

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RED HAT, INC.
Petitioner,

v.

COMPETITIVE ACCESS SYSTEMS INC.
Patent Owner

U.S. Patent No. 7,606,156

Issued: October 20, 2009

Filed: October 14, 2003

Inventor: Eric M DeLangis

Title: Residential communications gateway (RCG) for broadband communications over a plurality of standard pots lines, with dynamic allocation of said bandwidth, that requires no additional equipment or modifications to the associated class 5 offices or the PSTN at large

DECLARATION OF BILL LIN IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW

UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104

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LIST OF EXHIBITS¹

Exhibit No.	Description
1001	Declaration of Bill Lin, Ph.D. in support of <i>Inter Partes</i> Review
1002	<i>Curriculum Vitae</i> of Bill Lin
1003	Certified Copy of U.S. Patent No. 11,582,343
1004	Certified File History of U.S. Patent No. 11,582,343
1005	Certified Copy of U.S. Patent No. 11,418,641
1006	Certified File History of U.S. Patent No. 11,418,641
1007	Certified Copy of U.S. Patent No. 10,868,908
1008	Certified File History of U.S. Patent No. 10,868,908
1009	Certified Copy of U.S. Patent No. 9,350,649
1010	Certified File History of U.S. Patent No. 9,350,649
1011	Certified Copy of U.S. Patent No. 8,861,349
1012	Certified File History of U.S. Patent No. 8,861,349
1013	Certified Copy of U.S. Patent No. 8,228,801
1014	Certified File History of U.S. Patent No. 8,228,801
1015	Certified Copy of U.S. Patent No. 7,606,156
1016	Certified File History of U.S. Patent No. 7,606,156
1017	U.S. Patent Application Publication No. 2004/0001512 A1 (“Challener”)
1018	U.S. Patent Application Publication No. 2003/0026221 A1 (“Kotzin”)
1019	James Carlson, <i>PPP Design, Implementation, and Debugging</i> (2d ed. 2000) (“Carlson”)
1020	Gilbert Held, <i>Network Design Principles and Applications</i> , 2000 (“Held”)
1021	U.S. Patent No. 6,917,960 (“Decasper”)

¹ Unless otherwise specified, citations are to the original page, column, and line numbers in exhibits rather than the PDF page. Citations corresponding to the PDF pagination are indicated in [[brackets]]. Unless otherwise noted, all emphases and annotations are added.

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Exhibit No.	Description
1022	Johnny Chen, <i>New Approaches to Routing for Large-Scale Data Networks</i> (Rice University, 1999) (“Chen”)
1023	Declaration of Sylvia Hall-Ellis
1024	Webster's Ninth New Collegiate Dictionary, 1990
1025	Xin, W., Ishihara, S., and Mizuno, T., <i>A QoS-ensured Transmission Scheme with Content-based Priority for Mobile Cluster Users</i> , 2000 (“Xin”)
1026	U.S. Patent Application Publication No. 2002/0042274 A1 (“Ades”)
1027	U.S. Patent No. 7,003,580 (“Cook”)
1028	U.S. Patent No. 5,625,877 (“Dunn”)
1029	U.S. Patent Application Publication No. 2002/010866 A1 (“McCullough”)
1030	Candace Leiden & Marshall Wilensky, <i>TCP-IP for Dummies</i> (3d ed. 1999) (“Dummies”)
1031	U.S. Patent Application Publication No. 2003/0223450 A1 (“Bender”)
1032	U.S. Patent Application Publication No. 2004/0022224 A1 (“Billhartz”)
1033	Hung-Yun Hsieh & Raghupathy Sivakumar, <i>A Transport Layer Approach for Achieving Aggregate Bandwidths on Multi-homed Mobile Hosts</i> (2002) (“Hsieh”)
1034	U.S. Patent No. 6,778,495 (“Blair”)
1035	Cisco Systems, Inc., <i>Troubleshooting Async Multilink PPP Operations</i> (2001) (“Cisco”)
1036	U.S. Patent Application Publication No. 60/377,631 (“Tucker”)
1037	Konishi et al., <i>Web SHAKE: A fast WWW access method for mobile terminals on temporary cluster networks</i> , IEEE Proceedings April 28-May 2, 2002 (“Konishi”)
1038	RFC 1990: The PPP Multilink Protocol (MP), August 1996
1039	<i>Competitive Access Systems, Inc. v. Oracle Corporation, and Oracle America, Inc.</i> , 1:23-ca-00286-ADA, Dkt. 82 (W.D.TX. Aug. 10, 2023)
1040	<i>Red Hat, Inc. v. Competitive Access Systems, Inc.</i> , 4:24-cv-00130-D, Dkt. 1 (E.D.N.C. Sep. 3, 2024)

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Exhibit No.	Description
1041	<i>Red Hat, Inc. v. Competitive Access Systems, Inc.</i> , 4:24-cv-00130-D, Dkt. 1-10 (E.D.N.C. Sep. 3, 2024)
1042	Lai et al., <i>Measuring Bandwidth</i> , IEEE (1999)
1043	RFC 2663: IP Network Address Translator (NAT) Terminology and Considerations, August 1999
1044	U.S. Patent No. 5,878,040 (“Peirce”)
1045	“A Novel Mechanism for Data Streaming Across Multiple IP Links for Improving Throughput and Reliability in Mobile Environments,” IEEE INFOCOM 2002 (“Phatak”)
1046	RFC 2543: SIP: Session Initiation Protocol, March 1999
1047	RFC 2131: Dynamic Host Configuration Protocol, March 1997
1048	RFC 1945: Hypertext Transfer Protocol – HTTP/1.0, May 1996
1049	Endler, David, <i>Brute-Force Exploitation of Web Application Session IDs</i> , iALERT White Paper, Nov. 1, 2001 (“Endler”)
1050	Rappaport, Theodore S., et al., <i>Wireless Communications and Application Above 100 GHz: Opportunities and Challenges for 6G and Beyond</i> , IEEE Access, Vol. 7, 2019 (“Rappaport”)
1051	Reex. Control No. 90/019,265
1052	Gast, Matthew S., <i>802.11 Wireless Networks – The Definitive Guide</i> , 2002
1053	Shoemake, Matthew B., <i>Wi-Fi (IEEE 802.11b) and Bluetooth CoExistence Issues and Solutions for the 2.4 GHz ISM Band</i> , Texas Instruments, Feb. 2001, Ver. 1.1
1054	Furuskär, Anders, et al., <i>EDGE: Enhanced Data Rates for GSM and TDMA/136 Evolution</i> , IEEE Personal Communications, June 1990
1055	RFC 2326: Real Time Streaming Protocol (RTSP), April 1998
1056	Random House Webster’s Computer & Internet Dictionary, 3 rd ed., December 1998
1057	Andrew S. Tanenbaum, <i>Computer Networks</i> , Chps. 1 & 5 (3d ed. 1996)
1058	Adolfo Rodriguez <i>et al.</i> , <i>TCP/IP Tutorial and Technical Overview</i> , Chps. 1 & 14 (Prentice Hall PTR 2002)

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Exhibit No.	Description
1059	Richard O. LaMaire, et al., <i>Wireless LANs and Mobile Networking: Standards and Future Directions</i> , IBM, May 31, 1996

I. ASSIGNMENT

1. I have been retained as an expert witness on behalf of Red Hat, Inc. (“Red Hat”) to offer technical opinions regarding whether the claims of U.S. Patent No. 7,606,156 (“the ’156 Patent”) (Ex. 1001), would have been invalid to one of ordinary skill in the art as of October 15, 2002 in connection with the above-captioned Petition for *Inter Partes* Review (“IPR”).

2. For the purposes of my Declaration, I have been asked to assume that the priority date of the alleged invention recited in the ’156 Patent is October 15, 2002 (hereinafter the “Priority Date”).

3. I am not currently, and never have been, an employee of Red Hat. I received no compensation for this Declaration beyond my normal hourly compensation based on my time actually spent analyzing the ’156 Patent, the prior art cited below, and issues related thereto. I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ’156 Patent. I have no financial interest in Red Hat.

4. In forming the opinions expressed in this Declaration, I have also relied on my academic and professional experience. I also considered the viewpoint of a person having ordinary skill in the art as of the time of the alleged invention of the Challenged Patents. I also relied on the ’156 Patent and its file history, the reference

and other documents cited in the petition and in the declaration, as well as on the exhibits in the exhibit list.

II. BACKGROUND AND QUALIFICATIONS

5. I am an expert in the field of computer engineering and have been an expert in that field since before the Asserted Patents were filed. A copy of my curriculum vitae and prior testimony is attached to this report (Ex. 1002) and provides a comprehensive description of my relevant experience, including my academic and employment history, publications, professional activities, and speaking engagements.

6. I received a B.S. in Electrical Engineering and Computer Sciences from the University of California, Berkeley, in 1985. I received an M.S. in Electrical Engineering and Computer Sciences in 1988 and a Ph.D. in Electrical Engineering and Computer Sciences in 1991, both from the University of California, Berkeley.

