

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

IPR2024-00565
Patent 8,451,845 B2

Before THU A. DANG, BRIAN J. McNAMARA, and
ROBERT J. WEINSCHENK, *Administrative Patent Judges*.

McNAMARA, *Administrative Patent Judge*.

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

I. INTRODUCTION

Juniper Networks, Inc. (“Petitioner”) filed a petition, Paper 1 (“Petition” or “Pet.”), to institute an *inter partes* review (“IPR”) of claims 1 and 5–8 (the “challenged claims”) of U.S. Patent No. 8,451,845 B2 (“the ’845 patent”). 35 U.S.C. § 311. Monarch Networking Solutions, Inc. (“Patent Owner”) filed a Preliminary Response, Paper 12 (“Prelim. Resp.”), contending that the Petition should be denied as to all challenged claims. We have jurisdiction under 35 U.S.C. § 6 (2023). An *inter partes* review may not be instituted unless the information presented in the Petition “shows 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).

A decision to institute under § 314 may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018). In addition, if the Board institutes trial, it will institute “on all of the challenged claims and on all grounds of unpatentability asserted for each claim.” *See* 37 C.F.R. § 42.108(a).

Having considered the arguments and the associated evidence presented in the Petition and the Preliminary Response, for the reasons described below, we institute *inter partes* review of all challenged claims on all asserted grounds.

II. REAL PARTIES IN INTEREST

The Petition identifies Juniper Networks, Inc. as its real party-in-interest. Pet.1. Patent Owner identifies Monarch Networking Solutions LLC as its real party-in-interest. Paper 11, 2.

III. RELATED MATTERS

Petitioner and Patent Owner state that the '845 patent is involved in the following district court litigation: *Monarch Networking Solutions LLC v. Cisco Systems, Inc. and Charter Communications, Inc.*, Case No. 2:20-cv-00015 (E.D. Tex.) (“the Texas litigation”); *Monarch Networking Solutions LLC v. Juniper Networks, Inc.*, Case No. 1:23-cv-00670-TSE-LRV (E.D. Va.), transferred to the Northern District of California as *Monarch Networking Solutions LLC v. Juniper Networks, Inc.*, Case No. 4:23-cv-05076 (N.D. Cal.). Pet. 1, Paper 11, 2.

Petitioner and Patent Owner also state that the '845 patent is involved in the following proceedings at the U.S. Patent and Trademark Office: *Cisco Systems, Inc. v. Monarch Networking Solutions LLC*, IPR2020-01679 (PTAB), institution denied; *Ex Parte* Reexamination No. 90/019,246, pending (noting new claims have been added in response to an office action, but stating that no claims subject to this review have been amended). Pet. 1–2, Paper 11, 2.

IV. THE '845 PATENT

The '845 patent concerns Internet protocol (IP) telecommunication networks that transport data packets from source equipment identified by a source address to destination equipment identified by a destination address. Ex. 1001, 1:17–21. As technical background, the '845 patent states that IP conductivity service is managed by a service provider using the telecommunications network of an operator to route data packets sent by the terminal equipment to their final destinations. *Id.* at 1:34–37. The service provider assigns an IP address (generally a public IP address) to a home gateway between a home network and the public network or the IP domain of the operator; the “home gateway generally assigns private IP addresses to

the terminals of its home network.” *Id.* 1:40–44. The ’845 patent states “the expression ‘home gateway’ refers to any equipment for interconnecting a private network and a network operated by a service provider [(also called a public network)], the private network being either a home network or a business network.” *Id.* at 1:45–48. As additional technical background, the ’845 patent states that the home gateway is located on the path of data packets between a terminal of the private home network and the IP domain of the operator. *Id.* at 1:51–52. The home gateway includes a Network Address Translation (NAT) table that associates a private IP address and the port associated with that terminal with the public IP address of IPv4 type and with a port of the same gateway on the public network. *Id.* at 1:51–60.

Recognizing the possible exhaustion of IPv4 public addresses, the need for progressive migration from IPv4, and the absence of solutions that do not require client terminals implementing both IPv4 and IPv6, the ’845 patent proposes adapting a home gateway to connect a user terminal to an IPv6 domain. Ex. 1001, 1:61–2:6, 2:58–63, 3:4–6. The ’845 patent proposes that the home gateway be adapted to identify an IPv6 destination address constructed by concatenating an operator prefix, an IPv4 destination address, and a destination port number. *Id.* at 3:7–9. If necessary, the address would be regularized by replacing it using a process that replaces a constructed address with a native address and a native address with a constructed address modifying the data packet using the regularized address. *Id.* at 3:10–15. The modified packet is then routed to its destination. *Id.* at 3:17.

For example, if first terminal equipment transmits and receives only IPv4 data packets and second terminal equipment transmits and receives only IPv6 domain data packets, one of the equipment can send a packet to

another using its own protocol in the IPv6 domain, i.e., the data packet sent in IPv4 or IPv6 is transformed into an IPv6 data packet to be routed in the IPv6 domain, and if necessary, transformed back into an IPv4 data packet. *Id.* at 3:18–29. Equipment for interconnecting the IPv6 domain to an IPv4 domain constructs an IPv6 destination address by concatenating, as discussed above; the constructed IPv6 destination address can be routed in the IPv6 domain and contains the payload information carried by the IPv4 domain. *Id.* at 3:30–40. This transformation requires the second user terminal using IPv6 protocol to have an available dummy IPv4 address (or that of a home gateway that administers a home network); this address, used as the destination address of an IPv4 packet coming from an IPv4 domain, is used by the interconnection equipment to construct the IPv6 address. *Id.* at 3:41–48. Conversely, it is also possible to retrieve the IPv4 address and source port number from an IPv6 address constructed using the above approach. *Id.* at 3:49–50. Thus, there is no requirement to store an IPv4 to IPv6 translation table or to maintain states relating to the interconnection node of the IPv4 and IPv6 domains. *Id.* at 3:52–55.

V. ILLUSTRATIVE CLAIM

Independent claim 1, reproduced below with Petitioner’s paragraph designations, is illustrative of the subject matter recited in the challenged claims of the ’845 patent.

1[pre] A method for receiving an IPv6 data packet in an IPv6 domain connected to an IPv4 domain, said packet comprising an IPv6 destination address and an IPv6 source address, said method being executed in a home gateway adapted to connect a user terminal to said IPv6 domain, and comprising the following steps:

- [a] identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address and a destination port number,
- [b] if necessary, regularizing at least one of the IPv6 source address and the IPv6 destination address of the data packet by replacing said at least one IPv6 address, the replacement process belonging to a group comprising replacement of a constructed address with a native address and replacement of a native address with a constructed address, and modifying the data packet using the regularized address; and
- [c] routing the modified data packet to its destination.

VI. ASSERTED GROUNDS

Petitioner asserts that claims 1 and 5–8 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 5–8	103 ¹	Li ² (Ex. 1037), Li-2 ³ (Ex. 1038)
1, 5–8	103	Li
1, 5–8	103	Li, Li-2, Paunikar ⁴ (Ex. 1057)
1, 5–8	103	Li, Wu ⁵ (Ex. 1039), Paunikar

In support of its arguments, Petitioner cites the Declaration of Dr. Samrat Bhattacharjee in Support of the Petition. Ex. 1003, Bhattacharjee Decl.

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the ’845 patent issued from an application filed before March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

² X. Li et al., “Forwarding IPv4 Traffics in Pure IPv6 Backbone with Stateless Address Mapping,” IEEE (Apr. 2006), available at <https://ieeexplore.ieee.org/document/1687557> (“Li”).

³ X. Li, “Bi-directional Address Borrowing (IVI),” IETF (June 21, 2008) (“Li-2”).

⁴ US Patent No. 7,752,334 B2 to Paunikar; filed October 15, 2002, published July 6, 2010 (“Paunikar”).

⁵ Certified Translation of CN Patent No. 1525699 to Wu et al. (“Wu”).

VII. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner describes a person of ordinary skill in the art (POSITA or ordinarily skilled artisan) as having “a Bachelor of Science degree in electrical engineering, computer engineering, computer science, or a related subject, and three years of work experience in computer networking, including experience with the IPv4 and IPv6 protocols, or a related field,” and noting that “[l]ack of professional experience can be remedied by additional education, and vice versa.” Pet. 10 (citing Ex. 1003, Bhattacharjee Decl. ¶62). Patent Owner does not contest Petitioner’s description of an ordinarily skilled artisan. Prelim. Resp. 19.

The level of ordinary skill in the art may be evidenced by the references themselves. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). As the level of skill agreed to by the parties appears commensurate with the subject matter of the ’845 patent and the references, we apply this description for purposes of this Decision.

VIII. CLAIM CONSTRUCTION

We interpret claim terms using “the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). In this context, claim terms “are generally given their ordinary and customary meaning” as understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (citations omitted) (en banc). “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d

1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Extrinsic evidence is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’” *Phillips*, 415 F.3d at 1317 (citations omitted).

Any special definition for a claim term must be set forth in the specification with “reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

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

Petitioner proposes the following claim constructions, noting that they were applied by the district court in Texas. Pet. 10–12 (citing Ex. 1036). We understand Petitioner to assert that these constructions are how the claims should be construed under the *Phillips* standard applied by the district courts. *See* 37 CFR § 42.100(b). Patent Owner does not contest Petitioner’s proposed constructions. Prelim. Resp. 19.

Claim(s)	Term	Construction
1, 8	“IPv4 destination address”	“address formatted according to Internet Protocol version 4 indicating a destination”
1, 8	“concatenating”	“appending one item to the end of another so as to form a single unit in a contiguous pattern”

1, 8	“home gateway”	“any equipment for interconnecting a private network and a network operated by a service provider, the private network being either a home network or a business network”
1, 6, 8	“destination port number”	“number indicating a logical point of connection with a destination device”
1, 2, 5, 8	“regularizing”	Plain and ordinary meaning
1, 8	“if necessary”	“if the IPv6 source address is classified as a native address or if the IPv6 destination address is a constructed address”
1, 8	“modifying the data packet using the regularized address”	Plain and ordinary meaning
1, 8	“the replacement process belonging to a group comprising replacement of a constructed address with a native address and replacement of a native address with a constructed address”	Plain and ordinary meaning
8	“means for identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address, and a destination port number”	Function: “identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address, and a destination port number” Corresponding Structure: “the home gateway 20 that includes a processor programmed to perform the step of identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address, and a destination port number”
8	“means for regularizing, if necessary, at least one of the IPv6 source	Function: “regularizing at least one of the IPv6 source address and the IPv6 destination address of the data packet and

	address and the IPv6 destination address of the data packet by replacing said at least one IPv6 address, . . . and modifying the data packet using the regularized address”	modifying the data packet using the regularized address” Corresponding Structure: “the home gateway 20 that includes a processor programmed to perform the step of regularizing at least one IPv6 address when: 1. if the IPv6 source address is a native address, then the program executes the steps of choosing an IPv6 constructed source address whose source port number is in the authorized range assigned to the home gateway 20; and modifying the data packet by replacing the native source address with the constructed source address as illustrated in steps R21 and R22 of Figure 5; or 2. if the IPv6 destination address is a constructed address, then the program executes the steps of searching a translation table of the home gateway 20 and locates a native destination address associated with the constructed destination address; verifying that the transport level destination port of the data packet agrees with the destination port number contained in the destination address of the packet; and modifying the data packet by replacing the constructed destination address with the native destination address as illustrated in steps R’21, R’22, and R’23 of Figure 8”
8	“means for routing the IPv6 data packet to its destination”	Function: “routing the IPv6 data packet to its destination” Corresponding Structure: “the home gateway 20 that includes a processor programmed to perform the step of routing the IPv6 data packet to its destination.”

