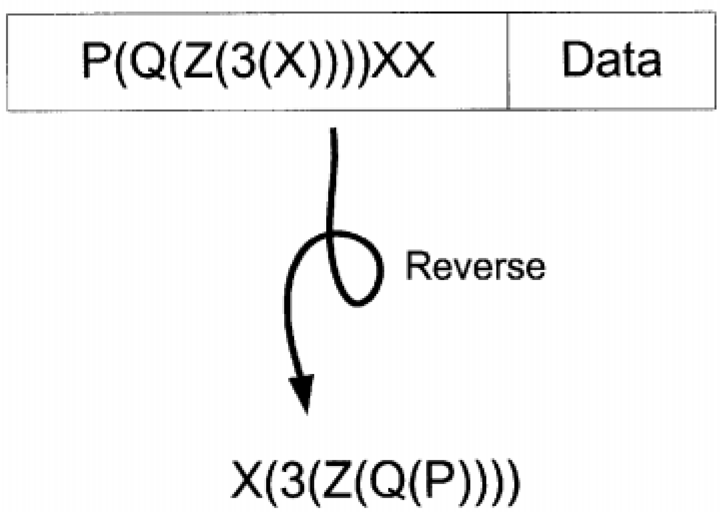

Fig. 21b

Fig. 21c

Indeed, the Specification explains in detail on how the reverse link is formed by reversing the order of the nodes in the forward link:

> the tree of FIG. 21a can be used to reconstruct the return path. This is accomplished by jumping from parent to parent in reverse order as indicated to determine the return path. In this example, the reverse order parent jumping indicates that the original path the server X was P>Q>Z>3>X, which, when reversed, gives us the proper reverse path, namely X(3(Z(Q(P)))). As will be appreciated by those skilled in the art, this type of reverse tree

traversal is easily accomplished with a recursive function (id. at 23:1-9).

Petitioner's expert Mr. Geier agreed that the reverse link is formed by reversing the order of the nodes in the forward link:

BY MR. GONSALVES:
Q. So suppose you would have described the forward link as C, B, A, S, how would you describe the corresponding reverse link --
MR. DAVIS: Objection, form.
BY MR. GONSALVES:
Q. -- in Figure 1A?
MR. DAVIS: Objection, form.
THE WITNESS: Well, that link between C and S, if you're going to send something from C to S that's one direction. If you're going to communicate the other direction from S to C, it would be using S, A, B, C. I don't understand. Maybe I don't understand your question, but that's how I would interpret that drawing or that pictorial.

(Exhibit 2006, 41:13-21).

For all these reasons, Patent Owner's proposed construction of the "reverse link" is the ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure and should be adopted in this proceeding.

V. THE SCOPE AND CONTENT OF THE PRIOR ART.

An obviousness analysis requires a consideration of the scope and content of the prior art and the differences between the prior art and the claims (*see* MPEP § 2141.01, 2141.02).

The Petitioner proposed obviousness rejections based upon Burchfiel, Schwartz, Heart, and the Online Encyclopedia. These references are summarized below.

A. Burchfiel (Exhibit 1005).

Burchfiel describes a packet radio network as having "a digital broadcast channel, fixed and mobile digital terminals … stations which provide centralized routing control and interconnections to other networks, and repeaters which provide area coverage for mobile terminals" (Ex. 1005, p. 245, col. 1). Burchfiel teaches objectives including "low-cost use of a broadcast band in digital burst mode to support digital computer and terminal communication, demonstration of coexistence with existing broadcast applications" (*id.*).

Burchfiel does not teach that a digital controller "changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway," as recited in claim 1 and as similarly recited in claim 10. Burchfiel does not optimize an existing transmission path; it instead establishes a path to a packet radio node (PRN) only when a path does not exist (*i.e.*, at network initialization, or when a repeater or station fails).

In addition, Burchfiel does not teach choosing any of the transmission paths in the group that is recited in claims 1 and 10 of the '516 patent; it does not teach, for example, choosing "the path to the gateway through the least possible number of additional clients," as recited in claims 1 and 10. Burchfiel instead discloses "forwarding of packets [in the direction of minimum distance] to the next repeater within 'earshot'" (Ex. 1005, p. 247, col. 1). Burchfiel's "minimum distance" differs from the claimed "least possible number of additional clients" because a path from a source node to a destination node through two or more intermediate nodes that are close to each other could traverse a smaller distance than another path from the source to the destination node through only one intermediate node.

Burchfiel also does not teach "adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network," as recited in claim 10. Rather, Burchfiel instead teaches that a simple gateway "is merely a packet reformatting and readdressing service" (Ex. 1005, p. 249). The claimed "reverse link" from a server to a client – when properly construed in light of the Specification – must describe a path through the same nodes as a link from the client to the server (i.e., forward link), except in the opposite direction. And there is no teaching in Burchfiel of adding a header to a received packet that includes route information to a client (*i.e.*, a direct or indirect link). Also, there is no teaching in Burchfiel that its "function" is a packet type as required by claim 10, contrary to Petitioner's allegation. Rather, Burchfiel discloses that its "'function fields' provides [sic] an address: within a PRU, it selects the control process, the debugging process, or the measurement process" (*id.* at p. 247).

B. Schwartz (Exhibit 1007).

Schwartz provides an overview of "routing algorithms used to establish the appropriate routing paths" between nodes in a network (Ex. 1007, p. 259). Schwartz teaches that routing algorithms can be either "centralized" by "establishing the paths between source and destination nodes at a centralized network management center and then distributing the routing information to all nodes in the network," or can be "decentralized" where "each node exchange[s] cost and routing information with its neighbors on an iterative basis, until routing tables at the nodes converge to the appropriate shortest-path entries" (*see id*. at 267).

Schwartz also teaches that packet switched networks typically employ shortest path routing algorithms and discloses two algorithms for achieving this result: Algorithm A, which is the link-state approach, and Algorithm B, which is the distance vector approach (*id.* at 268-274). In Algorithm A, "each node keeps a complete (global) topological database [of the network] that is updated regularly as topological changes occur" (Ex. 1007, 297; *see also id*. at 268). "[E]ach node . . . then carr[ies] out its own computation, using the same global information and generate[s] its own tree and corresponding routing table" (*id.* at 270). Accordingly, each node "finds the shortest paths from [itself] to all other nodes" (*id.* at 268).

Schwartz does not choose paths in accordance with any of the criteria required by independent claims 1 and 10. Rather, Schwartz teaches choosing the path with the lowest cost which is "related to such parameters as link length, speed, or bandwidth of link (transmission capacity), whether secure or not, estimated propagation delay, or some combination of these. The cost could include the average traffic expected at a given hour on a given day, it could include measured estimates of link traffic, buffer occupancy, measured error conditions on the link, and so forth" (Ex. 1007, pp. 260-261).