7. I am currently a Full Professor and the Department Chair of Electrical and Computer Engineering at the University of California, San Diego (“UCSD”), where I have been a professor since 1997.

8. At UCSD, my teaching and research has focused on computer architecture and computer networking problems, including the design of multiprocessor and multi-core processor architectures, multiprocessor and multi-core processor interconnection buses and networks, network processors, system-on-

chips, and data networks. I regularly teach senior-level design courses on advanced FPGA designs and the design of advanced processors, and I have taught graduate courses in hardware/software co-design and advanced special topics in computer architecture.

9. At UCSD, I am a Principal Investigator in the UCSD Center for Wireless Communications (CWC). CWC brings together researchers to work on a range of challenges in the design of future wireless communications systems. My contribution to CWC has been expertise in the design of multi-core processor architectures for wireless communications and mobile computing. I am also a Principal Investigator in the UCSD Center for Networked Systems (CNS). CNS brings together researchers to work on a range of challenges in the design of computer architecture solutions for packet processing and computer networking.

10. Before joining UCSD, I led the System Control and Communications Group at IMEC, Europe's largest independent microelectronics and information technology research center. At IMEC, I led a research team working on VLSI architecture, system design, and circuit techniques for system-on-chip applications. I also previously held positions at Hewlett Packard, Hughes Electronics, and Western Digital.

11. During my career, I have received or worked on research efforts that received millions of dollars in research funding from both government agencies and

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industry, including funding for research in multi-core processor design, hardware/software co-design, packet processing, and computer networks.

12. I have authored numerous publications, including books, chapters in books, and journal papers, and I have presented numerous invited lectures and keynote presentation around the world. A number of my publications have received best paper awards or distinguished paper citations, including best paper awards in the IEEE Transactions on VLSI Systems and the ACM/IEEE Design Automation Conference, and I have also been awarded five patents.

13. I have served as an Associate or Guest Editor for several prestigious journals published by the Association for Computer Machinery (“ACM”) and the Institute of Electrical and Electronics Engineers (“IEEE”). I have also served on the Editorial Board of the International Journal of Embedded Systems. Further, I have served as General Chair of several ACM/IEEE conferences, and on the Organizing or Steering Committees of many ACM/IEEE conferences, including the ACM/IEEE Symposium on Networks-on-Chips (NOCS) and the ACM/IEEE Symposium on Architectures for Networking and Communication Systems (ANCS). I have served on the Technical Program Committees of over 45 ACM/IEEE conferences.

III. UNDERSTANDING OF PATENT LAW

14. I am not an attorney, but I have been provided with an understanding of the patent law relevant to conducting the analysis given in this report. The following represents a summary of my understanding of these issues.

15. I have been informed and understand that patent claims are construed from the perspective of a person of ordinary skill in the art (“POSITA”) at the time the claimed invention was made and that, during this proceeding, terms are ordinarily to be given their plain and ordinary meaning as would be understood by a POSITA. I understand that this is the same standard as would be applied in District Court litigation.

16. I understand that claims in an IPR are construed under the case *Phillips v. AWH Corp.*, 415 F.3d 1303, decided by the Federal Circuit in 2005. I understand that under the rule in *Phillips*, words of claims are given their plain and ordinary meaning as understood by a person of ordinary skill in the art in view of the specification and prosecution history, unless those sources show an intent to depart from such meaning. No terms need to be construed for the purposes of this declaration. I reserve the right to respond to any constructions offered by the Patent Owner or adopted by the Board.

17. I understand that in IPR a claim is unpatentable if it is anticipated or obvious. Anticipation of a claim requires that every element of a claim be disclosed

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expressly or inherently in a single prior art reference, arranged in the prior art reference as arranged in the claim. An element is inherent if it is necessarily present in the reference.

18. It is my understanding that a patent claim is unpatentable for obviousness if the claimed invention would have been obvious at the time the invention was made to a person having ordinary skill in the art.

19. I understand that, for the purpose of an IPR, the Board may only consider anticipation or obviousness based on prior printed publications or prior patents and patent applications. I understand that a publication is prior art under § 102(a) if that publication was known or used by others in the U.S., or was patented or published anywhere, prior to the date of invention of the '156 Patent. I understand that a publication is prior art under § 102(b) if that publication was patented or published anywhere, or was in public use, on sale, or offered for sale in this country, more than one year prior to the earliest U.S. filing date of the '156 Patent. I understand that a patent or patent application is prior art under § 102(e) if that patent or published patent application has an effective filing date that is prior to the date of invention of the '156 Patent.

20. I have been informed and understand that the subject matter of a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious at the

time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I have also been informed that the framework for determining obviousness involves considering the following factors: (i) the scope and content of the prior art; (ii) the differences between the prior art and the claimed subject matter; (iii) the level of ordinary skill in the art; and (iv) any objective evidence of non-obviousness.

21. I further understand that a claim can be found obvious if it unites old elements with no change to their respective functions or alters prior art by mere substitution of one element for another known in the field, with that combination yielding predictable results. While it may be helpful to identify a reason for this combination, common sense should guide, and there is no rigid requirement for a teaching, suggestion, or motivation to combine. When a product is available, design incentives and other market forces can prompt variations of it, either in the same field or different one. If a person having ordinary skill in the relevant art can implement a predictable variation, obviousness likely bars patentability. Similarly, if a technique has been used to improve one device, and a person having ordinary skill in the art would recognize that the technique would improve similar devices in the same way, use of the technique is obvious. I further understand that a claim may be obvious if common sense directs one to combine multiple prior art references or add missing features to reproduce the alleged invention recited in the claims.

22. I also understand the following rationale may support a finding of obviousness:

- a. Combining prior art elements according to known methods to yield predictable results;
- b. Simple substitution of one known element for another to obtain predictable results;
- c. User of known technique to improve similar devices (methods, or products) in the same way;
- d. Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- e. “Obvious to try” — choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- f. Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
- g. Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

23. I also understand that it is impermissible to use the claimed invention itself as a blueprint for piecing together elements in the art. In other words, it is impermissible to use hindsight reconstruction to pick and choose among disclosures in the prior art to reconstruct the claimed invention.

24. I understand that so-called “secondary considerations of nonobviousness,” must be considered in an obviousness analysis. I understand that an analysis including these secondary considerations helps to prevent the forbidden use of hindsight in determining whether a patent claim is obvious. I understand that secondary considerations of non-obviousness include, among others: (a) a long-felt but unresolved need for the invention; (b) commercial success of the invention; (c) copying of the invention; (d) praise and recognition of the invention by others; (e) licensing of the rights to the invention; and (f) unexpected results.

25. In rendering my opinions, I followed these guidelines.

IV. SUMMARY OF OPINIONS

26. I have reviewed and agree with the analysis in the Petition for IPR of the '156 Patent. It is my opinion that each and every Challenged Claim would have been obvious to a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention in view of the knowledge of a POSITA and prior art cited in the Petition and as further explained in this declaration.

27. It is my opinion that claims 1–4 are obvious in view of Challenger (Ex. 1017) and Ades (Ex. 1026) (Ground IA).

28. It is my opinion that claims 3–5 are obvious in view of Challenger (Ex. 1017), Ades (Ex. 1026), and Xin (Ex. 1025) (Ground IB).

29. It is my opinion that claims 1–4 are obvious in view of Kotzin (Ex. 1018) and Ades (Ex. 1026) (Ground IIA).

30. It is my opinion that claims 3–5 are obvious in view of Kotzin (Ex. 1018), Ades (Ex. 1026) and Xin (Ex. 1025) (Ground IIB).

V. OVERVIEW OF THE TECHNOLOGY

31. I have read and agree with the technology overview in the Petition.

VI. THE '156 PATENT

A. Claims

32. The '156 Patent, titled “Residential communications gateway (RCG) for broadband communications over a plurality of standard pots lines, with dynamic allocation of said bandwidth, that requires no additional equipment or modifications to the associated class 5 offices or the PSTN at large” discloses devices and methods to combine voice, data, and video communications that transmit these communications over multiple paths, and thereby, increase the bandwidth and the data throughput. Ex. 1015, Abstract.

33. The '156 Patent has 5 claims of which claim 1 is independent, Independent Claim 1 is directed to a method for “aggregating, sharing and

dynamically routing and allocating bandwidth” among RCGs. *Id.*, 16:53-54.

Dependent claims 2–5 are claim generic variations on the methods and systems presented in independent claims. In particular, dependent claims, recite different ways of sharing and allocating bandwidth among RCGs.