As Petitioner’s unopposed constructions appear to be consistent with how the terms are used in the claims, we apply these constructions for purposes of this Decision.

IX. ANALYSIS

A. Introduction

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)); *see In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (citing *DyStar*

Textilfarben GmbH & Co. Deutschland KG v. C H. Patrick Co., 464 F.3d 1356, 1360 (Fed. Cir. 2006)).

An obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418; *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, Petitioner must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. Cir. 2016).

A reason to combine or modify the prior art may be found explicitly or implicitly in market forces; “design incentives; the ‘interrelated teachings of multiple patents’; ‘any need or problem known in the field of endeavor at the time of invention and addressed by the patent’; and the background knowledge, creativity, and common sense of the person of ordinary skill.” *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1328–29 (Fed. Cir. 2009) (quoting *KSR*, 550 U.S. at 398).

In determining whether a claim is obvious in light of the prior art, when in evidence, we consider any relevant objective evidence of non-obviousness. *See Graham*, 383 U.S. at 17. Notwithstanding what the teachings of the prior art would have suggested to one of ordinary skill in the art at the time of the invention, the totality of the evidence submitted, including objective evidence of non-obviousness, may lead to a conclusion that the challenged claims would not have been obvious to one of ordinary skill. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984). At this stage

of the proceeding Patent Owner does not offer evidence of such objective considerations

We analyze the asserted grounds of unpatentability in accordance with these principles to determine whether Petitioner has met its burden to establish a reasonable likelihood of success at trial.

B. Petitioner's Contentions that Claims 1 and 5–8 Would Have Been Obvious Over Li

We begin with Petitioner's second listed challenge. Pet. 4. Petitioner contends that the challenged claims are obvious based on Li in view of the common knowledge of a POSITA. *Id.* at 59 (citing Ex. 1003, Bhattacharjee Decl. ¶ 142). We first consider the Petition's discussion and the record evidence of the technology background that would have been known to an ordinarily skilled artisan.

1. Knowledge of a Person of Ordinary Skill

The Petition notes that an IPv4 address is 32 bits and typically encapsulates a transport control protocol (TCP) or user datagram protocol (UDP) header that contains 16-bit port numbers. Pet. 4 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 29–31, noting that an IPV4 address is typically written in dotted quad 4 notation, e.g., 172.16.254.1). Petitioner's expert, Dr. Bhattacharjee, illustrates a TCP header format with a source port and a destination port; Dr. Bhattacharjee testifies that the source port "identifies the specific process that sends the data, while the destination port number identifies the process that is to receive it." Ex. 1003, Bhattacharjee Decl. ¶ 30 (comparing the Simple Mail Transfer Protocol (SMTP) on port 25 used for email with the Hypertext Transfer Protocol (HTTP) on port 80 or HTTP Secure (HTTPS) on port 443 used by a Web server). The Petition further notes that, at the time of filing of the application for the '845 patent it was

understood that, due to the exhaustion of the number of IPv4 addresses, a lengthy transition to 128-bit IPv6 addresses was underway. Pet. 4 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 31–33). Dr. Bhattacharjee testifies that IPv6 described in RFC 2460 is an evolution of IPv4. Ex. 1003, Bhattacharjee Decl. ¶ 32 (citing Ex. 1015). Dr. Bhattacharjee provides an illustration of an IPv6 header and highlights the source address and destination address within it. *Id.* Dr. Bhattacharjee also notes that a 128-bit IPv6 address is conventionally written in hexadecimal digits within eight groups, each of which is 16 bits. *Id.* ¶ 33. Dr. Bhattacharjee states that an IPv6 address begins with a variable length prefix, i.e., a global routing prefix, that can be allocated to individuals, companies, service providers, and any other entity requesting IPv6 network address space. *Id.* ¶ 34 (citing Ex. 1017, 2; Ex. 1018, 176).

Petitioner states that “[m]ultiple prior art references disclose converting IPv4 addresses into IPv6 addresses; for example, constructing an IPv6 address by concatenating an IPv6 prefix with an IPv4 address.” Pet. 5 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 38–39). Dr. Bhattacharjee cites U.S. Patent No. 7,391,768 as disclosing a network device interposed between an IPv4 FTP⁶ client and an IPv6 FTP server, wherein the network device intercepts data sent by the IPv4 client to the IPv6 server and converts the IPv4 source address into an IPv6 source address by concatenating an IPv6 prefix with the IPv4 source address. Ex. 1003, Bhattacharjee Decl. ¶ 38 (citing Ex. 1019, 6:35–7:9, Fig. 2A). Dr. Bhattacharjee also cites “IPv4-to-IPv6 Transition Strategies” authored by Tim Rooney, published in February 2007, as disclosing an IPv6-over-IPv4 tunneling technique

⁶ File Transfer Protocol (FTP)

(“6to4”) that constructs an IPv6 address by concatenating a “6to4 prefix” with a “globally unique IPv4 address.” *Id.* ¶ 39 (citing Ex. 1020).

Petitioner further states that, although converting IPv4 addresses into IPv6 addresses solves the compatibility issue, it does not solve the exhaustion of IPv4 addresses. Pet. 5 (citing Ex. 1003, Bhattacharjee Decl. ¶ 40 (noting that IPv4 hosts still need to occupy one of the finite public IPv4 addresses to participate in the network and eventually the finite number IP before addresses may run out)). According to Petitioner, “POSITAs proposed solving the IPv4-exhaustion problem by sharing a single IPv4 address among multiple hosts and uniquely distinguishing the host by assigning them distinct port numbers.” *Id.* (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 41–49 as identifying various efforts that concatenate an IPv6 prefix, a port number, and an IPv4 address between 2003 and 2008). Dr. Bhattacharjee testifies that recognizing computers typically use only a small portion of the available port numbers to access services led ordinarily skilled artisans to extend the IPv4 address space by combining the IPv4 32-bit address with bits from the port number field. Ex. 1003, Bhattacharjee Decl. ¶¶ 40–41 (citing Ex. 1022⁷, 9 (stating “because there are approximately 65,000 possible ports, it is possible to multiplex many hosts on one IP address. This has become quite popular in the marketplace, from large organizations, all the way down to small home installations”); Ex. 1023⁸, 2

⁷ A. Reitz, “The Dynamic Port Reservation Protocol,” Univ. Ill. at Urbana-Champaign (2001), available at http://redefine.dyndns.org/~andyr/documents_and_writings/thesis/docs/areitz_msthesis.pdf

⁸ Y. Zhu et al., “Stateless Mapping and Multiplexing of IPv4 Addresses

(stating “if we limit the port that one host can use, then multiple hosts in an IPv6 network can share a same IPv4 address”).

The Petition also states that, when the application for the ’845 patent was filed, ordinarily skilled artisans would have been aware of Network Address Translation/Port Address Translation (“NAT/NAPT”) techniques in which a network router (“stub router w/NAT”) facilitates reusing IP addresses within a local domain (“stub domain”). Pet. 5–6 (citing Ex. 1003, Bhattacharjee Decl. ¶ 51). The Petition notes that in this process the source IP address of outbound data is translated to a globally unique source address and inbound traffic is similarly translated from a globally unique destination address to a reusable local destination address. *Id.* (citing Ex. 1003, Bhattacharjee Decl. ¶ 51). The Petition and Dr. Bhattacharjee discuss Figure 2 of RFC 1631⁹ as illustrating a data packet travelling from stub network A to stub network B through a wide area network (WAN) in which stub network A translates the local IP address to a globally unique IP address (198.76.29.7) and stub B router translates the packet destination address to the local address (10.81.13.22) to complete the transfer. *Id.*; Ex. 1003, Bhattacharjee Decl. ¶ 53. Dr. Bhattacharjee further testifies that an ordinarily skilled artisan would have understood that, within a company premises, every machine has a unique private IPv4 address in the form of 10.x.y.z that is converted to a public IPv4 address (e.g., 198.60.42.12) by a NAT when communicating outside the network, wherein the NAT could be

in Migration to IPv6 Internet,” Institute of Electrical and Electronics Engineers (“IEEE”) (Nov. 2008), available at <https://ieeexplore.ieee.org/document/4698208>

⁹ RFC 1631, “The IP Network Address Translator (NAT)” (1994), available at <https://datatracker.ietf.org/doc/html/rfc1631>. (Ex. 1062).

implemented as part of the company router or as a separate device.

Ex. 1003, Bhattacharjee Decl. ¶ 54 (citing Ex. 1059,¹⁰ 340, 341, 345).

2. *Li*

Li discloses a new technique that “is automatic and stateless for end nodes, without explicit tunneling” for “forwarding IPv4 traffics in pure IPv6 backbone,” in which “IPv4 packets are mapped onto IPv6 (or vice versa) automatically at the edge of the IPv6 backbone, with the help of BGP¹¹ routing tables.” Ex. 1037, 1.¹² Li illustrates three types of systems having increasing levels of complexity: a basic design for an intra-domain environment, an access network transition scheme, and an inter-domain solution. *Id.* at 10. Li’s architecture uses an IPv4-IPv6 edge router to enable

¹⁰ The subject matter cited by Dr. Bhattacharjee in his Declaration does not appear at the cited pages of Exhibit 1059. Petitioner identifies Exhibit 1059 as: Andrew S. Tanenbaum, *Computer Networks* (4th Ed. 2003). Exhibit 1059 in the record is the Fifth Edition of this work. As the Fifth Edition’s copyright date of 2011 is several years after the priority date of the ’845 patent, the parties may address during trial whether, and to what extent, Exhibit 1059 can be relied upon as evidence of the knowledge of an ordinarily skilled artisan on the priority date. Petitioner may also wish to consider seeking authorization to substitute the Fifth Edition of the text with the Fourth Edition.