C. Heart (Exhibit 1004).

Heart entitled "The interface message processor for the ARPA [Advanced Research Projects Agency] computer network" is dated 1970, more than two decades prior to the date of invention of the '516 patent (Ex. 1004, p. 551). Heart discloses a simple network including only four nodes: "a four-node test network was scheduled for completion by the end of 1969" (*id.* at p. 552, col. 1). Heart discloses what was then a "new kind of digital communication system employing wideband leased lines and message switching, where a path is not established in advance and each message carries an address" (*id.* at p. 551, col. 1). "[A]t each node, a copy of the message is stored until it is safely received at the following node. The network is thus a store and forward system" (*id.* at p. 551, col, 2). "ARPA decided to place identical small processors at each network node" (*id.*). "[T]he research computer centers are called Hosts and the small processors are called Interface Message Processors, or IMPs" (*id.*).

Significantly, Heart makes no mention whatsoever of wireless communication or a wireless network, let alone a wireless server that maintains a map of data transmission paths from wireless clients to the server and optimizes the paths according to certain criteria that is disclosed and claimed by the '516 patent (*id.* at pp. 551-556).[3]

Schwartz also does not teach "adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network," as recited in claim 10. There is no teaching in Schwartz of adding a header to a received packet that includes the claimed "reverse link." Also, there is no teaching in Heart that its "function" is a packet types as required by claim 10.

D. Online Encyclopedia (Exhibit 1008).

The portions of the Online Encyclopedia referenced by Petitioner discusses the Internet Protocol TCP/IP (Petition, pp. 55-56; Ex. 1008, p. 89). As explained by Patent Owner's expert Dr. Almeroth, "[b]ecause TCP/IP and the protocol disclosed in Burchfiel are different, the use of TCP/IP would

[3] Petitioner's expert Mr. Geier had a very limited knowledge of Heart; he could not "remember if Heart mentioned wireless" or if it disclosed a four node test network that was scheduled for completion by the end of 1969 (Exhibit 2006, 101:1-9).

eliminate the ability to include within a packet any of the information from the packet structure in Burchfiel (including the "ROUTE" and "FUNCTION" fields) and any of the packet structure in Heart (including any of the header bits)" (Ex. 2002, ¶ 113).

VI. THE PETITIONER DID NOT DEMONSTRATE THAT ANY OF THE CHALLENGED CLAIMS ARE OBVIOUS BY A PREPONDERANCE OF THE EVIDENCE

As set forth by the Supreme Court, the question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 399 (2007). A petitioner seeking to invalidate a patent as obvious must demonstrate that a "skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so." *OSRAM Sylvania, Inc. v. Am. Induction Techs., Inc.*, 701 F.3d 698, 706 (Fed. Cir. 2012). The Petition's evidence must also address every limitation of every challenged claim.

The Board should not cancel any of the challenged claims in this *inter partes review* on the combination of prior art for the instituted obviousness grounds because (i) the Petition failed to demonstrate that any of the different combinations teaches every element of any of the challenged claims (ii) the Petition failed to demonstrate that one of ordinary skill in the art would have been motivated to combine the teachings of the numerous prior art references in the combination to achieve the claimed invention with a reasonable expectation of success, and (iii) secondary considerations indicate that the claims are not obvious.

A. Claims 1, 4, 10, 13, and 14 Of The '516 Patent Are Not Rendered Obvious By The Combination Of Buchfiel, Schwartz and Heart (Proposed Ground 3)

1. Burchfiel And Schwartz Do Not Teach That A Digital Controller In A Server "changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway," As Recited In Independent Claim 1 and As Similarly Recited In Independent Claim 10

The combination of Burchfiel and Schwartz does not teach the claim limitation quoted above.

i. Burchfield Establishes A Path To A PRN Only Upon Network Initialization Or Component Failure When A Path Does Not Exist

Instead of optimizing an existing path, Burchfiel establishes a path to a packet radio node (PRN) only when a path does not exist (i.e., at network initialization, or when a repeater or station fails) (Exhibit 2004, ¶ 123). Burchfiel cannot possibly teach optimizing the transmission paths from the client to the gateway as claimed either at initialization or component failure because no such path exists at either time (*id.*). It is impossible to optimize a path (or anything) that does not exist.

In Burchfiel, a station assigns static routes (from station to connected repeaters/terminals) at initialization (*id.*). A new route is determined by a station only in the event of an error or failure in a network node (*id.*). Such a determination of a new route contrasts sharply with the path optimization that is disclosed and claimed in the '516 patent:

> It will therefore be appreciated that the wireless network system 10 of the present invention is constantly attempting to optimize itself for the 'best' data transmission. '516 patent, 9:6-9.
>
> In the scenario where client 18C realizes it has a better connection to sever 16 through the client 18D, the link 30 in client 18B is no longer used, and a new radio link 34 to client 18D is established. This is illustrated in FIG. 1b. Now, clients 18A and 18B remain 1 hop clients, clients 18B remains a 2 hop client, but client 18C is upgraded from a 3 hop client to a 2 hop client. Therefore, ***the data***

> ***transmission efficiency of the network has been 'stabilized' or 'optimized.'*** *Id.* at 10:1-10 (emphasis added).
>
> In FIG. 2g, the network 36 illustrates an extreme example where 58 clients are connected to the two severs 14 and 26. FIGS. 2h' and 2h" show a fully 'stabilized or 'optimized' network where the path or 'link' from any client to a server is as short as possible, i.e. ***where there is few 'hops' as possible***. It should be noted that ***the optimization occurs dynamically during operation*** and without complex algorithms and look-up tables. As will be discussed in greater detail subsequently, the ***optimization occurs when clients 'hear' transmission from other clients that have a better (i.e. shorter) path to a server***. *Id.* at 11:28-38 (*emphasis added*).

Moreover, the system of the '516 patent allows clients to have non-optimal transmission paths to a server (which can later be optimized as discussed above):

> In FIG. 2k, the 'stabilization' or 'optimization' process is illustrated. It was previously noted that the client 29 has a non-optimal path to its server. In order to improve this path, client 29 will receive 'help' from its neighbors starting with client 7. Client 7 currently has a route to server 14. Client 7 starts randomly

> probing its neighbors looking for a shorter route to a server. Client 7 finds a shorter route to client 26. Client 7 informs server 14 to drop client 7 from server 14's routing table, and client 7 informs server 26 to add client 7 to its routing table. Since client 29 was 'downstream' from client 07, client 29 dynamically becomes switched to a route to server 26. *Id.* at 12:5-16.

Burchfiel's system differs sharply from the invention that is disclosed and claimed in the '516 patent. At the initialization stage, Burchfiel station always computes minimum distance routes from server to all of its clients and loads this information to each repeater. Thus, Burchfiel does not have the need to constantly optimize and change the transmission paths of all clients.

The Petitioner also asserted that Burchfiel discloses the claim limitation quoted above because it discloses that "'[t]he station performs this reconfiguration by updating the connectivity matrix'" (Petition p. 38 (citations omitted)). But Burchfiel's connectivity matrix does not contain a description of an entire path from a client to the server or gateway (*infra*, § VI.A.4). Rather, Burchfiel explicitly states that its connectivity matrix "is a matrix of binary values which indicate the radio units which are capable of direct communication with each other" (Ex. 1005, p. 246). As explained by Dr. Almeroth, "the connectivity matrix does not include the routes, but is simply whether two nodes are within radio range of each other" (Ex. 2002, ¶ 132). Thus, Burchfiel's reconfiguration of its connectivity matrix cannot possible teach "changing the transmission path from the client to the gateway," as required by independent claims 1 and 10 because the connectivity matrix does not contain any transmission paths (*id.*).