34. Independent claim 1 is reproduced below:

A method for aggregating, sharing and dynamically routing and allocating bandwidth from a plurality of wired and wireless networks that are geographically disbursed over a wide area, and providing some or all of the aggregated bandwidth to any user on an on-demand basis, the method comprising the steps of:

developing and updating a network table that comprises a list of nearby RCGs, their bandwidth capabilities over local, remote and wireless connections, and their location with respect to a requesting RCG;

determining an optimum amount of bandwidth needed for an immediate data transfer needs of the requesting RCG;

determining which of the nearby RCGs should be contacted for access to unused bandwidth to support a transfer of the requesting RCG, based upon their unused local bandwidth capacity, and a distance and a number of hops between the RCGs and the requesting RCG;

sending a request to the supporting RCGs asking for use of a portion of the unused bandwidth;

receiving responses from the supporting RCGs with information about how much bandwidth each selected RCG can share;

selecting which of the supporting RCGs to use for optimal use of needed bandwidth;

contacting the selected RCGs with control information for
sending data to the requesting RCG;

sending packets of the data from the selected RCGs to the
requesting RCG;

reassembling the packets of the data at the requesting
RCG; and

relinquishing the bandwidth of each of the selected RCGs.

Ex. 1015, claim 1.

B. Specification

35. According to the specification, Local Exchange Companies, (“LECs”) had a “strangle hold” over “the ‘last mile’ of copper over which almost all residential customers receive their communications services.” Ex. 1015, 1:42-46. Competitive Local Exchange Companies (“CLECs”) worked to resell existing services offered by LECs but were not able to truly compete in the market. *Id.* 1:58-2:8. To attract customers, companies were attempting to provide Voice Over IP services (VoIP) “over high-speed or broad-band backbones just as DSL and cable modems, over Internet connections via a computer.” *Id.* 2:27-30. However, as the specification explains, the high-speed services required enhancing infrastructure to the local telephone companies’ facilities and cable plants, which is very expensive. *Id.* 2:29-32. The high-speed services also required installing expensive modems at the customer’s end. *Id.* These services were also difficult to install and were hard to use for the average user so were primarily provided to corporate markets rather than

residential users. *Id.* 2:20-30. While residential users could obtain high speed services through DSL and cable modems, the specification deems these solutions a failure because they “reach only a small segment of the population” and many DSL service providers failed during the collapse of the internet boom. *Id.* 2:43-50. Accordingly, the specification identifies a need for residential customer access to higher speed connections that do not require DSL, cable modems, or replacing last mile communication infrastructure.

36. To address this problem in the art, the ’156 Patent proposes using a specialized Residential Communications Gateway (“RCG”), which is a stand-alone external device that having the capabilities and features of “IP routers, Class 5 circuit switches and wireless LANs in a small stand-alone external modem like device.” *Id.* 2:54-56. The RCG has additional capabilities of a hands-free speakerphone device with a touch display, which can provide video telephone services. *Id.* 2:58-61.

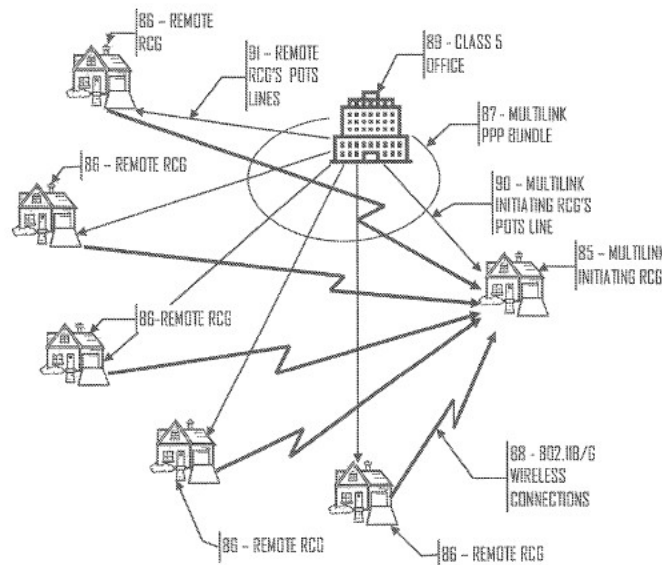
37. The alleged benefit of the RCG is that a Competitive Local Exchange Company (CLEC) can offer a variety of services to customers using the existing POTS line, and it doesn’t require the expensive enhancements of the network infrastructure like DSL and Cable services. The specification further explains that the RCG can be readily deployed to quickly expand CLEC customer bases because extra equipment is not needed. *Id.* 3:26-40. Indeed, the specification states that “[t]he RCG is designed to enhance, not replace, the existing phone line, enabling it to

provide new combined packetized voice and data services” and will “continue to work seamlessly” with “all existing telecommunications infrastructure.” *Id.*, 3:41-45.

38. The specification describes an RCG receiving data over at least two separate communication paths and combines the paths to increase bandwidth. *Id.*, Abstract. It further indicates that the RCG has “a main system processor that is responsible for all house keeping and traffic routing tasks.” *Id.* 3:20-22. The specification further explains that the RCG can be placed in a residence and be connected to a POTS line (a telephone line) coming from the Local Exchange Carrier (LEC). *Id.*, 3:3-5. Devices like telephones, FAX machines, computers, or Local Area Network (LAN) can be connected to the RCG via the built in Universal Serial Bus (USB) or the Ethernet interface. *Id.*, 2:62-3:2.

39. The RCG also “implements broadband” over POTS by using an 802.11b/g wireless interface to configure a PPP multilink bundle. *Id.* 11:29-31. The specification, however, clarifies that “[a]ny wireless interface scheme can be used to implement this device” and “there is nothing special or specific to the 802.11 wireless interface that makes it particularly suited to this application.” *Id.* 11:41-44. The specification also explains that an individual RCG is also “used to provide a peer-to-peer wireless home networking environment to other 802.11 compatible wireless component within the residence” while also “acting as an always on dialup

Internet gateway.” *Id.* 11:45-50. During data transmission, in order to gain greater bandwidth, an RCG can request that other RCGs assist in transferring data by using their respective POTS lines. *Id.* 11:50-59. For example, Figure 7 shows “an ad-hoc wireless LAN configuration with ppp multilink data distribution and wireless connectivity.”



Id., 4:34-35, Fig. 7.

40. Elements like wired and wireless networks, residential voice and data services, including IP routers, Class 5 circuit switches, and wireless LANs, sharing and dynamically routing and allocating bandwidth including through standardized methods like Multilink PPP, sending packets and allocating bandwidth through protocols like the Link Control Protocol for Multilink PPP, and routing tables such as those available in IP router devices were well known in the art at that time. Indeed,

the specification itself confirms these elements were widely used in the communications field. *See id.*, 3:3-18 (describing wired and wireless networks and stating an RCG can be connected to a telephone line, LAN through a USB, firewire, or Ethernet ports and various devices through 802.11b/g interface for wireless communication), 1:39-42, 2:26-42, 2:54-56 (stating an RCG's primary function is to compete with existing companies for residential voice and data services and explaining that an RCG combines capabilities of IP routers, Class 5 circuit switches and wireless LANs), 11:29-44 (describing a well-known 802/11 b/g interface used to configure multilink PPP bundle consistent with RFC 1990 protocol to share and dynamically route and allocate bandwidth), 12:5-14:6 (describing well-known Link Control and Multilink PPP protocols for sending packets and allocating bandwidth), 15:4-17 (describing routing tables used by IP router devices).

C. Prosecution History

41. I have reviewed the prosecution history of the '156 Patent. I understand that there was no substantive discussion of any prior art reference, that no claims were rejected over prior art, and that the applicant never submitted an information disclosure statement (IDS) to the USPTO.

D. Person of Ordinary Skill in the Art

42. I understand that there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including the educational level of active

workers in the field at the time of the alleged invention, the sophistication of the technology, the type of problems encountered in the art, and the prior art solutions to those problems.

43. In determining the characteristics of a hypothetical person of ordinary skill in the art of the '156 Patent at the time of the alleged invention, I considered several factors, including the type of problems encountered in this field, the swiftness with which innovations were made, the sophistication of the technology involved, and the educational background that would be necessary to understand the '156 Patent. Finally, I placed myself back in the relevant periods of time and considered the state of the art and the level of skill of those working in this field at those times.

44. In my opinion, taking all of the factors into account, a person of skill in the art for the '156 Patent would have had at least a bachelor's degree in electrical engineering, computer science, or a related field, and at least one year of experience with network design. Individuals with different education and additional experience could still be of ordinary skill in the art if that additional experience compensates for a deficit in their education and experience.

45. I also note that my opinions provided in this Declaration would not change in view of any minor modifications to this level of skill.

VII. CLAIM CONSTRUCTION

46. I understand that for the purposes of this inter partes review, the claims are to be construed under the so-called Phillips standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term.

47. I further understand that pursuant to 37 C.F.R. § 1.906, in IPR proceedings, claims are evaluated based on the requirements of 35 U.S.C. § 112 only with respect to subject matter added or deleted in the reexamination proceedings themselves. For example, it is my understanding that indefiniteness of a claim term cannot be raised in an IPR. Accordingly, I have not considered §112 challenges for this declaration, but I reserve the right to do so in litigation or any other forum. The fact that I have sought to express a meaning for each claim, or not otherwise challenged the definiteness of any terms, is not a concession that the term is not indefinite, and I reserve the right to render my opinion in litigation that certain limitations are indefinite.