¹¹ Border Gateway Protocol. *See, e.g.*, Ex. 2013, 2 (“Border Gateway Protocol (BGP) is an inter-Autonomous System routing protocol”), 3 (“Autonomous System [(AS)] is a set of routers under a single technical administration, using an interior gateway protocol and common metrics to route packets within the AS, and using an exterior gateway protocol to route packets to other ASs. . . . it has become common for a single AS to use several interior gateway protocols and sometimes several sets of metrics within an AS. . . . the administration of an AS appears to other ASs to have a single coherent interior routing plan and presents a consistent picture of what destinations are reachable through it.”).

¹² Page numbers refer to the page number of the Exhibit, not the original page numbers of the publication.

IPv4-over-IPv6 transition in an intra-domain environment and extends that design to other systems focusing on issue related to prefix discovery. *Id.* at 2.

Li first describes an IPv4-over-IPv6 transition in an intra-domain environment where the IPv4 address is predetermined and a well-known common IPv6 prefix can be applied before the IPv4 address, such that the formed subnet identifier can be routed within the domain. *Id.* at 2. Figure 1 of Li, reproduced below, shows such an intra-domain environment.

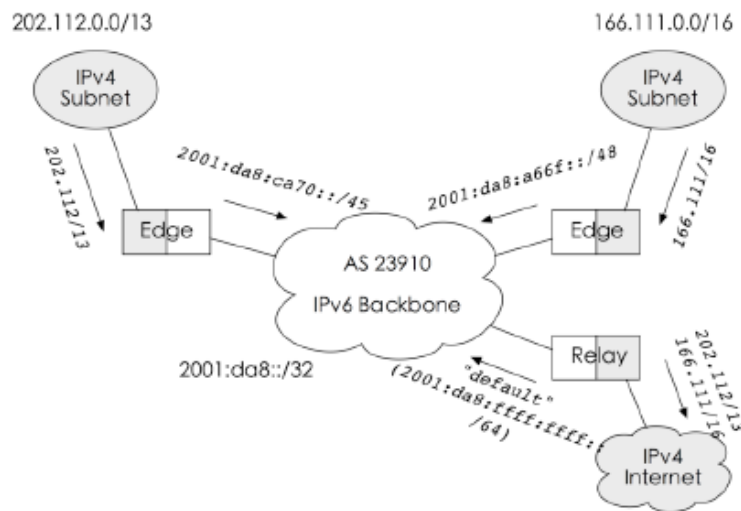


Figure 1. Intra-domain IPv4-over-IPv6 transition

In Figure 1, an IPv6 autonomous system that has IPv4 subnets is aware of all the IPv4 prefixes under its administration and controls the address assignment. Ex. 1037, 3. Edge routers at the edges of IPv4 subnets and the IPv6 backbone map the addresses and translate routing information between IPv6 and IPv4. *Id.* at 4. Access mapping is accomplished by appending the IPv4 network ID to the IPv6 aggregation of the autonomous system (AS). *Id.* Figure 2 of Li, reproduced below, illustrates the intra-domain transition from IPv4 to IPv6. *Id.* at 3.

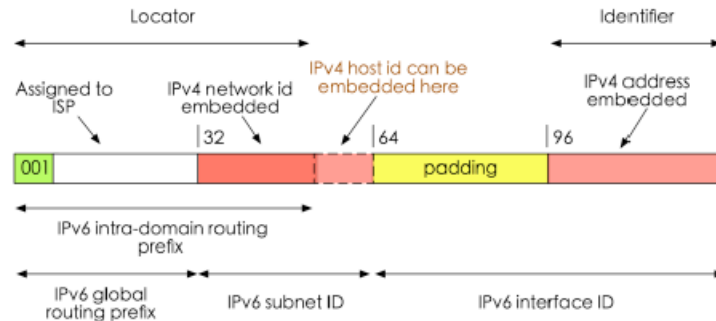


Figure 2. Intra-domain IPv4-over-IPv6 transition

Id. Only IPv4 addresses held by the AS can be mapped, otherwise the mapping would run out of space for the IPv6/32 block. *Id.* For networks outside the AS, a special prefix for the IPv4 default route, e.g., 0xFFFFFFFF, is defined as a second 32-bit word. *Id.* As this results in the IPv4 address being lost in the first 64 bits, the complete IPv4 address is embedded at the end of the mapped IPv6 version as a convention in all cases. *Id.*

Li extends its intra-domain scheme to inter-domain models, e.g., (1) stub autonomous systems that are customer networks connected to the IPv6 backbone and have access to IPv4 hosts only within the scope controlled by the provider, and (2) transit autonomous systems that are interconnected with each other. Ex. 1037, 6. Referencing the extension of the basic intra-domain scheme, Li states

[w]hen the scheme is extended to fit the requirements of forwarding IPv4 traffic in an inter-domain environment, a prefix discovery mechanism is necessary in order for [the] edge routers to determine which prefix should be employed for the address mapping. The key idea of the prefix discovery is utilizing the AS number to map an IPv4 network id to an IPv6 one.

Id.

Petitioner's annotated version of Figure 7 of Li, reproduced below, illustrates an inter-domain system.

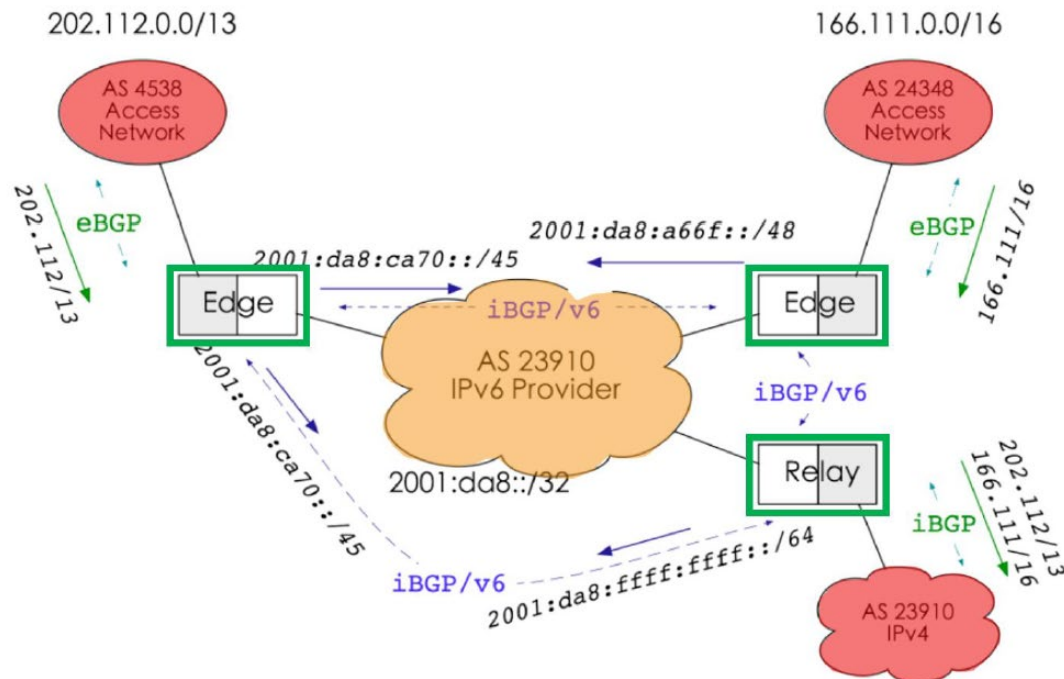


Figure 7. IPv4-over-IPv6 transition for access networks

Pet. 16, Ex. 1037, 7. Annotated version of Figure 7 of Li in the Petition shows the IPv6 domain at the center (highlighted in orange) surrounded by several IPv4 domain customer networks (autonomous system access networks) that send their traffic to one another over the IPv6 backbone (AS 23910 IPv6). Pet. 16; Ex. 1037, 6–7. As shown in the annotated version of Figure 7, two customer networks (AS 4538, AS 24348) peer with the backbone via Edge Border Gateway Protocol (eBGP) peers for IPv4, and possibly for IPv6. *Id.* The remaining IPv4 Internet (AS 23910 IPv4) is attached with a Relay Router. *Id.* Internal Border Gateway Protocol (iBGP) peers are utilized between relay routers and their counterparts in the IPv4 Internet. *Id.* The backbone border gateway uses iBGP for IPv6 that connects networks within the same autonomous system (AS 23910 IPv6

provider), such that peers are deployed as inside a general autonomous system to maintain routing consistency. *Id.* at 6.

Li describes the inter-domain addressing scheme as “similar to that in the basic design.” Ex. 1037, 7. According to Li, although the access networks have independent AS numbers and may hold IPv6 prefixes allocated by the provider, only the specified /32-prefix of the provider is used for address mapping. *Id.* The mapped prefixes are companied with an AS path in the BGP table learned by the provider’s backbone. *Id.*

Figure 11 of Li, reproduced below, is a simplified version of an inter-domain solution. Ex. 1037, 9–10

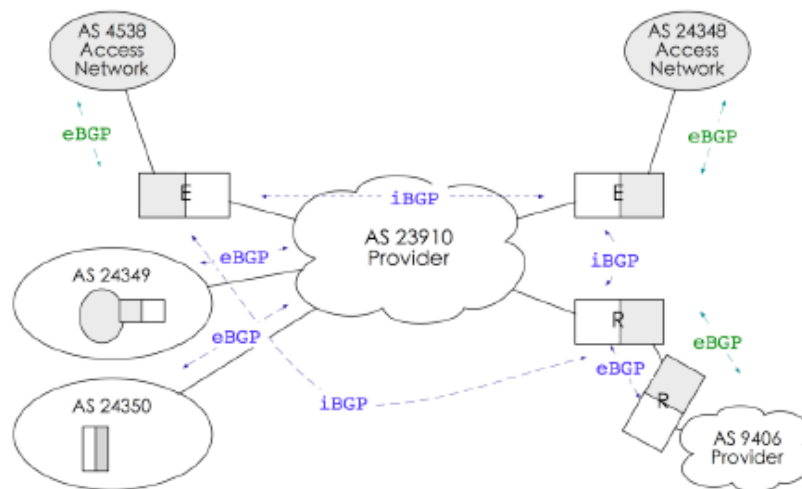


Figure 11. Migration with 3 steps

Ex. 1037, 9. Access network AS 24348 (upper right) has an edge router deployed on its boundary with provider backbone AS 23910. *Id.* The edge router announces to the backbone an IPv4-mapped prefix for the whole access network and translates headers for all packets coming in or going out across the network. *Id.*