Petitioner also repeated its assertion that Burchfiel discloses a "subroutine [that] takes the address of the destination PRN device, consults the radio propagation connectivity matrix, and constructs the route which should prefix all packets sent to the specified destination. This route is stored as part of the connection status in the connection table when the connection is established" (Petition, p. 36 (emphasis added)). But Burchfiel's connection table stores the route from the station to the terminal, not the transmission path from "a client of said first network to said server," as required by independent claims 1 and 10 (*infra* § VI.A.1; Ex. 2002, ¶ 132). Accordingly, Burchfiel cannot possibly teach "changing the transmission path from the client to the gateway," as claimed because Burchfiel's connection table does not even store a transmission path from a client to a gateway or server.

Moreover, the claim limitation "changing the transmission path from the client to the gateway so that the path to the gateway is chosen …" is properly construed as "changing the selection of a transmission path including an identification of an entire path from the client to the server" (*supra*, § IV). Burchfiel does not teach that the selection of a transmission path stored in its connection table is changed by a digital controller in a server, as required by claims 1 and 10 (*see* Ex. 1005, p. 250). There is no mention of Burchfiel selecting one transmission path among a set of alternatives and then changing the selection to a different transmission path within the set of alternatives (*id.*). Rather, Burchfiel's disclosure of reconfiguring or updating is limited to the connectivity matrix (*see id.* at p. 248; Exhibit 2004, ¶ 127). And the connectivity matrix does not contain any transmission paths (*infra*, § VI.A.4).

Accordingly, Burchfiel does not teach the claim limitation that a digital controller in a server "changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway," as recited in independent claims 1 and 10.

ii. The Secondary References Do Not Teach Optimizing A Transmission Path

Petitioner did not allege that the limitation quoted above, which is missing from Burchfiel, is instead taught by one of the secondary prior art references. (Petition, pp. 37-40). First, the Petitioner did not make any mention of either Heart or the Online Encyclopedia with respect to this claim limitation (Petition pp. 37-40).

Second, the portions of Schwartz cited by the Petitioner do not relate to the limitation of a digital controller in a server changing the selection of a transmission path from a client to a server (*id.*). "Schwartz makes no mention of many of the requirements of this claim limitation including a digital controller, a client, a server, a wireless network, etc." (Exhibit 2004, ¶ 128, *citing* Ex. 1007, pp. 15-16). Rather, Petitioner cited Schwartz with respect to the limitations relating to the criteria for path selection (Petition, pp. 37-40).

As explained by Dr. Almeroth, "the routing algorithm identified by the Petitioner discloses only the capability to determine the next hop in a path, not a transmission path" (Exhibit 2004, ¶ 129). Indeed, McQuillan (which is cited by Schwartz) explicitly states that "[t]he original ARPANET routing algorithm [Algorithm A in Schwartz] and the new version [modified Algorithm A in Schwartz] both attempt to route packets along paths of least delay. ***The total path is not determined in advance***; rather, each node decides which line to use in forwarding the packet to the next node" (Exhibit 2003, p. 711, 2:5-18 (*emphasis added*)). Even though McQuillan is cited in Schwartz and describes Schwarz's Algorithm A, Petitioner's expert Mr. Geier did not remember studying McQuillan before he formed his opinion and prepared his declaration:

THE WITNESS: I don't remember seeing this specific document. I may have in the past, but I don't remember this particular document.
BY MR. GONSALVES:
Q. Do you remember reviewing this document before you prepared your declaration in this IPR?
A. You mean, just in the last day or two or in the last week?
Q. No, you prepared a declaration, in fact, it's in front of you for this IPR. Before you prepared that declaration, did you study this article that I just handed to you?
A. Okay, I understand now.
Again, I might have reviewed this. I don't remember specifically.

(Exhibit 2006, 70:2-16).

Q. You didn't analyze this portion of McQuillan before you prepared your expert declaration in this IPR?
A. Well, as I mentioned --
MR. DAVIS: Objection, form. Go ahead.
THE WITNESS: I may have actually looked at the document, but I don't remember what parts of this, if any, I used as a basis for my analysis.

(Exhibit 2006, 73:10-17). If Mr. Geier would have studied McQuillan's description of Schwarz's Algorithm A, he would have understood that

Algorithm A does not determine the total path in advance, as required by the claims of the '516 patent.

Schwartz's Algorithm B also determines the next hop rather than optimizing the transmission path from the client to the gateway, as claimed by the '561 patent:

> Now consider algorithm B.... Here the shortest distance represents the distance a given node is away from a node 1, say, considered as the destination node. It ends with all nodes labeled with their distance away from node 1 (the destination node), and a label as to the next node into the destination node, along the shortest path. Construction of a routing table using algorithm B requires repeated or parallel application of the algorithm for each destination node, resulting in a set of labels for each node, each label giving routing information (next node) and distance to a particular destination. (Schwartz 270-271).

iii. Optimizing A Transmission Path From The Client To The Server Would Not Have Been Obvious

Petitioner also included a set of unsupported and conclusory allegations that the claim limitation of a digital controlling of a server changing the transmission path from the client to the gateway or server is obvious, notwithstanding the absence of any teaching of this limitation in Burchfiel or Schwartz (Petition, pp. 40-44).

But as explained above, Burchfiel and Schwartz have major differences in whether an entire transmission path between two nodes is determined in advance and therefore, merely applying Schwartz's routing algorithms in Burchfiel would lead to unpredictable results and would not arrive in the claimed invention. Indeed, as stated by Dr. Almeroth, Petitioner's expert "Dr. Geier provides only a conclusion and provides no basis for his opinions. He also identifies no secondary reference to support his conclusion. To the extent he is arguing his position based on knowledge of a POSITA, he does not say what the knowledge is or any reason why a POSITA would possess such knowledge" (Ex. 2002, ¶ 135). As explained by Dr. Almeroth, "routing is a complex task generally, and particularly so in a dynamic, wireless environment. There are an infinite number of ways of solving the problem of route determination and Dr. Geier has identified no motivation as to why a person of skill in the art would seek to change the routing procedure described in Burchfiel or that a POSITA would choose the particular technique identified in the claims" (*id.*). That is, neither the Petition nor its expert explain why the claim limitation that is not taught by the prior art would have been obvious to a person skilled in the art at the time of the invention of the '516 patent (*id.).*

These types of conclusory and unsupported allegations by attorneys or experts are given little or no weight by the Board (*see e.g., In Samsung Electronics Co., Ltd. v. Arendi S.A.R.L.*, Case IPR2014-00214, Decision Denying Institution of Inter Partes Review, Paper 12, p. 17 (*citing* 37 C.F.R. § 42.65(a)) (giving little weight to the expert's "testimony that the disputed limitations are taught by Drop Zones, because his testimony is conclusory and unsupported by the record evidence")). Here, the Board should again give little or no weight to Petitioner's conclusory and unsupported obviousness allegations. *See* 37 C.F.R. § 42.65(a).