48. In my view, there is no need to construe any terms for the purpose of the Petition or my Declaration. If Patent Owner raises claim construction arguments, I reserve the right to respond. Additionally, I reserve the right to render my opinion on claim construction in litigation.

VIII. OVERVIEW OF THE PRIOR ART

49. I have read the and agree with the characterization of the prior art in the petition.

IX. SPECIFIC GROUNDS FOR PETITION UNDER 37 C.F.R. § 42.104(B)

50. I do not provide in this Declaration a mapping of each claim limitation to the prior art. I have read and agree with the prior art mapping provided in Section VII of the petition, and incorporate this mapping herein by reference.

51. Instead, for each Ground, I discuss herein specific claim limitations where I believe context from the perspective of a POSITA would be helpful the Board.

A. Ground IA: Claims 1–4 are Obvious in View of Challenger and Ades

1. Independent Claim 1

- a. [1. pre.] “A method for aggregating, sharing and dynamically routing and allocating bandwidth from a plurality of wired and wireless networks that are geographically disbursed over a wide area, and providing some or all of the aggregated bandwidth to any user on an on-demand basis, the method comprising the steps of”*

52. In order to provide context, Challenger discloses providing some or all of the aggregated bandwidth to any user on an on-demand basis. In my opinion, a POSITA would have understood from Challenger that, if a BSD is used on a “master mode,” then “*any user*” would be the “end user subscriber.” *Id.*, ¶ [0046] (if a BSD

is operating in a “master mode,” “the Internet 104 communications originating from the end user terminal 108B benefits from increased bandwidth available through the aggregation of last mile telecommunications lines 110 connected to the bandwidth sharing devices 202A and 202C.”).

53. It is also my opinion that a POSITA would have understood from Challenger that “*the aggregated bandwidth*” would be provided to a user of the device operating in the master mode “*on an on-demand basis.*” Challenger teaches that “[i]f the bandwidth sharing device 202 in question initiates the bandwidth sharing, then it employs 504 the master module 402 and operates in master mode.” *Id.*, ¶ [0057]; *see also id.*, Fig-5. Accordingly, the master bandwidth sharing device initiates the bandwidth sharing depending on its bandwidth needs.

- b. [1.1] “*developing and updating a network table that comprises a list of nearby RCGs, their bandwidth capabilities over local, remote and wireless connections, and their location with respect to a requesting RCG;*”

54. I provide here additional explanation regarding the use of network tables, which would be helpful to supplement the discussion in the petition. In my opinion, the use of network tables within the context of Challenger’s bandwidth sharing system would have been an obvious design choice for a POSITA at the relevant time. Challenger describes a system in which a master bandwidth sharing device (BSD) initiates communication with other BSDs to aggregate available bandwidth from multiple telecommunications lines. Specifically, Challenger explains

that the master BSD sends queries to each detected BSD, and each BSD “affirmatively makes known the availability of bandwidth to the requesting bandwidth sharing device 202,” since the master BSD does not inherently possess this information (Ex. 1017, ¶¶ [0047]-[0048]). Given this architecture, it would have been apparent to a POSITA that some form of data structure—such as a network table—would be required to track the addresses and bandwidth availability of each participating BSD. This is further supported by Challenger’s disclosure that the system involves “frequent and regular verification of the continued availability of last mile telecommunications lines 110 and re-evaluation of the amount of available bandwidth to the master bandwidth sharing device 202” (*Id.*, ¶ [0056]). The arbitration module (416) is responsible for implementing necessary changes, such as adding or removing BSDs from the sharing configuration, in response to dynamic changes in network conditions.

55. The use of network tables in Challenger’s system would have also been obvious to a POSITA given multiple known benefits of using network tables. The need for such a network table is underscored by the use of standard networking protocols like TCP/IP, as referenced in Challenger (¶ [0015]). TCP/IP-based systems routinely rely on routing and network tables to manage connections, track available paths, and facilitate efficient data transfer between nodes. The use of network tables to store information about device addresses, bandwidth capacity, and connection

status would have been well understood and widely practiced in the field at the time, as further corroborated by standard networking references (*see, e.g.*, Ex. 1019 at 254). Moreover, the dynamic nature of the bandwidth sharing process described in Challenger—where devices may join or leave the sharing group based on availability or local demand—necessitates a mechanism for maintaining up-to-date information about the network topology and resource status. A POSITA would have recognized that a network table, updated dynamically as devices become available or unavailable, is the most practical and efficient means to support the arbitration and bandwidth allocation functions described in Challenger.

56. Ades discloses developing and updating a routing tables. A POSITA would have known the benefits of using a network table in Challenger’s system. At the relevant time frame, it was well known to create and update network tables to transmit and receive packets and/or messages to and from multiple devices. *See* Ex. 1030, 369 (“routing table: A table that lists all the possible paths data can take to get from source to destination. The routing table is stored in memory on routers, gateways, and computers.”); Ex. 1019, 254 (describing a step of checking the routing table while debugging network layer), 260 (describing a problem of lost packets when “NCP goes to opened state, but the external interfaces, routing tables, or name databases have not yet become operational.”).

57. Further, a POSITA would have known that network tables can store various types of information, including information about the available paths to transfer data from the source to the destination. *See* Ex. 1030, 369 (“A table that lists all the possible paths data can take to get from source to destination”). In particular, in my opinion, a POSITA would have known that network tables may store information about the next hop, number of hops, packet loss, and network delay, as this information was generally used to determine the optimal or best path for transmitting data packets across the network.

58. Finally, a POSITA would have known that network tables are automatically (dynamically) updated when network changes occur. *See* Ex. 1020, 275–76 (explaining that “[e]ntries in a routing table can be made statically or dynamically. . . dynamic routes are automatically entered by some process in the router or end station.”). Accordingly, it is my opinion that a POSITA would have known that a network table would be created and updated to ensure the data packets are transmitted to the designated destination over the optimal path. Alternatively, in my opinion, a POSITA would have found obvious to use Ades’s network tables in Challenger. **First**, a POSITA would have recognized that both Challenger and Ades are in the same field of endeavor and are directed to the same problem. Namely, both Challenger and Ades aim at improving available bandwidth. Challenger teaches a solution for peer-to-peer bandwidth sharing and aggregation and arbitration for

available bandwidth over existing lines using a BSD. Ex. 1017, ¶¶ [0002], [0013]-[0014]. Similarly, Ades discloses a method to improve bandwidth by accommodating peak traffic load, namely, a method of “inverse multiplex[ing]” data over a plurality of paths. Ex. 1026, ¶¶ [0024], [0289]. Ades also discloses a method of selecting the best route to accommodate traffic and storing information about best routes in network tables. *Id.*, ¶ [0541]. I note here that although a route with fewest hops is presumed to be the best route, Ades teaches that other factors can impact whether a path is the best path, aside of the number of links (hops) in a path. For example, Ades teaches determining a cost of using a link based on the link’s traffic capacity (*i.e.*, bandwidth capabilities) in addition to tracking the number of hops along a path (*i.e.*, *location*). *Id.*, ¶ [0273].

59. ***Second***, in my opinion, a POSITA would have understood that Challenger’s and Ades’s teachings involve similar techniques such that integrating Ades’s data allocation and information tracking using network tables to select the best route based on metrics like hop count, link cost, and bandwidth capacity in Challenger’s bandwidth aggregation system where multiple wireless units share the available bandwidth to improve overall information throughput simply applies a known technique to improve similar methods and would have yielded predictable results. Ex. 1017, ¶¶ [0002], [0013]-[0014]; Ex. 1026, ¶¶ [0024], [0289], [0543].

60. Further, Ades teaches methods to maintain and update a network table in order to determine the best route for a communication message and a POSITA would have known to implement this method in the Challenger's system. Using network tables was well known in the 2002 where network administrators used network tables in both local area networks and wide area networks to manage traffic between nodes such as Challenger's BSDs. Moreover, Ades's method of "inverse-multiplexing" between nodes in its multi-hop network is the substantially the same as Challenger's peer-to-peer bandwidth sharing method.