Access network AS 24349 (center left) contains a native IPv6 infrastructure but, because not all network nodes have been upgraded to

IPv6 and not all applications have been ported, some groups of subnets still communicate with the Internet via IPv4. Ex. 1037, 9. Li assumes that the IPv4 block of the access network is 210.29/16, and the corresponding IPv6 prefix would be 2001:da8:d21d::/48. *Id.* at 10. In that case, the relay router of the provider backbone would announce 210.29/16 to the IPv4 Internet and the regular border gateway of the access network would advertise its native IPv6 prefix 2001:da8:d21d::/48. *Id.*

Access network AS 24350 (lower left) contains separate dual stack hosts where all hosts and routers have been upgraded to support IPv6. Ex. 1037, 10. Nevertheless, IPv4 accessibility cannot be removed because the lengthy amount of time required to port applications to IPv6 versions renders eliminating IPv4 accessibility impractical. *Id.* Li notes that edge routers are no longer required, as header mapping is replaced by end systems and route mapping is no longer required. *Id.* As an example, Li states that a node with the IPv4 address 210.30.4.5 has the corresponding automatically mapped IPv6 address 2001:da8:d21e:0405::d21e:0405 and is only connected with the network via the IPv6 link. *Id.* Nevertheless, as an isolated IPv4 node running a service that another user must use an IPv6 packet to access, a local translation must be performed and the translated IPv4 version sent to the IPv4 stack to process. *Id.* Similarly, a packet related to IPv4-only application will be generated from the IPv4 stack but be translated into an IPv6 version to be sent out. *Id.*

3. *Claim 1*

a) *Preamble—1[pre]*

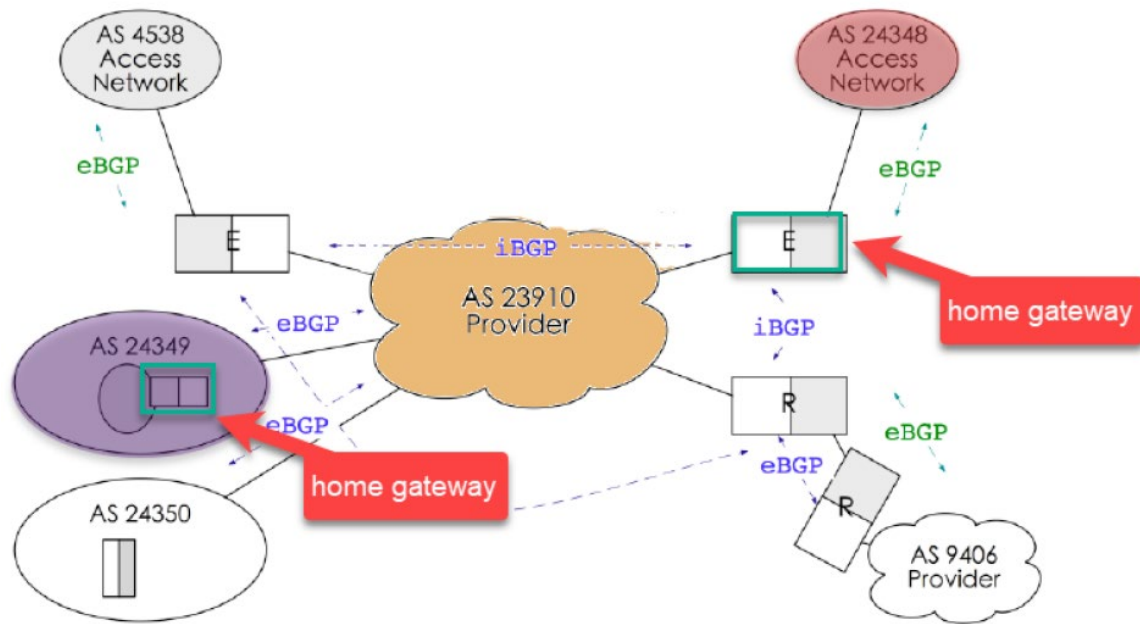
Petitioner identifies as the preamble of claim 1 the recitation “[a] method of receiving an IPv6 data packet in an IPv6 domain connected to an IPv4 domain, said packet comprising an IPv6 destination address and an

IPv6 source address, said method being executed in a home gateway adapted to connect a user terminal to said IPv6 domain.” Pet. xi. Petitioner cites Li as disclosing an “address mapping” process that constructs an IPv6 source and destination address from an IPv4 source and destination address.

Pet. 13. Petitioner states that Li discloses constructing an IPv6 address from an IPv4 address by concatenating a 32-bit IPv6 prefix (bits 0–31), a 32-bit IPv4 address (bits 32–63) and 32 bits of zero padding (bits 64–95). *Id.* at 14–16 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 66–68; Ex. 1037, 3¹³ (Table I,) Fig. 2).

Patent Owner contends that Petitioner fails to demonstrate that Li discloses the claimed home gateway, as that term is properly construed. The parties agree that “home gateway” should be construed to mean “any equipment for interconnecting a private network and a network operated by a service provider, the private network being either a home network or a business network.” *See* Section VIII herein; Prelim. Resp. n.2. Referencing its annotated version of Li’s Figure 11, reproduced below, Petitioner contends that “Li’s edge routers are ‘home gateways’ under the Texas court’s construction.” Pet. 32–33 (quoting Ex. 1037, 4 (stating “[f]or the IPv6 backbone, the edge router plays the role of an access gateway”)).

¹³ Page numbers refer to page numbers of Ex. 1037, not the page numbers of the published reference.



Petitioner's annotated version of Figure 11 of Li

Id. at 32. Petitioner argues that the elements outlined in green are home gateways because they connect a customer network (e.g., a home or business network that may be implemented as a private network) to the provider network and that these home networks are adapted to connect a user terminal to an IPv6 domain. *Id.* at 33 (citing Ex. 1037, 3, 7; Ex. 1035, 3:42–59; Ex. 1003 ¶¶ 102–104). In particular, Petitioner notes that the edge router at the upper right connects IPv4-only network AS 24348 (red) to IPv6 network AS 23910 (orange, in the center) and IPv6 network AS 24349 is connected to the IPV6 provider backbone. *Id.* Petitioner asserts that an ordinarily skilled artisan would have understood that IPv4-only access network AS 24384 and IPv6 access network AS 24349 would include host devices, e.g., computers that are user terminals connected to the IPv6 domain, such that Li's edge routers and access gateways are "home gateways" adapted to connect user terminals to the IPv6 domain. *Id.* at 34 (citing Ex. 1037, Fig 5 (cited by Petitioner as illustrating Hosts A and D in the IPv4 domain are

connected to the IPv6 domain via edge routers B and C); Ex. 1003
Bhattacharjee Decl. ¶ 105).

Patent Owner argues that Li teaches an edge router or border gateway that connects multiple provider-operated autonomous systems and does not disclose the claimed “home gateway” “because Li’s edge router and border gateway do not interconnect a private network with a provider operated network.” Prelim. Resp. 1, 21. Patent Owner contends that Li does not disclose a home gateway for three reasons:

- 1) Li teaches that the networks identified by Petitioner as private networks are instead networks operated by a service provider; (2) the edge router and border gateway Petitioners points to as ‘home gateways’ are instead border routers; and (3) Petitioner’s fallback position illustrates a single private domain, not two interconnected domains.

Id. at 22–23

Patent Owner’s first argument does not rebut Petitioner’s challenge. Patent Owner states that “[a]utonomous systems are not, themselves, private networks” and “Li never teaches that any of the autonomous systems within Figure 11 are private networks.” Prelim. Resp. 23–24. Li discloses IPv4 customer networks with an AS number that peer with the IPv6 backbone via eBGP for IPv4. Ex. 1037, 6. Patent Owner does not address Petitioner’s contention that an ordinarily skilled artisan would have understood that a customer network, such as that discussed in Li, can be a home or business network implemented as a private network. Pet. 33 (citing Ex. 1003, Bhattacharjee Decl. ¶ 102 (“A POSITA would have understood that a home network or the network of a business are examples of a customer network, and that those networks may be implemented as private networks.”))).

Patent Owner further argues that Petitioner fails to demonstrate the autonomous systems in Li are private networks at least because they “are instead networks operated by a service provider.” Prelim. Resp. 22–23. Without supporting evidence, Patent Owner argues that “a POSITA would understand that an autonomous system is not a private network—even if controlled by a ‘customer of the provider’—and thus the devices identified by petitioner are not ‘home gateway.’” *Id.* Patent Owner’s attempt to exclude service providers from the realm of private networks is inconsistent with the understanding of a person of ordinary skill. *See* Pet. 33 (citing Ex. 1035¹⁴, Fig. 1, 3:42–59 (“private network 105, such as an Internet Service Provider . . . is coupled with a gateway 110, which allows connectivity with a public network 115, such as the Internet. The private network 105 includes a plurality of intermediary hubs or routers . . . such as aggregators that provide connectivity for a plurality of edge routers . . . coupled to one or more hosts . . . such as PCs”))).

The argument advanced in the Preliminary Response is also not consistent with the ’845 patent itself. As “Background,” the ’845 patent distinguishes a public network, e.g., a network operated by the service providers, from a private network. Ex. 1001, 1:40–44. The ’845 patent states that the home gateway is located on the path of data packets between a terminal of the private home network and the IP domain of the operator, and that it is known in the art to include in the home gateway a table, i.e., the

¹⁴ U.S. Patent No. 7,624,195 B1 “Method and Apparatus For Distributed Network Address Translation Processing” Biswas, et. al., filed May 8, 2003, issued Nov. 24, 2009. Petitioner does not assert Biswas as a part of a challenge ground, but as indicative of an ordinarily skilled artisan’s understanding of a private network.

NAT table that associates the private IP address and port associated with the terminal on the private network with a public IPv4 address with a port of the same gateway on the public network. *Id.* at 1:51–60.

Consistent with the description in the '845 patent, a person of ordinary skill would have understood that

[the] NAT allows an intermediary device (e.g., computer, router or switch) to act as an agent between a public network (e.g., the Internet) and a private local network. Each device on the local network is assigned a local IP address that is used only for local communications. Additionally, the local network is given a range of public IP addresses to represent the devices on the local network when communicating with the public network.

When a local computer attempts to communicate with a computer outside the local network, the intermediary device (NAT box) maps the local computer's IP address to one of the public network's IP addresses and replaces the local computer's address with the network's IP address.