For all these reasons, Petitioner did not demonstrate that the claim limitation of a digital controller in a server changing "the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway," is obvious over the teachings of the asserted prior art.

2. Burchfiel and Schwartz Do Not Teach Choosing Any Of The Transmission Paths In The Group Recited In Claims 1 and 10 Of The '516 Patent.

Burchfiel and Schwartz do not teach choosing any of the transmission paths listed in claim 1 and 10: "the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path through the gateway through the fastest clients." Rather, Schwartz teaches an algorithm that "provides a least-cost path between a given source-destination pair, the 'cost' of the path defined to be the linear sum of the costs of each hop in a given path" (Ex. 1007, p. 15).

Schwartz's least-cost path algorithm yields a very different result than any of the paths recited in claims 1 and 10 as shown by the exemplary graph FIG. 6-5 (reproduced below) that was referenced by the Petitioner (Exhibit 2004, ¶ 136).

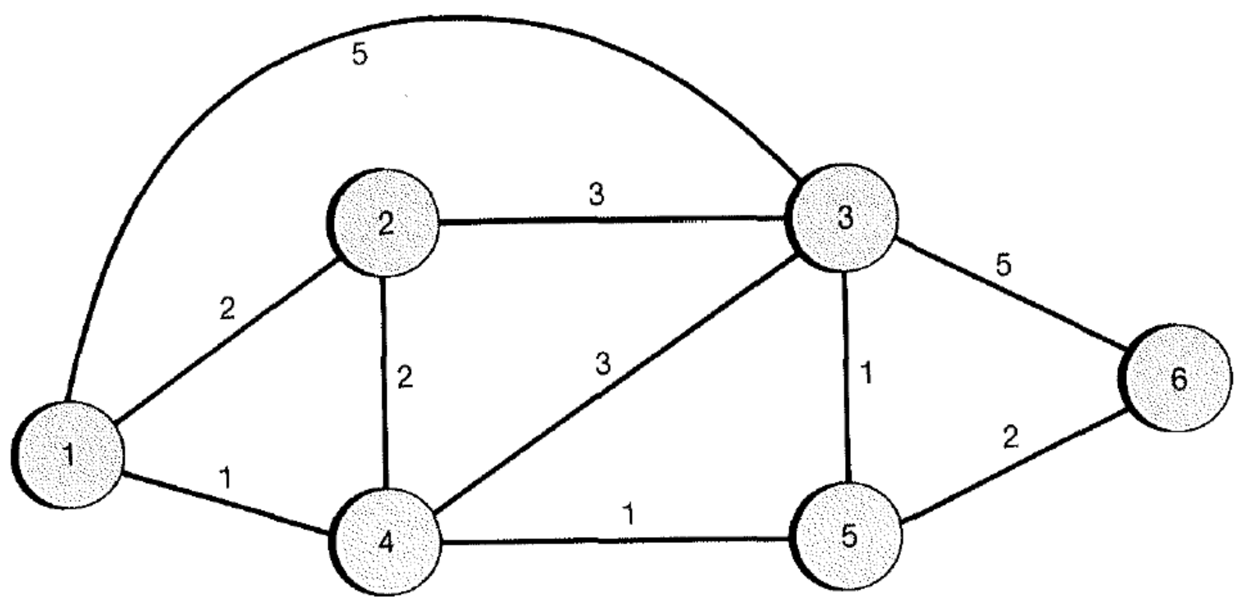

Figure 6–5 Example network

In particular, Schwartz's least-cost path algorithm would select the path from node 1 to node 3 through nodes 4 and 5 because the sum of the costs on the individual hops along that path is 3 (Ex. 2002, ¶149). That is, Schwartz's algorithm would select that path that traverses intermediate nodes (called clients in the '516 patent) (*id.*). In contrast, the claimed "path to the gateway through the least possible number of additional clients" is the direct path from node 1 to node 3 because that path has the least possible number of additional clients (*i.e.*, zero additional clients) (*id.* at ¶142). Petitioner's own expert Mr. Geier agreed (Exhibit 2006, 80:14 – 81:7).

The claimed "path to the gateway through the least possible number of additional clients" is not the path from node 1 to node 3 that traverses intermediate clients 4 and 5 (which would have been selected by Schwartz) because that path has a greater number of additional clients (*i.e.*, two additional clients) (*id.*). Thus, Schwartz's least-cost path algorithm yields a different result than the claimed path of claims 1 and 10 and thus, differs from the claimed invention.

Moreover, "Schwartz does not teach any of the other paths in the groups recited in claims 1 and 10" (Exhibit 2004, ¶ 138). For example, Schwartz does not teach "the path to the gateway through the most robust additional clients," as recited in claims 1 and 10. As explained by Dr. Almeroth, "the term 'robust' in the context of the communication field refers to the ability to maintain communication with the network under adverse conditions" (Ex. 2002, ¶143). And Schwartz does not teach choosing the path that includes the additional clients having the most ability to maintain communication with the network under adverse conditions (*id.*). Indeed, there is no mention of Schwartz of measuring any such ability for the nodes in its graphs (*id.*).

The Petitioner alleged that Schwartz teaches selection of this claimed path because it discloses a "'cost'…related to…whether secure or not" (Petition, p. 38 (citations omitted)). But as explained by Dr. Almeroth, "the security disclosed by Schwartz is very different than the ability to maintain communication with the network under adverse conditions, as required by claims 1 and 10 of the '561 patent. Security in the context of Schwartz relates to maintaining the secrecy of the transmitted data, which differs sharply from the ability to maintain communication under adverse conditions" (Ex. 2002, ¶ 144). Petitioner's expert Mr. Geier agreed at his deposition that there is a significant difference between selecting a path that is "robust" (which is claimed in the '516 patent) and selecting a path that is "secure" (which is disclosed in Schwartz); he gave two entirely different definitions for the two terms (Exhibit 2006, 79:9-15 (defining robust as to "be able to handle different situations"); 92:19-22 (defining secure as "less vulnerable to some external source interfering with the signal or interfering with the system or being able to extract information from it).

"Schwartz also does not teach any of the remaining paths that are recited in claims 1 and 10: the path to the gateway through the clients with the least amount of traffic, and the path through the gateway through the fastest clients (Ex. 2004, ¶ 140). There is no disclosure in Schwartz of measuring the amount of traffic for the clients or the speed of the clients, and selecting the path having the intermediate clients that collectively have the minimum the amount of traffic or the maximum speed (Ex. 1007, pp. 15-16; Ex. 2002, ¶ 145). Petitioner's own expert Mr. Geier admitted that he did not know whether Schwartz's Algorithm A or Algorithm B took into consideration the speed of the clients (Ex. 2006, 81:23 – 83:20). Thus, Schwartz does not teach the selection of any of the paths recited in claims 1 and 10.