61. In my opinion, a POSITA would have been motivated to implement Ades's methodology in Challenger's system in order to improve bandwidth aggregation and data throughput. Further, implementing Ades's methodology in Challenger's system would have required nothing more than routine experimentation and would have had the predictable result of achieving increased bandwidth, and coordinated assessment, allocation, and aggregation of available bandwidth across a wireless network. *Id.* In my opinion, a POSITA would have had a high likelihood of success in making this combination.

c. [1.2] "*determining an optimum amount of bandwidth needed for an immediate data transfer needs of the requesting RCG;*"

62. I also think it is helpful for me to provide additional information regarding term "determining an optimum amount of bandwidth." As shown in Figure

5 of Challenger below, which I have illustrated to highlight the steps of bandwidth sharing arbitration, the master BSD (“*requesting RCG*”) communicates with slave BSDs in order to *arbitrate* and share bandwidth:

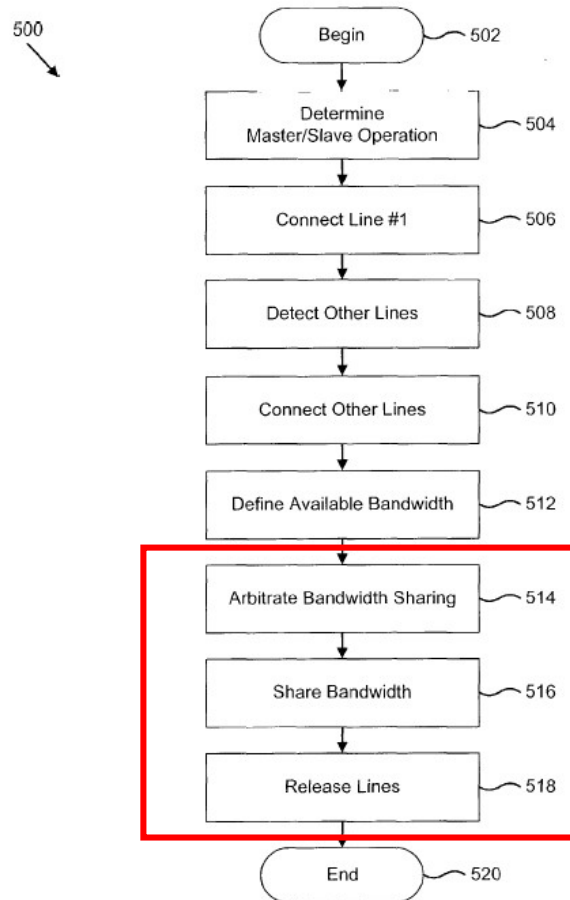


Fig. 5

Ex.1017, Fig-5. As described by Challenger, the process of bandwidth arbitration and setting up bandwidth sharing includes “*initial configuration* of the bandwidth sharing system, which is characterized by the number of active bandwidth sharing devices 202 and the *corresponding amount of available bandwidth* for each device.” *Id.*, ¶ [0061]. Further, Challenger notes that “[t]he arbitration 514 of the

bandwidth sharing also necessitates frequent and regular *re-evaluation* of device and bandwidth availability status.” *Id.*

63. In light of Figure 5 and the corresponding disclosure, it is my opinion that a POSITA would have known that Challenger’s system conducts a “regular re-evaluation of device and bandwidth availability status” to achieve “*optimum bandwidth*” (i.e., “*optimum amount of bandwidth needed for an immediate data transfer need*”) based on the available bandwidth in the give time. A POSITA would have further understood that “an optimum amount of bandwidth” is the amount needed to avoid the bottleneck. Indeed, achieving the optimum of bandwidth by avoiding bottlenecks was a stated goal of Challenger. As Challenger explains, “due to low bandwidth capability, the last mile telecommunications lines 110 prove to be a significant bottleneck precluding broadband connectivity between the Internet 104 and the end user terminals 108, even though abundant transmission capacity is available on the broadband telecommunications lines 106.” *Id.* ¶ [0036].

d. [1.7] “*contacting the selected RCGs with control information for sending data to the requesting RCG;*”

64. It is helpful for me to provide context regarding term “control information.” A POSITA would have understood that, in order for devices to share bandwidth, they would have to share “*control information.*” Control information is used to receive and sequence the received packets and without it sending information over multiple links would not be possible. For example, Held describes “control

information” as information that “enables the computers to determine which packets go where and ensure that all the information in the message has been received.” Ex. 1020, 654.

65. Indeed, the '156 Patent acknowledges, and in my opinion a POSITA would have understood that using control information when sending data was a well-known technique. For example, the '156 Patent mentions prior art that teaches routing a phone call from one device to another: “[t]he SIP Proxy Server process sends a SIP Invite to the IXC’s Media Gateway 60 device, **as well as other control information**, to direct the Media Gateway 60 device to terminate the call.” Ex. 1015, 9:3-9.

2. Dependent Claim 2

- a. [2] *“The method of claim 1, further comprising the step of sending a request to a single supporting RCG that has sufficient unused bandwidth for satisfying the request of the requesting RCG.”*

66. It is helpful for me to provide additional explanation regarding the disclosure of sending a request to share bandwidth to a single RCG “that has sufficient unused bandwidth for satisfying the request of the requesting RCG.” According to Challenger, “**a master bandwidth sharing device 202 may be allowed to use the entire amount of bandwidth available on a last mile telecommunications line 110.**” Ex. 1017, ¶ [0050]. Moreover, the “[t]he arbitration module 416 implements necessary changes, i.e., adding or removing bandwidth

sharing devices to and from the current sharing method and structure in order to accommodate dynamic availability and releasing operations.” *Id.*, ¶ [0056]. Therefore, in my opinion, a POSITA would have known that the requesting device may only need to make the request to one BSD, in a case where sufficient bandwidth is available from a single BSD.

67. Moreover, Ades explicitly teaches that the network should use a single path (or resource) to satisfy a bandwidth request if that path alone is sufficient. Only when the demand exceeds the capacity of that single path does the system seek out and utilize additional resources. Ex. 1026 ¶¶ [0072]-[0073]. This approach is rooted in common sense approaches to efficiency, resource optimization, and the avoidance of unnecessary complexity.

3. **Dependent Claim 4**

- a. [4.1] *“The method of claim 1, further comprising the steps of: dynamically reallocating shared bandwidth of the supporting RCGs during multi-link data transfers as supporting RCGs opt out of bandwidth sharing due to local bandwidth demands”*

68. I think it is also helpful for me to provide additional context regarding term “multi-link data transfer.” In my opinion, a POSITA would have understood that Challenger’s request to a slave device to reallocate the shared bandwidth is a “*multi-link data transfer*” because the master BSD requests that the slave device provide one of multiple physical links that will be used to receive or transmit data

on behalf of the master BSD. Ex. 1017, ¶ [0015] (“The logic unit instructions allow for a variety of circumstances, including the dynamic arbitration of multiple shared transmission lines.”).

69. Further, in my opinion, bandwidth sharing as described by Challenger was one of numerous well-known ways of aggregating multiple links to increase bandwidth. For example, other ways included inverse multiplexing, bonding, load balancing, and multilink PPP according to RFC 1990. *See, e.g.*, Ex. 1019, 203-207.

B. Ground IB: Claims 3-5 are Obvious In View of Challenger, Ades, and Xin

a. [3.1] “The method of claim 1, wherein each of the supporting RCGs can opt out of bandwidth sharing based upon local demand priority”

70. It is helpful for me to provide here additional context regarding implementation details related to opting out of bandwidth when the local demand for bandwidth supersedes a request of a device for bandwidth sharing. In my opinion, to the extent that Challenger and Ades do not render this implementation obvious, Xin remedies these deficiencies.

71. Xin teaches an ad-hoc mobile cluster-type network. According to Xin’s disclosure, “[e]ach host in the cluster can share other hosts’ communication links or paths” when communicating with a network (*e.g.*, the Internet) connected to the mobile cluster network. Ex. 1025, 568-69. Figure 1, which I have reproduced below, shows an example topology of Xin’s system.