Ex. 1035, 1:23–45.

Referring to Li's discussion of routers and autonomous systems in Figure 11, Patent Owner's second argument appears to be based on the assertion, unsupported by evidence, that "a POSITA would understand that this edge router is the gateway used to connect autonomous system (or a BGP Border Router). This edge router is not a 'home gateway' interconnecting a private network and a public network." Prelim. Resp. 27. Citing Li's disclosure that eBGP routers are established between edge routers and their customer's BGP routers and iGBP peers are utilized between relay routers and their counterparts in the IPv4 internet, Patent Owner notes Li's disclosure that its "edge routers and relay routers here are all BGP speakers." Prelim. Resp. 26–27 (quoting Ex. 1037, 6).

Patent Owner acknowledges that Li discloses its “edge router is deployed on the border boundary of the access network and the provider backbone. It announces to the backbone an IPv4 mapped IPv6 prefix for the whole access network.” Prelim. Resp. 27 (quoting Ex. 1037, 9) (emphasis omitted). Patent Owner acknowledges that AS 24348 in Figure 11 communicates with the edge router in part using eBGP. *Id.* at 27. Patent Owner acknowledges that Li explains AS 24349 in Figure 11 consists of IPv4 and IPv6 subnets and that AS 23349 is connected to the AS 23920 provider backbone with a border gateway that uses the eBGP routing protocol. *Id.* Nevertheless, Patent Owner asserts that “[n]othing in Li teaches that the border gateway is anything other than a border gateway at the edge of an autonomous system. In other words, Li does not teach performing its mapping at a ‘home gateway’ within AS24349.” *Id.*

Patent Owner’s second argument does not rebut Petitioner’s challenge. Patent Owner’s attempt to focus on the structure and performance features of a border gateway is inconsistent with the construction of home gateway as “*any equipment* for interconnecting a private network and a network operated by a service provider, the private network being either a home network or a business network.” *See* Section VIII herein (emphasis added). For the reasons discussed above, Patent Owner’s second argument is also insufficient to the extent that Patent Owner’s second argument is grounded in its unsupported first argument that an autonomous system is not a private network. Patent Owner’s first and second arguments are inconsistent with the disclosure in Exhibit 2013 that “[t]he primary function of a BGP speaking system is to exchange network reachability with other BGP systems. This network reachability information includes information on the list of Autonomous Systems (ASs) that

reachability information traverses.” Ex. 2013, 2. “Since the current Internet uses only the ‘hop-by-hop’ routing paradigm and since BGP can support any policy that conforms to that paradigm, BGP is highly applicable as an inter-AS routing protocol for the current Internet.” *Id.* at 3; *see also* Section IX.B herein (citing the description of an AS as a set of routers under a single technical administration, using an interior gateway protocol to route packets within the AS and an exterior gateway protocol to route packets to other ASs).

Patent Owner’s third argument is in response to Petitioner’s citation of Figure 5 of Li as demonstrating user terminals (e.g., hosts A and D) in the IPv4 domain are connected to the IPv6 domain via a home gateway (e.g., edge routers B and C). Prelim. Resp. 28 (citing Ex. 1037, 5). According to Patent Owner, Petitioner does not explain how a computer teaches the claimed home gateway, Figure 5 does not teach any of the other elements of the claims, as it does not illustrate packet transmission, and, as a prototype implementation representing an environment set up and controlled by Li’s drafters, Figure 5 discloses a single private network rather than two interconnected networks. *Id.* at 28–29.

Patent Owner’s third argument does not rebut Petitioner’s contentions. Li explains that Figure 5(a) shows two native IPv4 networks separately connected to pure IPv6 network sections via edge routers B and C and that Host A (10.0.0.2) (default gateway 10.0.0.1) and Host D (11.0.0.2) (default gateway 11.0.0.1) do not have IPv6 functionality but wish to communicate. Ex. 1037, 5. The two IPv4 networks IDs, 10.0.0.0/8 and 11.0.0.0/8 are mapped into IPv6 prefixes with edge router B having been programmed with the translation and the routing, such that router B knows Host D is reachable

and Hosts A and D can communicate with each other. *Id.* at 5–6; Ex. 1003, Bhattacharjee Decl. ¶ 104.

Having considered that evidence and arguments of record, we determine that, for purposes of this Decision, Petitioner has demonstrated Li discloses the features recited in the preamble of claim 1.

b) Claim Limitation [1a]

Petitioner identifies as claim limitation [1a] the recitation “identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address and a destination port number.” Pet. xi. Petitioner cites Li as disclosing an address mapping method to translate an IPv4 source and destination address in a packet into an IPv6 version, wherein the method includes concatenating (appending) a 32-bit IPv6 prefix assigned to an ISP’s IPv6 domain to an IPv4 address, and adding 32 bits of padding in the form of bits filled with 0s. *Id.* at 36–37 (citing Ex. 1037, 3–4, 7–9, Figs. 2, 4, 11, Table I); Ex. 1003, Bhattacharjee Decl. ¶ 106.

Petitioner acknowledges that Li does not explicitly discuss port numbers, as recited in limitation [1a]. *Id.* at 61. Petitioner contends that a POSITA would have recognized there is more than sufficient space to “include a 16-bit destination port number in Li’s constructed IPv6 destination address by replacing 16 bits of the zero padding with the destination port number.” *Id.* at 40 (citing Ex. 1003, Bhattacharjee Decl. ¶ 113). In this challenge ground, instead of citing prior art, Petitioner contends that evidence of simultaneous invention supports this contention. *Id.* at 62 (citing Ex. 1003, Bhattacharjee Decl. ¶ 157). According to Dr. Bhattacharjee, “[e]vidence of simultaneous invention shows that not only would a POSITA have been motivated to make this modification and would have been successful in doing so, but POSITAs at that time were actively

modifying Li in such a manner.” Ex. 1003, Bhattacharjee Decl. ¶ 157. Dr. Bhattacharjee cites a September 2008 publication by Randy Bush describing an “Address + Port” (A+P) approach in which an IPv4 address is combined with a port number to form an A+P pseudo address within an IPv6 address using a well-known IPv6 prefix. *Id.* ¶ 149 (citing Ex. 1029, 1–3).

According to Dr. Bhattacharjee, “[i]n other words, Bush similarly proposed forming an IPv6 address by concatenating an IPv6 prefix, IPv4 address, and port number.” *Id.* Dr. Bhattacharjee adds that “Bush identified and discussed several related works in the same field” and referenced “a long history of treating port numbers as part of the network address.” *Id.* (citing Ex. 1029, 4). Dr. Bhattacharjee cites still another paper published by Bush in October 2008, that describes the A+P technique as like other past techniques for extending address space and explains the IPv6 address is formed by combining a well-known prefix with a destination IPv4 address that is an Address + Port. *Id.* (citing Ex. 1041, 16–17, 21).

Petitioner further contends that Li-2, submitted on June 21, 2008 and which is the subject of a different ground discussed below, even if it is not considered prior art, is further evidence of simultaneous invention, because in Li-2, the Li authors disclose a port multiplexing technique to construct an IPv6 address containing an IPv6 prefix, a destination IPv4 address, and a destination port number. Pet. 59. As support for this assertion, Petitioner cites testimony of Dr. Bhattacharjee that on July 6, 2008, one week after the June 30, 2008 priority date of the ’845 patent, the Li authors submitted another Internet Engineering Task Force (IETF) publication to the Network Working Group (“IVI Memo”) that discloses the use of “port multiplexing” to construct an IPv6 address with destination port numbers. Ex. 1003, Bhattacharjee Decl. ¶ 145 (citing Ex. 1027, 7–8, 18–20); Pet. 59–60. Dr.

Bhattacharjee also cites a July 29, 2008 presentation to the IETF by the authors of Li and Li-2 discussing an address and routing scheme (IVI) and that teaches concatenating the destination port number to the IPv6 address by replacing zero padding. Pet. 40; Ex. 1003, Bhattacharjee Decl. ¶ 146 (citing Ex. 1028, 22; Ex. 1007 ¶ 11; Ex. 1005 ¶¶ 53–57); Ex. 1028, 20 (disclosing multiplexing of global IPv4 addresses including “Port Multiplexing—[c]ombine address with the port number”).

Patent Owner contends that Petitioner fails to show simultaneous invention. Prelim. Resp. 43. According to Patent Owner, Petitioner has oversimplified and narrowed the invention to constructing the IPv6 destination address by concatenating an IPv6 prefix, and IPv4 destination address and a destination port number. *Id.* at 43–47. Patent Owner contends that “Petitioner’s reliance on Li-2 to show simultaneous invention must be disregarded because Petitioner has not meaningfully addressed any claim limitation beyond ‘destination port number’ and a NAT table (which is not required by Claims 1 and 8).” *Id.* at 45. Patent Owner cites other limitations in claims 1 and 8 that it argues are not disclosed by the Bush papers or Li-2. *Id.* at 44–45. Patent Owner emphasizes the importance of considering the evidence of simultaneous invention in light of all the circumstances. *Id.* (citing *Intex Recreation Corp. v. Team Worldwide Corp.*, IPR2018-00859 Final Written Decision (Paper 128), 51–53 (PTAB Oct. 21, 2019 (finding that the analysis provided by Petitioner’s expert did not persuasively support Petitioner’s conclusory statement in its Reply that the combined information corresponds to the claimed subject matter of the challenged claims and does not explain why, in light of all the circumstances, the invention was the product of ordinary mechanical or engineering skill))); *see also Intex Recreation Corp. v. Team Worldwide Corp.*, IPR2018-00859 Final Written

Decision on Remand (Paper 132) 59–61 (PTAB April 15, 2022); *Lindemann Maschinenfabrik GmbH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1460 (Fed. Cir. 1984).

In the context of its challenge based on Li and the level of ordinary skill, Petitioner references “simultaneous invention” in its discussion of limitations 1[a], 1[b], and 1[c]. Pet. 61–63. Simultaneous invention may bear upon the obviousness analysis in two ways; first it is evidence of the level of skill in the art; second, it constitutes objective evidence that persons of ordinary skill in the art understood the problem and a solution to that problem. *Regents of University of California v. Broad Institute, Inc.*, 903 F.3d 1286, 1295 (Fed. Cir. 2018) (citing *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 883 (Fed. Cir. 1998)).