Burchfiel also does not teach the selection of any of the claimed paths. The Petitioner argued that the claim limitation "the path to the gateway through the least possible number of additional clients" is the same as the "minimum distance route" disclosed in Burchfiel (Petition, pp. 37-38). But as explained by Dr. Almeroth, "Burchfiel's 'minimum distance route' is not related to the claimed 'least number of additional clients.' Rather, Burchfiel's 'minimum distance route' is related to the radio frequency (RF) signal strength between adjacent nodes, not the distance in terms of the number of nodes along a path, as required by the claims" (Ex. 2002, ¶ 147). In Burchfiel, a node is at a minimum distance from a particular neighbor node if the signal received from the neighbor is stronger than that received from any other neighbor:

> STATION CONTROL FUNCTIONS
> The control functions performed by a station include initialization of the PRN, dynamic routing changes, and multi-station coordination. Initialization of the PRN includes the following steps:
>
> 1. Measurement of RF propagation connectivity between all stations and repeaters. This measurement data is used to construct the connectivity matrix: this is a matrix of binary values which indicate the radio units which are capable of direct communication with each other
> 2. Configuring the PRN by loading each repeater with routing parameters which control the packet store and-forward program. ***These parameters specify forwarding of packets [in the direction of minimum distance] to the next repeater within "earshot".***
> 3. Establishing control, debugging, and measurement connections from the station to each repeater that it controls. These connections remain open to perform the indicated functions as long as the station and repeater continue to function normally.

(Ex. 1005, p. 247, col. 1 (emphasis added)). Therefore, as explained by Dr. Almeroth, "a minimum distance between two nodes in Burchfiel is the minimum physical distance between every pair of nodes along a path measured by the strength of the RF signal 'earshot,' not the number of nodes along the path as required by the independent claims" (Ex. 2002, ¶ 148).

For these additional reasons, Petitioner did not establish by a preponderance of the evidence that any claim of the '516 patent is obvious.

3. Burchfiel and Heart Do Not Teach A "process providing a gateway between a wireless network and a second network comprising … adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network," As Recited In Independent Claim 10 And As Similarly Recited In Dependent Claim 5.

Burchfiel and Heart do not teach the claim limitation quoted above from independent claim 10 for many reasons.

First, Petitioner's allegation that Burchfiel adds a header that includes a data packet type is wrong because it is based on the unsupported position that the "function" in Burchfiel is the claimed "data packet type" (Petition, pp. 50-51). Contrary to Petitioner's position, Burchfiel explicitly states that its "function field" is an address to "the control process, the debugging process, or the measurement process" (Ex. 1005, p. 247, col. 1). As explained by Dr. Almeroth, the address in the function field is not the claimed "data packet type" because "any type of data and any type of control information could be passed to any of the control process, debugging process, or measurement process" (Ex. 2002, ¶ 151). There is no teaching in Burchfiel to support Petitioner's allegation that its address or "function" is a packet type or that either the address or "function" is checked to determine the type of packet, as required by the claims (*see id.*). Indeed, Petitioner's expert Mr. Geier was unable to identify a single instance in the '516 patent that referred to a function as a packet type (Exhibit 2006, 94:14 – 95:11). Thus, a function and a packet type are very different. And Petitioner failed to explain why a person of ordinary skill in the art (POSA) would have modified Burchfiel to use its "function" field to determine the type of the packet (*see id*.).

Moreover, Burchfiel teaches that a simple gateway "is merely a packet reformatting and readdressing service" (*id.* at p. 249). The claimed "reverse link" from a server to a client – when properly construed in light of the Specification – must pass through the same nodes as the a link from the client to the server (i.e., forward link), except in the opposite direction (*supra* §IV.D). And there is no teaching in Burchfiel, Heart, or Schwartz of adding a header to a received packet that includes the particular link containing the same nodes as a forward link but in the opposite order.

Also, there is no teaching in Burchfiel or Heart that their "functions" are packet types as required by claim 10, contrary to Petitioner's allegation. In particular, there is no indication that the terms "address," "function," and "packet type" are used interchangeably in the '516 patent or any patent in its family. Rather, the '516 patent illustrates the packet types as codes in FIG. 19. The Specification explains that the packet type is used to distinguish a packet containing data from a packet containing intermodal information: "a step 106 determines whether the packet is a data type. If not, a step 10 processes 'internodal information'" (Exhibit 1001, 14:7-9). In sharp contrast, the Specification refers to a function in the context of "performing housekeeping functions," (*id.*, Abstract), "network functions such as a central file repository, printer functions," "performing a 'gateway' function to another network," a "one-way function modifies the seed using an algorithm known to both the server and the clients," etc. The '516 patent never refers to a function as a packet type.

Moreover, the terms "address" and "packet type" are presumed to have different meanings because both terms appear in the claims of the '516 patent. Our precedent instructs that different claim terms are presumed to have different meanings. *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n.3 (Fed. Cir. 2006) ("[T]he use of two terms in a claim requires that they connote different meanings. . . ."); *CAE Screenplates Inc. v. Heinrich Fiedler GmbH*, 224 F.3d 1308, 1317 (Fed. Cir. 2000) ("In the absence of evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings."). In particular, claim 5 recites "a header that includes an address of the client," and claim 10 recites "adding a header to said packet including a reverse link and a data packet type." The use of these two terms (address and data packet type) in the claims indicates that they are presumed to connote different meanings.

Heart also fails to teach this claim limitation. Heart makes no mention whatsoever of wireless communication or a wireless network, let alone a gateway that adds a header to a packet that includes a reverse link and a data packet (*see e.g.*, Ex. 1004, pp. 551-556). Rather, Heart discloses a simple network including only four nodes: "a four-node test network was scheduled for completion by the end of 1969" (*id.* at p. 552, col. 1). Heart discloses what was then a "new kind of digital communication system employing wideband leased lines and message switching, where a path is not established in advance and each message carries an address" (*id.* at p. 551, col. 1). Indeed, Petitioner's own expert Mr. Geier admitted that in Heart, "a path is not established in advance" (Exhibit 2006, 102:20). Clearly, Heart cannot possibly teach adding a reverse link to a header as claimed by the '516 patent beucase it does not determine any link or path in advance. Rather, "at each node, a copy of the message is stored until it is safely received at the following node. The network is thus a store and forward system" (*id.* at p. 551, col, 2).

The packet header in Heart referenced by Petitioner is added by an intermessage processor (IMP) (Ex. 1006, p. 554), not by a gateway as required by claim 10 or a server as required by claim 5. Petitioner's own expert admitted that it is the IMP that adds the packet header (Ex. 2006, 105:13-14 ("the IMP forms a header by adding further information for network use")). Moreover, Heart provides no description of the fields in FIG. 5 referenced by Petitioner, let alone explain how they constitute a packet type (Exhibit 2004, ¶151).

The Petitioner failed to explain why a POSA would have been motivated to modify Burchfiel's packet reformatting and readdressing service with the teachings of a store and forward system that is entirely unrelated to a wireless network or why such a person would have achieved the claimed invention of "adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network," with a reasonable expectation of success (*see* Petition, pp. 46-51).

As explained by Dr. Almeroth, Petitioner's expert "is either substituting one packet header structure for the other or proposing some combined packet header. A POSITA would not be motivated to substitute one packet header structure since the difference in structure and the different information included in the alternate header would fundamentally change the operation of the system. For example, Heart does not disclose a packet structure with "ROUTE" information" (Ex. 2002, ¶ 154). As further explained by Dr. Almeroth, "[a] person of skill in the art would not be motivated to encumber a packet header with lots of additional information and fields that were unnecessary for the operation of the network" (*id.*).