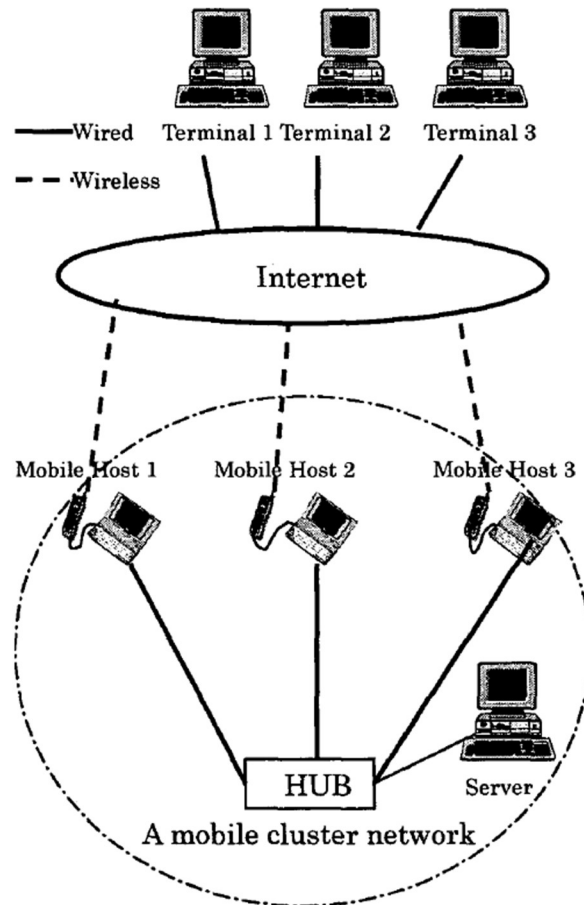


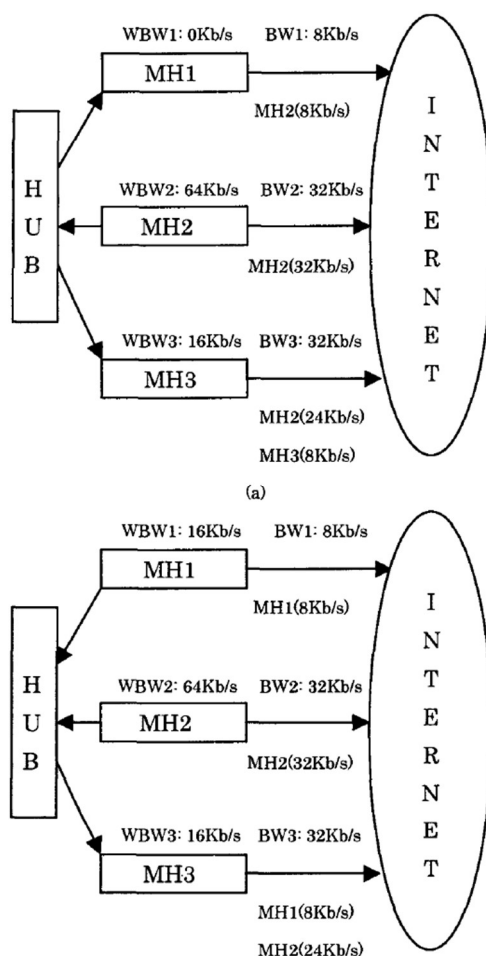
Figure 1: An example of the system

Id. Fig-1.

72. Further, Xin points out that ad hoc networks “are networks in which the transmission range of a node is limited and the topology of the network is dynamic, so that multihop communication is necessary for nodes to communicate with each other.” *Id.*, 569. Xin further teaches that mobile hosts can “have different communication requirements and the packets from each mobile host [can] have different characteristics, such as different delay time limit, different bit error rate request [etc.]” *Id.*, 570. Accordingly, Xin proposes grouping the mobile hosts into

various priority classes. As an illustration, Xin proposes grouping the mobile hosts into three priority classes: (i) control information which is delay-critical and loss-critical service, (ii) audio and video signals which is a delay-critical service, and (iii) common data packets which is not delay-critical service but is a loss-critical service. *Id.*

73. Xin further explains that in an exemplary embodiment, which is illustrated in the Figure 2 reproduced below, mobile host 1 (“MH1”) sends or receives burst data and is assigned to the highest priority class. Next, mobile host 2 (“MH2”) participates in a video conference with the outside network and is assigned to the second highest priority class. Finally, the third mobile host (“MH3”) sends common data to the remote terminal and is assigned to the lowest priority class. *Id.*



Id., Fig-2. As illustrated at time T1, the required bandwidth of the three mobile hosts is 0, 64Kb/s and 16Kb/s, respectively. *Id.* MH2 uses the bandwidth shared by MH1, a part of MH3's bandwidth and its own bandwidth. *Id.* Further, MH3 uses the remaining 8Kb/s of bandwidth, which is not being shared with MH2. *Id.* At time T2, MH1's bandwidth requirements **take priority** to send burst data to a remote device, so it uses the 8Kb/s bandwidth of MH3 and its own 8Kb/s. *Id.* Then, MH2 used the 24kb/s bandwidth of MH3 and its own. And MH3 does not benefit from bandwidth sharing with other hosts.

74. In my opinion, based on Xin's disclosure, a POSITA would have known this to mean that MH2 has opted out of bandwidth sharing based upon its local demand priority.

75. A POSITA would have recognized that Challener, Ades, and Xin are in the same field of endeavor and directed to the same problem of improving available bandwidth in a network. As I have explained in detail above, both Challener and Ades are directed to the same problem of improving available bandwidth. *See* §IX.A.1.b. Xin similarly discloses methods of improving bandwidth in a network by dividing mobile hosts in one network into different priority classes based on hosts' different communication requirements. Ex. 1025, 569-71. Based on these requirements, Xin provides methods for opting out of bandwidth sharing based on priority and dynamically reallocating shared bandwidth as the devices supporting the data transfer opt out. *Id.* 570. Moreover, Xin explains the importance of scheduling data transfers (e.g., "resource reservation") in the system and the possibility to prearrange resource availability in order to guarantee bandwidth and avoid delay and error in sending data packets. *Id.*, 569-70.

76. Further, in my opinion, a POSITA would have understood that Challener, Ades and Xin involve similar techniques such that integrating Xin's dynamic bandwidth allocation techniques in Challener's and Ades's bandwidth aggregation systems where multiple wireless units share the available bandwidth to

improve overall information throughput simply applies a known technique to improve similar methods and would have yielded predictable results. Accordingly, a POSITA would have been motivated to modify Challenger to prioritize the bandwidth requirements of the wireless units 106 based on the content being transmitted from the WAN communication system 104 to the wireless units as taught by Xin. Indeed, a QoS-ensured priority system proposed by Xin optimizes performance of high priority traffic such as video and voice. Moreover, as I explained in detail above, Challenger recognizes the benefit of providing its BSD end user the ability to opt-in or opt-out of resource (*i.e.*, bandwidth) sharing and allows the BSDs to start or stop bandwidth sharing based on the local needs of the network. *See, e.g.*, EX. 1017, ¶¶ [0053]-[0055]. Additionally, implementing Xin's solution in Challenger's system would not present any additional technical complexity and, in my opinion, combining Xin's, Challenger's and Ades's disclosures would have required only routine experimentation and would have a predictable result, namely, the improvement of bandwidth allocation and throughput in a network. *Id.* Accordingly, it is my opinion that a POSITA would have had a high likelihood of success in making this combination. *Id.*

77. Finally, in my opinion it would have been obvious to a POSITA to use a priority system as taught by Xin with Challenger's system to properly allocate bandwidth for the same reasons I explained in this section.

2. Dependent Claim 4

- a. [4.2] “enlisting additional supporting RCGs to provide additional bandwidth.”*

78. I also provide here additional context regarding the implementation details related to enlisting additional supporting RCGs to provide additional bandwidth. In my opinion, to the extent that Challenger and Ades do not render this implementation obvious, Xin remedies these deficiencies.

79. In my opinion and based on Xin’s disclosure, a POSITA would have known to add additional links to other wireless units (*e.g.*, MH4) in order to provide additional bandwidth under Xin’s dynamic reallocation of shared bandwidth process. For example, at the relevant time period, it was well known that protocols (*e.g.* RFC 1990 PPP Multilink Protocol) disclosed adding more bandwidth by dynamically adding or dropping links between two nodes and that this may be done without interrupting the connection. Ex. 1038 at 2 (“Basic Rate and Primary Rate ISDN both offer the possibility of *opening multiple simultaneous channels* between systems, giving users additional bandwidth *on demand* (for additional cost).”).

80. Moreover, in my opinion, it would have been obvious to a POSITA to use Xin’s dynamic reallocation system with Challenger’s system to properly allocate bandwidth for the same reasons I explained with respect to the knowledge of a POSITA in Section IX.B.a.

3. Dependent Claim 5

- a. [5] *“The method of claim 1, further comprising the steps of scheduling a data transfer to occur at future date and time based upon at least one of anticipated network bandwidth availability, network congesting, and future notice of availability of the data of interest.”*

81. I also provide here additional explanation of the implementation details related to scheduling data transfer at a later time due to network conditions. In my opinion, to the extent that Challenger and Ades do not render this implementation obvious, Xin remedies these deficiencies.

82. Pursuant to Xin’s bandwidth sharing example I described in detail above, because to its low priority, MH3 is unable to access an outside network due to congestion at time T2. Ex. 1025, 570; *See* § IX.B.a. Accordingly, in my opinion, a POSITA would have understood that one solution to MH3’s inability to transfer common data to a remote terminal at time T2 would be to schedule that transfer for a later time. Indeed, according to Xin’s disclosure, the availability and complexities around “reserving resources,” (*i.e., scheduling a data transfer*) are considered in wired and wireless networks. Xin proposes “content-based priority transmission scheme . . . to ensure the QoS parameters of priority mobile hosts.” Ex. 1025, 569 (“With resource reservation one can ***prearrange*** for resources to be dedicated for the duration of the flow, thereby guaranteeing the bandwidth, delay, and error rates contracted for by the application”), 570 (“Every mobile host will report to the server

in any time when it wants to begin or end its communication with outside terminals or changes its communication content type.”).

83. Moreover, in my opinion, it would have been obvious to a POSITA to use a method for “*scheduling a data transfer to occur at future date and time*” to ensure proper resource allocation given anticipated network conditions. § IX.B.a.