Petitioner cites the “Address+Port” disclosures by Bush in September and October 2008. Pet. 60 (citing Ex. 1029, 1–4; Ex. 1041, 21). The Petition cites testimony by Dr. Bhattacharjee that an ordinarily skilled artisan would have understood that converting IPv4 to IPv6 addresses by concatenation does not solve the issue of IPv4 address exhaustion and that sharing a single IPv4 address among multiple hosts and that uniquely distinguishing hosts by assigning them distinct port numbers to address exhaustion was well known. See Pet. 59–61, 5–6 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 41–43 (discussing Exs. 1021–1025), ¶¶ 44–49 (discussing Ex. 1026–1033); see also Section IX.B.1 herein.

Although the parties may wish to develop simultaneous invention as an issue for trial, in this ground, Petitioner cites Li-2 only as evidence of the knowledge of an ordinarily skilled artisan. For example, the Petitioner points out the Li-2 reference discussion of NAT features in RFC 1919. Pet.

62 (citing Ex. 1060¹⁵, 14 (discussing address hiding in classical application sessions consisting of a session between a client and a proxy and a session between a proxy and a server)). As “Technology Background,” the Petition also cites to Dr. Bhattacharjee, who discusses earlier references, filed and/or published between 2002 and the ’845 patent’s priority date, that he characterizes as disclosing adding port numbers to internal hosts, so that internal hosts can share an IPv4 address, and constructing an IP address comprising an IPv6 prefix, a port number, and an IPv4 address. *See, e.g.*, Pet. 5; Ex. 1003, Dr. Bhattacharjee Decl. ¶ 42 (citing Ex. 1024, filed May 23, 2006, published Nov. 29, 2007 (Publ. No. US2007/0276957), issued Oct. 4, 2011), ¶ 43 (citing Ex. 1025, filed May 31, 2002, issued Sept. 13, 2011), ¶ 48 (citing Ex. 1030, filed on March 27, 2003, published Sept. 30, 2004), ¶ 49 (citing Ex. 1031, filed on July 11, 2003, issued Dec. 12, 2006).

As we institute trial on other grounds discussed further herein, we leave further development of these issues for trial.

c) Claim Limitation [1b]

Petitioner identifies as claim limitation [1b] the recitation “if necessary, regularizing at least one of the IPv6 source address and the IPv6 destination address of the data packet by replacing said at least one IPv6 address, the replacement process belonging to a group comprising replacement of a constructed address with a native address and replacement of a native address with a constructed address, and modifying the data packet using the regularized address.” Pet. xi.

Petitioner cites Li as disclosing edge routers that receive IPv6 packets and replace constructed IPv6 addresses with IPv4 addresses by inverting the

¹⁵ RFC 1919, Classical versus Transparent IP Proxies, March 1996.

mapping. *Id.* at 62. Petitioner notes that the '845 patent itself states that a NAT table would have been known to persons skilled in the art and argues that an ordinarily skilled artisan would have been well aware of NAT tables at the time and understood NAT features, such as address hiding. *Id.* (citing Ex. 1001, 1:56–60; Ex. 1003, Bhattacharjee Decl. ¶ 158; Ex. 1058, 7).

Petitioner contends it would have been obvious to regularize the address using IPv4 NAT, such that the IPv4 address is further translated from a public IPv4 address to a private IPv4 address. *Id.* at 62–63 (citing Ex. 1003, Bhattacharjee Decl. ¶ 158; Ex. 1038, 18). According to Petitioner, “in view of the general knowledge of a POSITA, it would have been obvious to implement NAT within the access gateway AS24349” outlined in a green box in Petitioner’s annotated version of Figure 11 of Li. *Id.* at 49–50 (citing Ex. 1037, Fig. 11). Petitioner states that after Li’s router receives and translates a constructed IPv6 address to a native IPv4 public address by reversing the address mapping, the data packet would be routed with the private IPv4 address to the IPv4 host that allocated that private IPv4 address. *Id.* at 50–51 (citing Ex. 1003, Bhattacharjee Decl. ¶ 124; Ex. 1037, 9–10).

Other than its arguments concerning simultaneous invention discussed above, Patent Owner does not respond explicitly to Petitioner’s contentions concerning limitation 1[b]. *See* Prelim. Resp. 44–45.

Having considered the arguments and evidence of record, we determine that Petitioner has demonstrated that in the context of the knowledge of an ordinary skill artisan, Li would have disclosed or suggested [1b] a person of ordinary skill.

d) Claim Limitation [1c]

Petitioner identifies as claim limitation [1c] the recitation “routing the modified data packet to its destination.” Pet xi. According to Petitioner, an

ordinarily skilled artisan would have understood Li to teach that the modified packet is routed to the address in the destination IP address filed. *Id.* at 51 (citing Ex. 1003, Bhattacharjee Decl. ¶ 126).

Other than its arguments concerning simultaneous invention discussed above, Patent Owner does not respond explicitly to Petitioner's contentions concerning limitation 1[c]. *See* Prelim. Resp. 44–45.

Having considered the arguments and evidence of record, we determine that Petitioner has demonstrated that in the context of the knowledge of an ordinarily skill artisan, Li would have disclosed or suggested limitation [1c] a person of ordinary skill

e) Claim 1 Conclusion

In consideration of the above, for purposes of institution, we leave for further development during trial whether Petitioner has cited sufficient evidence to demonstrate that Li would have disclosed or suggested all the limitations of claim 1 to a person having the knowledge of one of ordinary skill.

4. Claim 5

Claim 5 depends from claim 1 and recites that when the data packet comes from the IPv4 domain and goes to the user terminal, the step of regularizing the destination address comprises the following steps: (1) searching an address translation table of the gateway for an entry associating with the constructed destination address a native destination address; and (2) if an entry is found, replacing the constructed destination address of the data packet with the native destination address from that entry. Ex. 1001, 18:64–19:6. Petitioner contends that Li, in view of the general knowledge of a POSITA, renders claim 5 obvious. Pet. 63 (citing Ex. 1003, Bhattacharjee Decl. ¶¶ 160–162). Petitioner cites its annotated version of Figure 11 of Li

as illustrating that a “router within the native IPv6 AS24349 network (purple) receives an IPv6 packet, where the IPv6 packet was originally transmitted as an IPv4 packet from AS4538 (red),” that “it translates the constructed IPv6 address to a native public IPv4 address by reversing the IIVI address mapping and may also integrate IPv4 NAT to further translate the native IPv4 address to a private IPv4 address,” such that “[t]he IPv4 packet is then routed to a host within the AS24349 that is associated with the private IPv4 address (‘user terminal’).” *Id.* at 51–52 (citing Ex. 1059, 340)¹⁶. Petitioner further notes that the ’845 patent acknowledges a NAT would have been known to one of ordinary skill. *Id.* (citing Ex. 1001, 1:56–60). According to Petitioner, an ordinarily skilled artisan would have known to replace the entry and pass the packet if an entry in the table is found. *Id.*

Patent Owner acknowledges that NAT tables provided a well-known solution for addressing IPv4 address exhaustion, but argues Petitioner provides no motivation to deviate from this known solution and that Petitioner’s reliance on post-priority date references indicates the solution claimed in the ’845 patent was not known. Prelim. Resp. 41–42. However, as discussed above, Petitioner cites publications and developments around the same time as that of the priority date of the ’845 patent as evidence of simultaneous invention, i.e., as secondary evidence of obviousness. “Independently made, simultaneous inventions, made ‘within a comparatively short space of time,’” although not determinative, of statutory obviousness, “are persuasive evidence that the claimed apparatus ‘was the product only of ordinary mechanical or engineering skill.’” *Geo. M. Martin*

¹⁶ See previous footnote concerning Exhibit 1059.

Co. v. Alliance Machine Systems Inter LLC, 618 F.3d 1294, 1305–1306 (Fed. Cir 2010).

In view of the circumstances, for the same reasons as discussed above in the context of claim 1, we leave further development of the issues presented by this challenge for trial.

5. *Claim 6*

Claim 6 depends from claim 5 and recites verifying that the destination port number of the data packet and the destination port number in the constructed destination address match. Ex. 1001, 19:7–10. Petitioner contends a POSITA would have also found it obvious to verify that the port numbers match and that, by the time of the alleged invention of the '845 patent, POSITAs understood that such a comparison would be useful to identify errors and security issues. Pet. 54–55 (citing Ex. 1003, Bhattacharjee Decl. ¶ 133). As discussed above, in this ground, Petitioner cites Li-2 as evidence of the level of ordinary skill in the art. *Id.*

Except for its arguments concerning simultaneous invention, Patent Owner does not explicitly address Petitioner's contentions concerning claim 6. Having considered the arguments and evidence of record, for purposes of institution, we leave for further development during trial whether Petitioner has cited sufficient evidence to demonstrate that Li would have disclosed or suggested all the limitations of claim 6 to a person having the knowledge of one of ordinary skill.

6. *Claim 7*

Independent claim 7 recites a non-transitory computer program product downloadable or stored on a non-transitory medium comprising instructions for executing the method of claim 1. Ex. 1001, 19:11–16. For the same reasons as those addressed in our discussion of claim 1, we leave

for further development during trial whether Petitioner has cited sufficient evidence to demonstrate that Li would have disclosed or suggested all the limitations of claim 7 to a person having the knowledge of one of ordinary skill.

7. *Claim 8*

Independent claim 8 recites “a device for receiving an IPv6 data packet in an IPv6 domain connected to an IPv4 domain, said packet comprising an IPv6 destination address and an IPv6 source address, said device for use in a home gateway adapted to connect a user terminal to said IPv6 domain.” Pet. 56. Petitioner contends that the claimed device corresponds to the “home gateway” recited in claim 1 and that Li’s edge router teaches such a device for the same reasons as Li teaches the home gateway of claim 1. *Id.* at 56–57.

Petitioner identifies as limitation [8a] the recitation “means for identifying an IPv6 destination address constructed by concatenating an IPv6 prefix, an IPv4 destination address, and a destination port number.” Pet. xii. Adopting the construction applied in the Texas litigation, Petitioner cites Li as disclosing a home gateway implemented on a computer as disclosing a corresponding a structure that performs the same function as that claimed. Pet. 57–58.

Petitioner identifies as limitation [8b] the recitation “means for regularizing, if necessary, at least one of the IPv6 source address and the IPv6 destination address of the data packet by replacing said at least one IPv6 address, the replacement process belonging to a group comprising replacement of a constructed address with a native address and replacement of a native address with a constructed address, and modifying the data packet using the regularized address.” Pet. xii, 58. Applying the

construction adopted in the Texas litigation, Petitioner cites Li as disclosing a home gateway structure that performs the functions of regularizing “the constructed address by inverting the IVI address mapping to obtain the embedded IPv4 address, and may further implement NAT to search a translation table for a native destination address associated with the constructed destination address (a private IPv4 address).” *Id.* at 58. Referencing earlier arguments, Petitioner further argues that “[t]o protect against spoofing, a POSITA would have also found it obvious to verify that the transport level destination port of the data packet agrees with the destination port number contained in the destination address of the packet . . . and to modify the packet by replacing the constructed destination address with the native IPv4 destination address if there is a match.” *Id.*

Petitioner identifies as limitation [8c] the recitation “means for routing the modified data packet to its destination.” Pet. xii, 58–59. Applying the construction adopted in the Texas litigation, Petitioner contends that a home gateway would provide a structure that performs the claimed routing. Pet. 59.