For these additional reasons, Petitioner did not establish that any claim of the '516 patent is obvious.

4. Burchfiel Does Not Teach "maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network," As Recited In Independent Claim 1 and As Similarly Recited In Independent Claim 10

The Petitioner relied solely on Burchfiel for the claim limitation quoted above; it did not reference either Schwartz or Heart for this claim limitation (Petition, pp. 35-37 and 54).

In particular, the Petitioner's argument refers to a connectivity matrix that is disclosed in Burchfiel (*id.* at p. 35). Burchfiel's connectivity matrix, however, is not a "map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said sever," as recited in claims 1 and 10. As explained above, the claimed "transmission path a client of said first network to said server" of claim 1; and "transmission path from the client to the gateway" of claim 10 should be construed as a "description of the entire path of clients from the client to the server or gateway" (*supra*, § IV). In addition, the claimed "map of transmission paths" is properly construed as "a data structure containing a representation of a plurality of transmission paths from a client to the server through one or more other clients" (*id.*).

Burchfiel's connectivity matrix is not a data structure containing a plurality of ***descriptions of the entire path*** from a client to the server or gateway. Rather, Burchfiel explicitly states that its connectivity matrix "is a matrix of binary values which indicate the radio units which are capable of direct communication with each other" (Ex. 1005, p. 246). As explained by Dr. Almeroth, Burchfiel simply indicates "which radios are within range of each other" (Ex. 2002, ¶ 122). As further explained by Dr. Almeroth, "the connectivity matrix is for routes only ***to the clients***" (*id.* at ¶123). An indication of radio units that are capable of direct communication is not nearly sufficient to teach a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server, as required by claims 1 and 10.

For the return path, dynamic routing is used instead of providing a path from the station to the terminal: "Dynamic routing changes are performed locally within the PRN by permitting a repeater to specify an alternate address for the next hop after some number of unsuccessful attempts to forward the packet along its specified route. This capability provides a localized terminal tracking facility which will hand off a mobile terminal from one repeater to another." (Ex 1005, p. 247; Ex. 2002, ¶ 124).

Petitioner also argued that Burchfiel discloses a "subroutine [that] takes the address of the ***destination PRN device***, consults the radio propagation connectivity matrix, and constructs the route which should prefix all packets ***sent to the specified destination***. This route is stored as part of the connection status in the connection table when the connection is established" (Petition, p. 36 (emphasis added)). But Burchfiel's subroutine resides and executes on the station and therefore, the destination PRN device refers to a terminal (*e.g.*, a client), not the station (*e.g.*, server or gateway). In other words, Burchfiel's connection table stores the route from the station to the terminal, not the transmission path from "a client of said first network to said server," as recited in independent claims 1 and 10. Indeed, there is no mention in Burchfiel of storing a description of the entire transmission path from a client to a server or gateway, as claimed by the '516 patent.

Indeed, Burchfiel states that "[t]he dynamic packet routing capability (packet store-and-forward) is programmed in the repeaters, with the stations providing initialization and centralized control of parameters for terminal tracking. The programmable capability of the repeater is provided in its IMP-16 microprocessor" (Ex. 1005, p. 245). Thus, as explained by Dr. Almeroth, Burchfiel's station does not provide "information from a map of transmission paths about the path each terminal should use to reach the station" (Ex. 2002, ¶ 126).

Petitioner's expert Dr. Geier references Burchfiel's Figure 3 to suggest that a "route" is included in the transmitted packets (Ex. 1004, ¶ 181). But as explained by Dr. Almeroth, "this figure offers no support as to what is stored in the connection table" (Ex. 2002, ¶ 128). "Dr. Geier has identified no evidence as to (1) whether the connection table at the station stores this information, (2) how a station communicates this route to the terminal, (3) what the information is in the 'route' field of Figure 3, and (4) that the source of this information is from the station's connection table" (*id.*).

Therefore, Burchfiel does not teach the claim limitation of "maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network." Moreover, Petitioner did not allege that any of the secondary references (*i.e.*, Schwartz, Heart, Online Encyclopedia) teach this claim limitation (Petition, pp. 35-37). For this reason alone, Petitioner did not establish that any claim of the '516 patent is unpatentable by a preponderance of the evidence.

5. The Petitioner Failed To Show That It Would Have Been Obvious To Modify Burchfiel With Schwartz And Heart To Achieve A Server That Maintains A Map Of Data Packet Transmission Paths From A Client To The Server, Optimizes the Transmission Paths To Select The Claimed Paths, And Adds A Header To The Packet Including A Reverse Link And A Data Packet Type.

i. A POSA Would Not Have Been Motivated To Combine The Teachings of Burchfiel, Schwartz, and Heart And Would Not Have Achieved The Claimed Invention With A Reasonable Expectation Of Success

The Petitioner requires Burchfiel to be combined with Schwartz as well as Heart (Petition, pp. 18-21). But the Petition's motivation to combine is rooted in forbidden hindsight analysis that is based on its incorrect assumption regarding the level of ordinary skill in the art. The Petitioner failed to provide any evidence whatsoever that combining the various portions of the references would achieve a server that maintains a map of data packet transmission paths from a client to the server, optimizes the transmission paths to select the claimed paths, and adds a header to the packet including a reverse link and a data packet type, as required by the challenged claims (*id.*).

The Petitioner did not suggest why a person of skill would modify Burchfiel to use Schwartz's routing algorithm or Heart's IMP (*id.*). Petitioner instead argues that Burchfiel and Schwartz occupy the same field of art. (Petition, p. 19). Petitioner does not identify what problem was unresolved in Burchfiel that is solved by combining it with Schwartz or Heart (*see id.* 27-29). Petitioner also does not identify exactly what would motivate a person of skill to combine the references. *See CardioKinetix, Inc. v. Heart Failure Techs.*, IPR2013-00183, Paper 12, at 9 (finding Petitioner's assertion that references concerned the same field did not amount to an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness").

Neither Petitioner nor its expert explain how or why a person of skill in the art would have used Schwartz and/or Heart with Burchfiel to achieve the server that maintains a map of data packet transmission paths from a client to the server, optimizes the transmission paths to select the claimed paths, and adds a header to the packet including a reverse link and a data packet type, as required by the challenged claims (Petition, pp. 18-20; Exhibit 1004, ¶ 165). "For example, the differences between Burchfiel's centralized approach to routing and Schwartz's decentralized Algorithm A are illustrative about the fundamental differences and incompatibility of various routing algorithms. The algorithms discussed in Burchfiel and Schwartz lie at opposite ends of the centralized to decentralized routing spectrum" (*id.*). "At the time of the invention of the '516 patent, these were considered fundamentally different approaches to routing" (*id.*)

Burchfiel employed a centralized routing algorithm where a station "has labelled all PRU's [packet radio units] and established connections to them" (Ex. 1005, p. 247). As explained by Dr. Almeroth, "[t]his routing algorithm reduced the complexity of the PRs in the network by leaving all decision making to the stations" (Exhibit 2004, ¶ 166). On the other hand, Schwartz's algorithm is a decentralized routing algorithm where each node maintains a map of the entire network and computes its own routes to other nodes (*supra*, § V.B). "Because the routing algorithms in Schwartz and Burchfiel are so fundamentally different, a person of skill in the art would not be motivated to combine the teachings of these references" (Exhibit 2004, ¶ 166).