C. Ground IIA: Claims 1-4 are Obvious in View of Kotzin, Or Alternatively in View of Kotzin and Ades

1. Independent Claim 1

- a. [1.pre] “*A method for aggregating, sharing and dynamically routing and allocating bandwidth from a plurality of wired and wireless networks that are geographically disbursed over a wide area, and providing some or all of the aggregated bandwidth to any user on an on-demand basis, the method comprising the steps of.*”

84. In order to provide context to the analysis in the petition, Kotzin discloses a plurality of wireless units that use short-range wireless system 102 (e.g., an 802.11 WiFi network) for sharing (i.e., aggregating) their bandwidth for use by one of the wireless units, for example Unit 106A, when communicating with external network 104, such as the Internet. Ex. 1018, Abstract, ¶ [0024]. Kotzin’s wireless units connect with each other wirelessly so units “receive portions of the communication on behalf of the destination wireless apparatus 106 a” from the external network, resulting in higher effective bandwidth for Unit 106A. *Id.*, ¶ [0035], *see also* ¶¶ [0028], [0031]. The external network is described by Kotzin as

“a wireless wide area network (WAN) communication system 104 such as a digital cellular communication system, the Internet, or any other suitable communication system.” In my opinion, a POSITA would have understood that the Internet includes a wired network. *Id.*, ¶ [0022]. When additional bandwidth is needed, the destination communication device (*e.g.*, unit 106A) sends “to each of the participating proximal wireless units, a partial bandwidth request indicating an amount of data to be received by a party from the wide area network.” Ex. 1018, ¶ [0040].

85. Further, in my opinion a POSITA would have understood that “***the aggregated bandwidth***” would be provided to the destination communication device “*on an on-demand basis.*” As Kotzin explains, the destination communication device (*e.g.*, unit 106A) initiates the bandwidth sharing. Ex. 1018, ¶ [0037] (“In response to receiving the data indicating the amount of data to be sent via the wide area network, the wireless apparatus 106a carries out local communication via the wireless short range communication system to determine which of the wireless apparatus 106b-106n is within range of the wireless unit 106a.”); Fig-5.

b. [1.1] “*developing and updating a network table that comprises a list of nearby RCGs, their bandwidth capabilities over local, remote and wireless connections, and their location with respect to a requesting RCG;*”

86. I provide here additional explanation regarding the use of network tables, which would be helpful to supplement the discussion in the petition. In my opinion, a POSITA would have been motivated to implement a network table in

Kotzin's UNITS. First, it would allow a unit to track the addresses of the other wireless units. To do so, a requesting wireless unit would need an "address book," *i.e.*, a network table. In my opinion, it would have been obvious to a POSITA to use a network table for this purpose given that Kotzin's relies upon an 802.11 WiFi network for sharing bandwidth, which a POSITA would have known relies on network tables. Ex. 1018, Abstract, ¶ [0022]. Moreover, TCP/IP-based systems routinely rely on routing and network tables to manage connections, track available paths, and facilitate efficient data transfer between nodes. Ex. 1020, 275.

87. Further, using a network table would permit tracking of the other UNITS, from which UNIT 1 can borrow the bandwidth. Ex. 1018, ¶¶ [0040]-[0041]. It is common sense that in order to aggregate bandwidth, each wireless unit must know how to locate and contact the other units. As Kotzin explains, the wireless units enable "location discovery by other peer proximal wireless units and sharing protocols to allow. . . resource sharing on the wireless apparatus." *Id.*, ¶ [0020]. This messaging is utilized to "indicate the number of megabits per second that each proximal wireless apparatus is capable of providing" and the information is gathered "in memory 113 or any other suitable location." *Id.* ¶¶ [0037]-[0039]. In my opinion, it would have been obvious to a POSITA that this information must be stored in a table such as a network table.

88. Moreover, network tables would store information about unit's bandwidth capabilities, as well as the amount of bandwidth that UNITS have to share with UNIT 1 and, at the same time, allow UNIT 1 to make an efficient and optimal decision on how it should route packets to the Internet via the other UNITS.

89. A POSITA would have also found obvious tracking and updating a table with the bandwidth capabilities of nearby wireless units based on their location and "local, remote and wireless connections." Indeed, Kotzin highlights the importance of keeping track of quality of service information in order to select units for bandwidth sharing. For example, Kotzin discusses wireless units of Figure 4 stating that "some of the wireless apparatus 106a-106n may not experience the same quality of communication with the wide area network 104." *Id.*, ¶ [0035]. "Accordingly, a wireless apparatus in the group of proximal units that is located in a more optimal location (*e.g.*, near window) is used to carry a larger burden of the traffic for the group. This quality information (*e.g.*, signal strength) may be determined by the network element 400 (one or more) or by the wireless apparatus themselves using conventional signal quality detection techniques. The resulting link quality information is then provided to other members of the group of proximal units via peer-to-peer communication and results are communicated with the wide area network to increase efficiency in maintaining an acceptable level of quality of service." *Id.*

90. A POSITA would have known the benefits of using a network table in Kotzin’s system. At the relevant time frame, it was well known to create and update network tables to transmit and receive packets and/or messages to and from multiple devices. *See* Ex. 1030, 369 (“routing table: A table that lists all the possible paths data can take to get from source to destination. The routing table is stored in memory on routers, gateways, and computers.”); Ex. 1019, 254 (describing a step of checking the routing table while debugging network layer), 260 (describing a problem of lost packets when “NCP goes to opened state, but the external interfaces, routing tables, or name databases have not yet become operational”).

91. Further, a POSITA would have known that network tables can store various types of information, including information about the available paths to transfer data from the source to the destination. *See* Ex. 1030, 369 (“A table that lists all the possible paths data can take to get from source to destination”). In particular, in my opinion, a POSITA would have known that network tables may store information about the next hop, number of hops, packet loss, and network delay, as this information was generally used to determine the optimal or best path for transmitting data packets across the network.

92. Finally, a POSITA would have known that network tables are automatically (dynamically) updated when network changes occur. *See* Ex. 1020, 275–76 (explaining that “[e]ntries in a routing table can be made statically or

dynamically. . . dynamic routes are automatically entered by some process in the router or end station.”). Accordingly, it is my opinion that a POSITA would have known that a network table would be created and updated to ensure the data packets are transmitted to the designated destination over the optimal path.

93. Accordingly, in my opinion, a POSITA would have found it obvious to implement a network table in Kotzin’s system to track the configuration of the bandwidth sharing system, signal quality and bandwidth metrics. This would allow a POSITA to readily select other wireless units for bandwidth sharing and would help a POSITA to determine how to split packets among the bandwidth sharing devices.

94. Alternatively, in my opinion, it would have also been obvious to combine Ades’s and Kotzin’s teachings to use a network table in Kotzin’s system. In my opinion, a POSITA would have recognized that both Kotzin and Ades are in the same field of endeavor and are directed to the same problem. Namely, both Kotzin and Ades aim at improving available bandwidth. Kotzin’s method focuses on a the need for the “aggregation of shared resource usage of wireless resources.” Ex. 1018, ¶¶ [0004], [0006]. Kotzin teaches “allow[ing] aggregation of . . . wireless resources capabilities with other proximal wireless units to enhance throughput with a wide area network.” *Id.*, ¶ [0019]. Whereas Ades discloses a method to improve bandwidth by accommodating peak traffic load through “inverse multiplex[ing]”

data over a plurality of paths. Ex. 1026, ¶¶ [0024], [0289]. Ades also discloses a method of selecting the best route to accommodate traffic and storing information about best routes in network tables. *Id.*, ¶ [0541]. I note here that although a route with fewest hops is presumed to be the best route, Ades notes that other factors can impact whether a path is the best path, aside of the number of links (hops) in a path. For example, Ades teaches determining a cost of using a link based on the link's traffic capacity (*i.e.*, bandwidth capabilities) in addition to tracking the number of hops along a path (*i.e.*, *location*). *Id.*, ¶ [0273].

95. Additionally, in my opinion, a POSITA would have understood that Kotzin's and Ades's teachings involve similar techniques such that integrating Ades's data allocation and information tracking using network tables techniques in Kotzin's methods and apparatus simply applies a known technique to improve similar methods and would have yielded predictable results. Kotzin discloses "a peer-to-peer communication technique" that "is used to allow the plurality of proximal wireless units to use each other's . . . resources for a given communication session." Ex. 1018, ¶ [0021]. Ades teaches methods to maintain and update a network table in order to determine the best route for a communication message and a POSITA would have known to implement this method in the Kotzin's system. Using network tables was well known in the 2002 where network administrators used network tables in both local area networks and wide area networks to manage

traffic between nodes such as Kotzin's BSDs. Moreover, Ades's method of "inverse-multiplexing" between nodes in its multi-hop network is the substantially the same as Kotzin's peer-to-peer bandwidth sharing method.