Having considered the arguments and evidence of record, for purposes of institution, we leave for further development during trial whether Petitioner has cited sufficient evidence to demonstrate that Li would have disclosed or suggested all the limitations of claim 8 to a person having the knowledge of one of ordinary skill.

C. Petitioner’s Contentions That Claims 1 and 5–8 Would Have Been Obvious Over Li and Li-2

1. Petitioner’s Reliance on Li-2

According to Petitioner, “Li-2 supplements Li’s disclosures by teaching concatenating a destination port number to the end of the

constructed IPv6 address (replacing any unused zero padding as necessary) in order to uniquely identify IPv4 hosts and mitigate IPv4 address exhaustion.” Pet. 24.

2. *Port Multiplexing in Li-2*

Li-2 discloses that, to further increase the utilization ratio of public IPv4 addresses, port multiplexing inside the ISP can be deployed, as disclosed in RFC2766, such that a single borrowed IPv4 address (IPIv4(i)) can be used for multiple IVI6(i) addresses. Ex. 1038, 14, 32 (citing RFRC2766, publ. Feb. 2000). The mapping uses the least significant bits in IVI6(i) to define multiple mapping and combine the transport-layer port number to uniquely perform mapping from IVI4(i) to IVI6(i). *Id.* According to Li-2

mapping gain can be adjusted incrementally depending on the requirements. For example, zero bit means 1-to-1 mapping, and it is stateless. One bit means 1-to-1 mapping, and it has two states. Four bits means 1-to-16 mapping, etc. In the case of one-to-many mapping, when two IVI6 (i) have the same port number, the IVI gateway will map one of the port number to another unused port number and maintain the mapping table (IVI4 (i) plus port number)

Id.

3. *Reasons To Combine the Teachings of Li and Li-2*

Noting that Li, Li-2, and the '845 patent are all in the same field of endeavors and, therefore, are analogous art, Petitioner argues that an ordinarily skilled artisan would have had reason to combine the teachings of Li and Li-2. Pet. 24–26. Noting that Li and Li-2 are authored by the same persons and that both concern address mapping, Petitioner characterizes Li-2 as an evolution of IVI address mapping and is drawn from the extensible foundation of Li. *Id.* (citing Ex. 1037, 2 10; Ex. 1038, 1). Petitioner also

contends that the Petition’s discussion of the relevant technical background demonstrates that the prior art would have led an ordinarily skilled artisan to combine Li-2’s port multiplexing with Li. *Id.* at 25 (citing Pet. Sec. IV.B.2 (Pet. 5) discussing Exs. 1021–1033 as describing the use of port numbers to uniquely distinguish a host). Petitioner further argues that the combination of Li and Li-2 merely combines prior art elements to achieve predictable results using known methods. *Id.* at 26.

Patent Owner contends that Li-2 is not an extension of Li because Li concerns how IPv4 hosts within an IPv4 network communicate with other IPv4 hosts across an IPv6-only network, while Li-2 concerns a different problem, i.e., enabling hosts within an IPv6-only network to communication with IPv4 hosts. Prelim. Resp. 36–39. Patent Owner also argues that the prior art discloses NAT tables as a well-known solution for IPv4 address exhaustion and that Petitioner provides no motivation for an ordinarily skilled artisan to deviate for the known solution. *Id.* at 41–42. Patent Owner further argues that the subject matter Petitioner refers to as technical background prior art are actually references that post-date the priority date of the ’845 patent. *Id.* at 39–40; see Section IX.A.3.b herein discussing these references.

4. *Prior Art Status of Li-2*

The parties dispute whether Petitioner has demonstrated that Li-2 is prior art. Pet. 19–22, Prelim. Resp. 29–36. Petitioner argues that Li-2 is prior art “because it was publicly available before the ’845 patent’s priority date of June 30, 2008.” Pet. 19 (citing Ex. 1008 ¶¶ 4–12; Ex. 1009 ¶¶ 10–11). According to Petitioner, Li-2 was uploaded to IETF’s staging folder on June 21, 2008. *Id.* (citing Ex. 1009, Second Declaration of Alexa Morris (“Morris Decl. II”) ¶¶ 10–11; Ex. 1008, Declaration of Ron Bonica (“Bonica

Decl.”) ¶¶ 4–10). Petitioner contends that a person of ordinary skill in the art “would have monitored the IETF’s staging folder for new document uploads and browsed the staging folder for documents relevant to the networking field.” *Id.* at 20–21 (citing Ex. 1008, Bonica Decl. ¶¶ 9–10). In particular, Petitioner alleges that a person of ordinary skill in the art would have recognized that Li-2’s document name—draft-xli-ivi-00-7431-cancelled.txt—includes “xli” for the author, Dr. Xing Li, and “ivi” for IPv4 to IPv6 transition technology. *Id.* at 21 (citing Ex. 1008, Bonica Decl. ¶ 10). Petitioner also contends that “once a draft is uploaded to the IETF, it is added to the IETF Datatracker, which is a sophisticated tool that allows users to search drafts by several criteria, including working group, author, and technical area.” *Id.* (citing Ex. 1008, Bonica Decl. ¶¶ 11–12; Ex. 1009, Morris Decl. II ¶ 11).

Patent Owner argues that Petitioner does not show sufficiently that Li-2 is prior art to the challenged claims. Prelim. Resp. 29–36. Patent Owner argues that Li-2 never became an official Internet-Draft and was not published in the IETF directory because the author cancelled the submission, meaning that the IETF did not move the Li-2 upload from the staging folder to its official repository and did not announce Li-2 to the community. Prelim. Resp. 30–31 (citing Ex. 1009, Morris Decl. II ¶¶ 10–11). Patent Owner further contends that “[t]he staging folder . . . contains many thousands of files” that are “not indexed or searchable” and thus “not reasonably accessible.” *Id.* at 33. Patent Owner also contends that “when an author cancels their submission (as Li-2 was cancelled), ‘[a]fter a given period, it is removed from the Datatracker.’” *Id.* at 34.

The question before us is not whether in IETF parlance the subject upload was published, but whether the subject upload establishes Li-2 as a

printed publication for prior art purposes. As discussed above, Petitioner presents evidence that although Li-2 “never became an official Internet-Draft published in the IETF directory,” Li-2 remained in the IETF’s staging folder. Pet. 20–22; Ex. 1009, Morris Decl. II ¶¶ 10–11. But the evidence of record indicates that the IETF’s staging folder may contain thousands of documents. Prelim. Resp. 35; Ex. 1008, Bonica Decl. ¶ 4; Ex. 1044. This raises the issue of whether a person of ordinary skill in the art exercising reasonable diligence could have located Li-2 simply by browsing the filenames of the numerous documents in the IETF’s staging folder. *See, e.g., SRI Int’l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008). The parties may address this issue again and present any other arguments regarding this asserted ground in its response to the Petition after institution.

Petitioner also presents evidence that the IETF’s Datatracker included Li-2 for “a given period” after the authors canceled Li-2. Pet. 22; Ex. 1008, Bonica Decl. ¶ 11. But Petitioner does not indicate how long the IETF’s Datatracker would have included Li-2 (e.g., hours, days, weeks, years). *See* Pet. 22; Prelim. Resp. 36; Ex. 1008, Bonica Decl. ¶ 11. This raises the issue of whether Li-2 was present in the IETF’s Datatracker such that a person of ordinary skill in the art exercising reasonable diligence could have located Li-2.

5. *Conclusion as to Li-2*

As we are instituting trial on other grounds, and in view of the potential issues concerning Li-2’s status as prior art, we leave resolution of the issues concerning Li-2 for trial.

D. Petitioner's Contentions That Claims 1, and 5–8 Are Unpatentable As Obvious Over Li or Li and Li-2 in further view of Paunikar

1. *Paunikar*

Paunikar discloses that “Network Address Translation (NAT)” is a term used to describe “the method by which Internet Protocol addresses . . . used within one network are mapped” or translated “to a different IP address known within another network, in an attempt to provide transparent routing to host computers.” Ex. 1057, 1:15–21. Typically, a company maps its local inside network addresses to one or more global outside IP addresses and un-maps the global IP addresses or incoming packets back into local IP addresses. *Id.* at 1:21–25. “Network Address Translation” allows a single device, such as a gateway device or router, to act as an agent between a public network, e.g., the Internet, and a local or private network. *Id.* at 1:32–35. Using this arrangement, only a single, unique IP address can represent an entire group of hosts. *Id.* at 1:35–36. Paunikar discloses that one impetus for the increasing use of NAT is a shortage of IP addresses. *Id.* at 1:36–39. Paunikar’s system provides for different hosts connecting two different network destinations to use the same public IP address, concurrently, by mapping assigned public IP addresses to destination addresses. *Id.* at 3:25–31. Paunikar only denies re-using the same public IP address if subsequent network users are connecting to the same destination address. *Id.* at 3:30–33.

2. *Petitioner's Reliance on Paunikar*

Petitioner cites Li, with or without Li-2, as disclosing to an ordinarily skilled artisan the limitations of claim 1 as discussed above and on Paunikar as further disclosing regularizing limitation [1b]. Pet. 70–71. Petitioner

contends that based on Li or Li-2, after receiving an IPv6 packet with an IPv6 destination address, the edge router or access gateway in Li's Figure 11 (the claimed home gateway), reverses the address translation to conform the IPv6 address to the public IPv4 address. *Id.* at 67–68, 70–71.

Petitioner cites Paunikar as disclosing “an ‘intelligent network address translator’ that can analyze data packets ‘based on packet type (i.e., protocol and destination address) and decide[], based on the packet type, what mode of network address translation will be applied.’” Pet. 65 (citing Ex. 1057, 5:18–33; Ex. 1003, Bhattacharjee Decl. ¶ 169). Referencing the SmartNAT Service implemented in a gateway, as shown in Paunikar's Figure 3, Petitioner states that for an outgoing packet, if a connection is found in a translation table, the system performs the translation and completes the connection, and if no connection is found, the system creates a new entry for the source address. *Id.* at 66 (citing Ex. 1057, 9:7–15, Fig. 3). If the packet has special characteristic defined by a network administration, the SmartNat assigns a public address from a pool of available public addresses and enters the connection into the NAT table. *Id.* at 66–67 (citing Ex. 1057, 9:13–15, 9:33–40; Ex. 1003, Bhattacharjee Decl. ¶ 171). Petitioner also notes that for an incoming packet, the system determines if the incoming packet corresponds with an address in the network and, if found, “reverse translates” the packet and communicates with the private network. *Id.* (citing Ex. 1057, 9:41–46, 9:54–57; Ex. 1003, Bhattacharjee Decl. ¶ 172).