Also, it is unclear how these two disparate approaches *would* be combined, because each approach is classified according to the location of the decision-making regarding routes: a centralized server (Burchfiel) or each decentralized node (Schwartz) (Exhibit 2004, ¶ 167). "Indeed, such a combination would result in both the station and the PRs attempting to calculate the same routing paths" (*id.*). Which node in Burchfiel would be the ultimate decision maker: the station or the PRs? The Petitioner does not say, much less begin to explain how to resolve the fundamentally different approaches (*see* Petition, pp. 18-20).

Indeed, Burchfiel actually teaches away from using Schwartz's decentralized algorithm by explaining that "[t]he programs which provide centralized monitoring, debugging, and statistics collection are located in the station, with a small (slave) routine in each repeater" (Ex. 1005, p. 245). "Yet the Schwartz routing algorithm relied on by Petitioner requires that all PRs incur the cost and complexity of knowing information about every other PR. Further, implementing a link-state algorithm like the one disclosed in Schwartz into a system like Burchfiel would have actually increased the overhead and decreased the system's bandwidth" (Exhibit 2004, ¶ 168). Thus, a person skilled in the art would have not been motivated to combine Burchfiel and Schwartz to arrive at the claimed invention (*id.*).

Moreover, changing Burchfiel to use the link-state algorithm of Schwartz would only have exacerbated the scalability issues it already faced. And given that the link-state algorithm has much higher overhead in a wireless network, use of Schwartz's algorithm in Burchfiel's network would additionally be contrary to the problems the '516 patent sought to address.

As explained by Dr. Almeroth in a related IPR, "the environment for which the routing protocol is developed influences the design of the routing algorithm" (IPR2015-01901, Ex. 2003, ¶ 162). Neither Schwartz nor Heart discuss the kinds of factors in wireless networks that affect routing algorithm design. The substantial differences in the routing algorithms and networks of Burchfiel, and Schwartz and Heart indicate that a POSA would not have been able to combine either Schwartz or Heart with Burchfiel to achieve the claimed invention without undue experimentation. It would not have not have been a simple matter of taking the algorithms disclosed in Schwartz or Heart and changing them to work in the system of Burchfiel. Not only would the systems be fundamentally incompatible, but the routing protocol would require careful design, development, and tuning before achieving the right combination of performance characteristics within a network.

When the Board considered this very same type of unsupported argument for combining the teachings of different systems from different prior art references in *Epistar v. Boston University*, it declined to institute the IPR. *Epistar, et al. v. Trustees Of Boston University,* IPR2013-00298, Decision Not To Institute, Paper No. 18 (P.T.A.B. November 15, 2103). There, the Board reasoned that "Petitioner identifies no objective evidence — for example, experimental data — tending to establish the structure of a GaN buffer layer grown under Manabe's process conditions" (*id.*).

Here, as in *Epistar*, the Petitioner failed to provide experimental data or other objective evidence indicating that a "skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so." *OSRAM Sylvania, Inc. v. Am Induction Techs., Inc.*, 701 F.3d 698, 706 (Fed. Cir. 2012).

For these additional reasons, none of the challenged claims of the '516 patent should be cancelled.

ii. Combining The Teachings Of Schwartz With Burchfiel Would Have Rendered Burchfiel Inoperable And Unsuitable For Its Intended Purpose Of A Network Having Simple, Low-Powered Repeaters.

The Petitioner points to Algorithms A and B disclosed in Schwartz and argues that a POSA would have been motivated to combine either algorithm with Burchfiel to allegedly render claims 1 and 10 obvious.

But claims 1 and 10 of the '516 patent require a server "changing the transmission ***path from the client to the gateway*** so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients" (Ex. 1001, 25:13-22 (*emphasis added*)). That is, the claimed server optimizes the path from the client to the server. As explained by Dr. Almeroth, "[a] person of ordinary skill in the art would have understood that because wireless routes are not always symmetric and are often unstable, optimizing a path from a client to a server is not equivalent to optimizing a path from the server to the client (Ex. 2004, ¶ 172 (citations omitted)).

Second, Schwartz's "Algorithm A finds the shortest paths from a source to all other nodes. To do this, it requires global topological knowledge, i.e., a list of all nodes in the network and their interconnections, as well as costs for each link. It thus lends itself to centralized computation, with complete topological information available at a central database. It is also the basis of the ARPA network decentralized routing algorithm…, in which each node in the network maintains its own global database" (Schwartz, p. 268).[4] That is, a

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[4] Petitioner's expert Mr. Geier yet again demonstrated that he does not have an understanding of the basic issues in this proceeding by testifying that he did not know whether each node in the ARPA network decentralized routing

node implementing Algorithm A finds the shortest path from itself to all other nodes in the network. If *centralized* Algorithm A is implemented on the Burchfiel's Station (Server), then the Station would be able to find shortest paths from itself to the repeaters but not from the repeaters (Client) to the Station (Server) as required by the claim limitation.

The alternative is to implement the decentralized version of Algorithm A on each node in Burchfiel network (Station and Repeaters). But this requires that "algorithm A, running independently on all nodes. In essence, each node keeps a complete (global) topological database that is updated regularly occur." (Schwartz, p. 297). But Burchfiel teaches away from implementing decentralized routing algorithms because Burchfiel's repeaters are simple, low-powered, and are not designed to support routing algorithms:

> The repeater is required to operate unattended in relatively remote areas for long periods of time. ***It must therefore be a simple, low-powered component. Accordingly, it is not designed to support complex dynamic routing algorithms. Instead, such functions must be provided in the stations***, giving some measure of centralized control in the Packet Radio Network[5] (Ex. 1005, p. 245, col.1. (emphasis

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algorithm maintains its own global database even though it is explicitly disclosed in Schwartz (Ex. 2006, 85:16-22).

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added)).

That is, combining the teachings of Schwartz into Burchfiel would have rendered Burchfiel inoperable and unsuitable for its intended purpose.

Schwartz Algorithm B, whether centralized or decentralized, requires each node in the network to perform "repeated or parallel application of the algorithm" to calculate a distance metric to every destination in the network based on distance information they receive from their neighboring nodes. Accordingly, for the same reasons discussed above for Algorithm A, Algorithm B is not suitable for the simple, low-power repeaters in Burchfiel.

Therefore, contrary to the Petitioner's argument, a POSA would have been discouraged from combining the teachings of Schwartz with Burchfiel and would not have achieved the claimed invention with a reasonable expectation of success.

B. The Challenged Dependent Claims 2, 5, and 11 Are Not Obvious

As explained above, the combination of Burchfiel, Schwartz, and Heart does not teach all the limitations of any of independent claims 1 or 10 (*supra*, § VI.A). And the Petitioner did not allege that the additional reference (*i.e.*, Online Encyclopedia) asserted against claims 2, 5, and 11 teaches any of the limitations that have been shown to be missing from Burchfiel, Schwartz, and

Heart (Petition, pp. 55-69). Accordingly, the Petitioner did not demonstrate that any of claims 2, 5, and 11 are obvious.