3. *Motivation to Combine the Teaching of Paunikar With Those of Li.*

Petitioner contends that a person of ordinary skill would have had reason to combine the teachings of Paunikar with those of Li because the problem of IPv4 address exhaustion was previously documented. Pet. 68

(citing Ex. 1003, Bhattacharjee Decl. ¶¶ 175–176). Noting that NAT functionality was well known at the time, Petitioner further contends that combination merely involves applying a known technique to a known device to yield predictable results. *Id.* at 69.

Patent Owner does not explicitly respond to Petitioner’s contentions concerning motivation to combine the teachings of Paunikar with those of Li.

4. *Conclusion*

Petitioner argues that when combined, the references teach the limitations of claims 1 and 5–8. As discussed above for the ground based on Li, we leave for further development during trial issues regarding simultaneous invention and the knowledge of one of ordinary skill in the art. Thus, having considered the arguments and evidence of record, we leave for further development during trial whether Petitioner has demonstrated that an ordinarily skilled artisan would have had reason to combine the teachings of Paunikar with those of Li, and that, in the context of the knowledge of one of ordinary skill in the art, the combined teachings of Li and Paunikar would have disclosed or suggested the limitations of claims 1 and 5–8 to such an ordinarily skilled artisan.

E. Petitioner’s Contentions that Claims 1 and 5–8 Are Unpatentable As Obvious Over Li, Wu and Paunikar

1. *Petitioner’s Reliance on Wu*

Petitioner cites Wu as teaching “that a constructed IPv6 address may be formed by concatenating a destination port number,” i.e., constructing an IPv6 address “by concatenating an IPv6 prefix, an IPv4 address, and a port number.” Pet. 79–80 (citing Ex. 1039, Fig. 1, 9–12; Ex. 1003, Bhattacharjee Decl. ¶ 211). Noting that Li teaches “its IPv6 address concatenates 32-bits

of zero padding (bits 64-96) following the IPv6 prefix and IPv4 address,” Petitioner contends that a “POSITA would have recognized that there is more than sufficient space to further include a 16-bit destination port number.” *Id.* at 80 (citing Ex. 1003, Bhattacharjee Decl. ¶ 212).

2. *Wu*

Wu concerns transitioning from IPv4 to IPv6. Ex. 1039, 9. As background technology, Wu discloses NAT as an effective technology extensively deployed in China. *Id.* Wu notes that when receiving a data packet from the Internet, NAT translates the source address (private address) into another address (public address), called the external address, translates the TCP or UDP source port into an external port number, then sends the translated port to the external network. *Id.* The NAT also adds the mapping relation between the source address, source port, and the external address (the external port in the translation table it maintains). If the external network sends back the data packet, it sets the external address as the data packet’s destination address and the external port as the destination port. When NAT receives the data packet from the external network, it uses the mapping table to translate the IPv4 destination address and the TCP or UDP destination port into the source address and source port and sends the data packet the internal network. *Id.*

Wu identifies the following three main IPv4 to IPv6 migration mechanisms proposed by IETF: (1) dual-stack nodes to adopt IPv4 protocol or IPv6 protocol to send or receive data packets according to the destination IP address; (2) protocol translation in which a NAT assigns a provisional IPv4 address to an IPv6 node and maintains the mapping relation between the IPv4 address and the IPv6 node during the session; and (3) tunnel technology, which addresses the problem of communication between nodes

of the same IP version separated by an incompatible network. Ex. 1039, 10. Wu states that most tunnel technologies encapsulate IPv6 data packets into an IPv4 load, but do not allow the NAT in the body of the tunnel because the NAT discards the protocol type field of the IPv4 header after receiving the IPv6-in-IPv4 data packet. *Id.*

Wu discloses a tunnel technology (SilkRoad) that encapsulates the IPv6 data packet in the user datagram protocol (UDP) load. *Id.* A SilkRoad client has a global unicast IPv6 address and a private IPv4 address; a SilkRoad server has a public IPv4 address and can have a route leading to an IPv6 backbone network and a route leading to an isolated IPv6 network; and an ordinary IPv6 node represents other IPv6 nodes besides the client end and the server. *Id.* at 11. In Wu's system, the IPv6 address adopted by the client and during communication has a prescribed form. *Id.* Figure 1 of Wu, reproduced below, is a form diagram the SilkRoad address assigned to the client and by the server. *Id.*

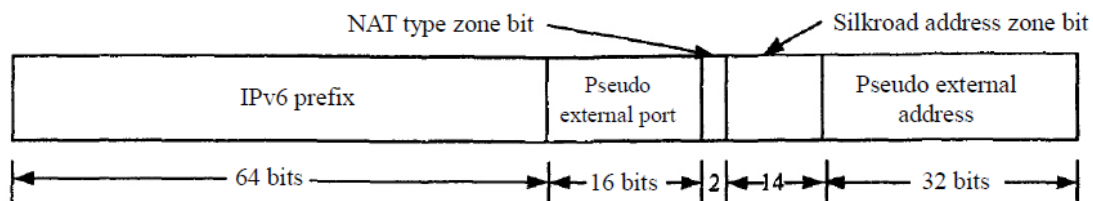


Fig. 1

Ex. 1039, Fig. 1. As shown in Figure 1, the IPv6 address adopted by the client ends during communication includes a 64-bit address prefix, and a 64-bit interface ID. *Id.* at 11. The Interface ID includes a pseudo port field, a NAT type zone field bit field, a Silkroad address zone bit field, and a pseudo external address field. *Id.* When it passes the NAT, the UDP port of an initialized data packet sent by the SilkRoad client to the server is mapped to the external port. *Id.* The server obtains this port from the received

initialized data packet and the client or server periodically sends data packets to the NAT to maintain the mapping relation and prevent its expiration. *Id.*

3. *Motivation to Combine the Teachings of Wu With Those of Li and Paunikar*

Petitioner contends that a person of ordinary skill would have had reason to combine the teachings of Wu with those of Li as the need to indicate IPv4 address exhaustion was well known, wherein one way of addressing this exhaustion was to extend the IPv4 address space by sharing an IPv4 address among many hosts using port numbers to uniquely identify those hosts. Pet. 78 (citing Ex. 1003, Bhattacharjee Decl. ¶ 204). Petitioner further argues that Wu's teaching of constructing an IPv6 address by concatenating a port number to a known device, i.e., Li's edge router that already constructs an IPv6 address by concatenating information, including 32 bits of unused padding, yields a predictable result (i.e., an edge router that can construct an IPv6 address that includes a destination port in place of the 16 bits of unused padding). *Id.* Petitioner further contends that the combination is merely the simple substitution of one known element (16 bits of unused padding) for another (a destination port number) to obtain the predictable result of connecting an IPv4 and IPv6 network while mitigating IPv4 address exhaustion). *Id.* at 79 (citing Ex. 1003, Bhattacharjee Decl. ¶ 207). Finally, Petitioner also cites its arguments concerning simultaneous invention of the '845 patent subject matter as evidence of a reason to combine the teachings of the references. *Id.*

Although Patent Owner does not explicitly present arguments concerning whether the references in this ground teach the individual claim limitations, Patent Owner argues that a person of ordinary skill would not have been motivated to combine the teachings of Li, Wu, and Paunikar

because Li and Wu address different problems. Prelim. Resp. 47–50. Specifically, Patent Owner contends that Li concerns “allowing IPv4 host within an IPv4 network to communicate with other IPv4 hosts across an IPv6-only network or backbone,” but Wu turns the inverse problem, i.e., “allowing IPv6 hosts within a network to communicate with other IPv6 hosts across an IPv4 network.” *Id.* at 48–49.

On this record, Patent Owner’s argument is unavailing. First, the evidence of record indicates that Li and Wu are analogous art. Pet. 70; Ex. 1003, Bhattacharjee Decl. ¶ 201. For example, the ’845 patent, Li, and Wu are all directed to the same field of endeavor, namely, computer networking and routing data packets. Ex. 1001, 1:17–21, Ex. 1003 ¶ 201; Ex. 1037, 1; Ex. 1039, 9. Second, the evidence of record indicates that a person of ordinary skill in the art would have had a reasonable expectation of success in combining the cited teachings of Li and Wu. Pet. 78–79 (citing Ex. 1003, Bhattacharjee Decl. ¶ 207). As discussed above, Petitioner relies on Wu’s teaching that an IPv6 destination address includes a destination port number. Pet. 79–80 (citing Ex. 1003, Bhattacharjee Decl. ¶ 211). Even if Patent Owner is correct that Li and Wu address the interoperability of IPv4 and IPv6 networks from different perspectives, a person of ordinary skill in the art would have reasonably expected that Wu’s destination port number could be incorporated into the unused padding in Li’s IPv6 destination address. Pet. 76–80; Ex. 1003 ¶¶ 199–212.

On this record, Petitioner shows sufficiently that an ordinarily skilled artisan would have had reason to combine the cited teachings of Li and Wu.

4. *Conclusion*

Petitioner argues that when combined, the references teach the limitations of claims 1 and 5–8, and that Wu, in particular teaches the use of

port numbers not discussed in Li. Pet. 79–80. Having considered the arguments and evidence of record, we determine that Petitioner has demonstrated that an ordinarily skilled artisan would have had reason to combine the teachings of Wu with those of Li, and that, in the context of the knowledge of one of ordinary skill in the art, the combined teachings of Li, Wu and Paunikar would have disclosed or suggested the limitations of claims 1 and 5–8 to such an ordinarily skilled artisan.

X. CONCLUSION

For the reasons discussed above, we are persuaded that Petitioner has demonstrated a reasonable likelihood that it will succeed in showing that at least one of the challenged claims is unpatentable on the following challenges to patentability, including:

Claims 1 and 5–8 as unpatentable over Li, Paunikar, and Wu.

XI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of the '845 patent is hereby instituted, commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

FURTHER ORDERED that the trial is authorized on all grounds set forth in the Petition; and

FURTHER ORDERED that the trial will be conducted in accordance with a corresponding separately issued Scheduling Order.

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Patent 8,451,845 B2

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