Moreover, as explained by Dr. Almeroth, Petitioner's expert "relies on the use of TCP/IP in the combined system to meet the additional dependent limitation of Claims 2, 5, and 11. However, using TCP/IP would eliminate the ability to include any of the information from the packet structure in Burchfiel (including the "ROUTE" and "FUNCTION" fields) and any of the packet structure in Heart (including any of the header bits) in the combination of Burchfiel, Heart, and Online Encyclopedia" (Ex. 2002, ¶ 158). As further explained by Dr. Almeroth, dependent claims 2, 5, and 11 would not have been rendered obvious by either of the choices available to Petitioner for using TCP/IP in its proposed system:

> In the first choice, TCP/IP does not include the fields relied on by Dr. Geier and disclosed in Burchfiel and Heart. In the second, choice, any alteration to TCP/IP would necessarily mean that the resulting protocol is no longer TCP/IP and packets with the new header would not function in a TCP/IP network.

(Ex. 2002, ¶ 159). For these additional, independent reasons, Petitioner did not demonstrate that any of dependent claims 2, 5, and 11 are obvious.

C. Objective Indicia Of Nonobviousness Support The Patentability Of The Patent Claims

The non-obviousness of the claims are also supported by secondary considerations of non-obviousness, including satisfaction of a long-felt need, and failure of others.

i. The Invention Satisfied A Long-Felt, But Unmet, Need

Prior to the invention of the routing optimization scheme of the claimed invention, there was a long-felt, but unmet need for "a packet-based wireless computer network that is both robust and efficient" (Exhibit 1001, 4: 40-42). Prior art wireless communication systems such as Ricochet and those that used the AX.25 protocol exhibited a number of drawbacks resulting in packet duplication and proliferation, and data congestion. For example, the Ricochet system transmitted multiple copies of packets when a radio modem of a personal computer was either not in the range of a wireless transmitter or in the range of multiple transmitters:

> the Ricochet network can create a great deal of "packet duplication" or "pollution" as copies of a particular data packet are multiply repeated, rather than routed. This packet duplication can also occur if a radio modem of a particular personal computer

> is in radio transmission range of two or more transceivers of the Ricochet network. In such an instance, the two or more transceivers can each receive the data packets, and each proliferates copies of the data packet across the Ricochet network. … In addition, since data packets are transmitted from all the transceivers of the Ricochet network, there may be packet duplication at the personal computer if it is in contact with more than one transceiver of the Ricochet network, and the bandwidth available from each transceiver is reduced since each transceiver is transceiving each client-destined data packet on the network… It is therefore apparent that prior art wireless networks of the Ricochet network type lack robustness (i.e. the ability to maintain communication with the network under adverse conditions) and exhibit a number of inefficiencies such as data packet proliferation. (Exhibit 1001, 2:35-65).

Similarly, prior art AX.25 peer-to-peer digital repeater systems also suffered from data congestion caused by unnecessary, repeated transmission of data packets:

> Amateur radio ("Ham") operators have developed a peer-to-peer digital repeater system referred to as the AX.25 protocol. With this

> protocol, each peer repeats all data packets that it receives, resulting in rapid packet proliferation. In fact, with this protocol, so many packet collisions occur among the peers that the packets may never reach the intended peer (*id.* 3:10-16).

The present invention satisfied this long-felt, but unmet need for "a packet-based wireless computer network that is both robust and efficient" (*id.* 4:40-42). Unlike the prior art, the present invention optimizes existing paths from the client to the server (Exhibit 1004, ¶ 185). The claimed invention chooses the path with from a "path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients" (*id.* 23:48-54). "Burchfiel instead establishes a path to a packet radio node (PRN) only when a path does not exist (*i.e.*, at network initialization, or when a repeater or station fails). Burchfiel cannot possibly teach optimizing the transmission paths from the client to the gateway as claimed either at initialization or component failure because no such path exists at either time. It is impossible to optimize or improve a path (or anything) that does not exist" (Exhibit 2004, ¶ 185). This optimization of choosing a more optimal path than an existing paths reduces the need for packet duplication that caused data congestion and message proliferation in prior art systems (*id.*).

ii. Others Failed To Accomplish What The Claimed Invention Achieved

Others failed to accomplish what the claimed invention achieved: "a packet-based wireless computer network that is both robust and efficient" (Exhibit 1001, 4:40-42). "The claimed invention of the '516 patent achieved efficiency by optimizing existing paths from a client to the gateway to thereby reduce packet duplication and data congestion. Because the claimed invention finds more optimal paths, it reduces the need to retransmit messages along an existing less optimal path" (Exhibit 2004, ¶ 186).

As explained by Dr. Almeroth, "[t]he prior art such as Ricochet, the systems that used the AX.25 protocol, and the references asserted in this proceeding (*e.g.*, Burchfiel, Schwartz, and Heart) did not achieve the level of efficiencies and robustness of the '516 patent because they do not teach finding paths that are more optimal than an existing path. Burchfiel instead establishes a path to a packet radio node (PRN) only when a path does not exist (i.e., at network initialization, or when a repeater or station fails)"

(Exhibit 2004, ¶ 187).[6] Also, "Heart makes no mention whatsoever of wireless communication or a wireless network, let alone address any problem associated with wireless communication such the problems of packet duplication and network congestion addressed by the claimed invention" (*id.*). Schwartz makes no mention of many of the requirements of this claim limitation including a digital controller, a client, a server, a wireless network, etc. (Ex. 1007, pp. 15-16). "Significantly, a node in Schwartz is only capable of determining the next hop in a path, not a transmission path, let alone determine a wireless transmission path that is more optimal than an existing wireless path" (Exhibit 2004, ¶ 187).

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[6] Unlike Patent Owner's expert Dr. Almeroth, Petitioner's expert Mr. Geier has a very limited knowledge of Ricochet and AX.25 (*see e.g.*, Ex. 2006, 20:1-13; 22:3-9). Even though both are discussed extensively in the '516 patent and are important to an understanding the long-felt need that was satisfied by the '516 patent, Mr. Geier did not remember studying any material on them before he formed his opinion and prepared his declaration: "Q. did you review any documents on the Ricochet system, other than what's described here in the 516 Patent? … THE WITNESS: I might have, I just can't recall exactly which documents they might have been" (*id.* 23:14-20).

VII. CONCLUSION

For all the reasons expressed herein, the Petitioner did not show that any claim is unpatentable by a preponderance of the evidence.

Date: May 17, 2017

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CERTIFICATE OF COMPLIANCE

This Paper contains 13,875 words, excluding the portions exempted by 37 C.F.R. § 42.24(a)(1). Accordingly, this Paper complies with the requirements of 37 C.F.R. § 42.24(b)(1).

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CERTIFICATE OF SERVICE

I certify that a copy of the foregoing Patent Owner's Preliminary Response Pursuant to 37 C.F.R. § 42.207 and the accompanying exhibits were served on May 17, 2017 by email to counsel for the Petitioner at the following email addresses:

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