96. In my opinion, a POSITA would have been motivated to implement Ades's bandwidth allocation method to extend the communication range in Kotzin and use Ades's network tables in Kotzin's wireless unit 106a to track hop-count data to other nearby wireless units. In my opinion, implementing these techniques would also help maintain capacity data (*e.g.*, bit rates) of those wireless units in Kotzin's system and help establish an optimal path for a communication link to and from the WAN base station. In my opinion, implementing Ades's methodology in Challenger's system would have required nothing more than routine experimentation and would have had the predictable result of achieving increased bandwidth, and coordinated assessment, allocation, and aggregation of available bandwidth across a wireless network. *Id.* In my opinion, a POSITA would have had a high likelihood of success in making this combination.

c. [1.7] "contacting the selected RCGs with control information for sending data to the requesting RCG;"

97. It is helpful for me to provide context regarding term "control information." As I have explained above, '156 Patent itself acknowledges and, in my opinion, a POSITA would have known that using control information when

sending data was a well-known technique in the art at the relevant time period. *See* § IX.A.1.d.

98. Further, Kotzin describes a scenario where a wireless apparatus (the requesting node) determines which proximal wireless units are available to share their wireless resources. The requesting node then sends a partial bandwidth request (i.e., control information) to each participating proximal wireless unit, indicating the exact amount of data to receive from the wide area network (WAN) on behalf of the requesting node. Ex. 1018 ¶ [0040] (“As shown in block 606, the method includes sending, by the wireless apparatus 106a for example, to each of the participating proximal wireless units, a partial bandwidth request indicating an amount of data to be received by a party from the wide area network.”)

99. In my opinion, a POSITA would have understood that Kotzin’s partial bandwidth request acts as control information, instructing each selected node (proximal wireless unit) how much data to obtain from the WAN and subsequently forward to the requesting node. This ensures that the data is split and delivered according to the needs of the requesting node.

a. [1.8] “sending packets of the data from the selected RCGs to the requesting RCG;”

100. It is also helpful for me to discuss the limitations of the term “sending packets.” For example, in step 512B of Figure 5, a Base Station on external network 104 sends 1MB/SEC of data to UNIT 2. Ex. 1018, Fig-5. And, in step 514A, UNIT

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2 forwards 1MB/SEC of data to UNIT 1. *Id.* UNITS 3, 4, and N also forward data to UNIT1 if they were selected to share bandwidth. *Id.* Thus, UNIT 1 receives data packets from each of the other units, which are remote communications devices for the reasons discussed above. *Id.*

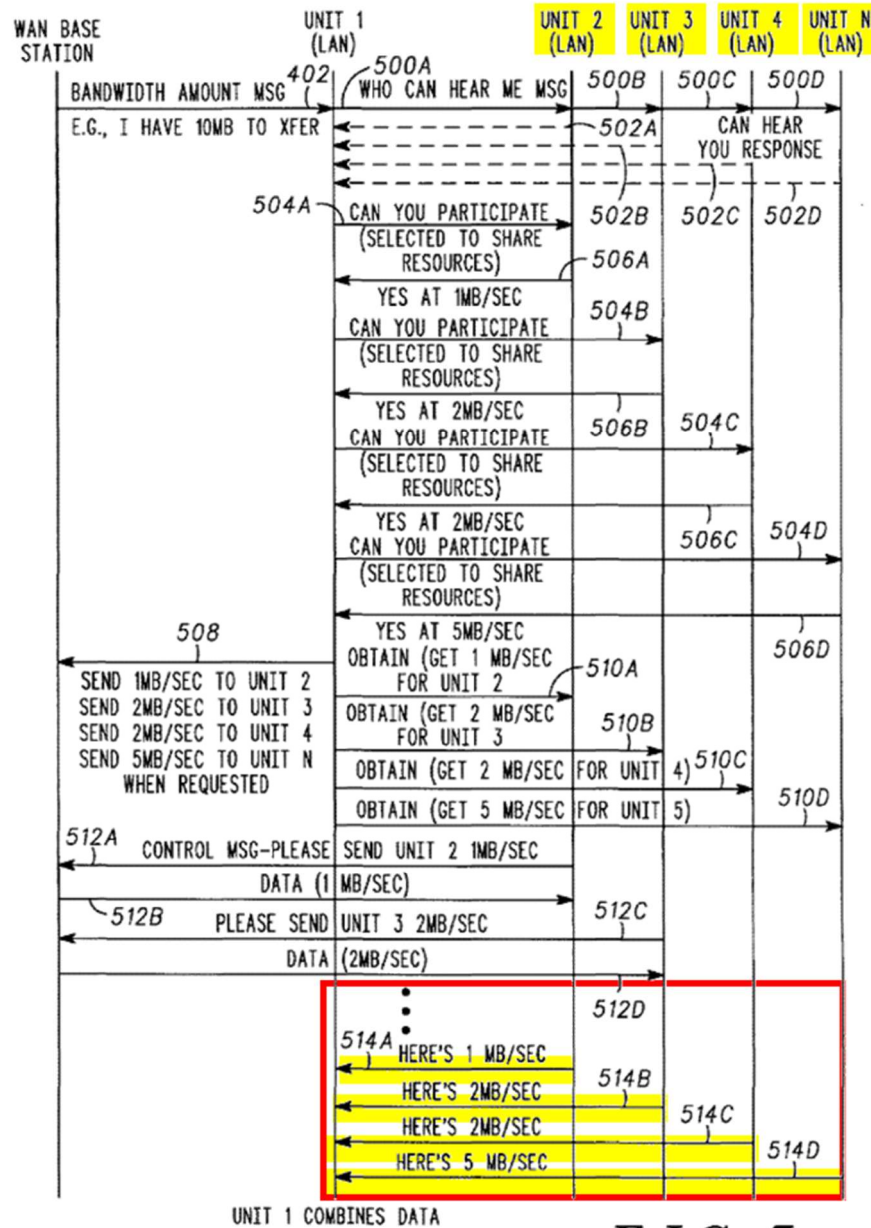


FIG. 5

Id., Fig-5.

101. While Kotzin does not use the explicit term “packet,” the context and the described methods/systems make it clear that packet-based communication is the intended environment. Kotzin describes splitting information into subsets to be sent

to different proximal units, which then forward these subsets to the destination node.

See e.g., Ex. 1018 ¶ [0018]. This process is characteristic of packet-based communication, where data is divided into discrete units (packets) for transmission and later reassembled. Kotzin is described as operating over wireless LANs (such as Bluetooth, 802.11) and WANs (such as cellular networks, the Internet, based on the TCP/IP protocol), all of which are inherently packet-based communication systems. *Id.*, ¶ [0022].

102. Thus, to the extent that Kotzin does not expressly disclose sending packets of the data, it would have been obvious to do so when operating over wireless LANs (such as Bluetooth, 802.11) and WANs (such as cellular networks, the Internet), all of which are inherently packet-based communication systems.

2. Dependent Claim 3

- a. [3.1] *“The method of claim 1, wherein each of the supporting RCGs can opt out of bandwidth sharing based upon local demand priority”*

103. I provide here, the additional context regarding opting out of bandwidth sharing based on local demand. In my opinion, it would have been obvious to a POSITA the Kotzin’s wireless unit can opt out of the resource sharing based on the local demand. Indeed, Kotzin explains that “a user interface provides selectable enabling by a user of whether the wireless apparatus will allow shared use of its

wireless resources with proximal wireless units in a wide area network.” Ex. 1018 ¶
[0044]; *see also* IX.C.2.b.

b. [3.2] “*and wherein local demand for bandwidth
supersedes a request of a remote RCG for bandwidth
sharing.*”

104. It is also helpful for me to provide explanation of the term “bandwidth
superse[ding] local demand.” Kotzin explicitly addresses the relationship between
local demand for bandwidth and requests from remote units for bandwidth sharing.
The system is designed so that each wireless unit can evaluate its own current
bandwidth utilization and local service requirements before agreeing to participate
in bandwidth sharing with a remote requesting unit. Ex. 1018 ¶ [0031] (“the wireless
unit also generates a message for the wireless wide area network indicating that the
wireless unit is allowing its short-range wireless resources to be shared in the local
area network.”) A POSITA would have understood that, if a unit’s local demand for
bandwidth is high—such as when it is engaged in its own data or voice
transmissions—it can deny or limit the amount of bandwidth it shares with remote
units.

105. Further, a POSITA would have known that when a user’s device has an
option to opt-out of bandwidth sharing, the user’s decision to opt out would be based
on a variety of factors including the user’s own “*local demand priority*.” This is
explicitly disclosed by Kotzin. For example, Kotzin states that “users may resist or

be unwilling to participate in sharing wireless resources” because “battery energy may run down when it is used to retransmit information for a different destination subscriber” *Id.*, ¶ [0005]. Kotzin also explains that wireless units’ users can decide whether to participate in bandwidth sharing. *Id.* ¶ [0038]; *see also* ¶ [0019] (“[T]he method and apparatus generates reward data to provide a reward, such as free telephone calls, account credits, price reductions, or other rewards, so that a billing system is updated when a wireless apparatus has been enabled as allowing shared use of its wireless resources by other proximal wireless units.”), ¶ [0026] (“[T]he processing device 112 enables the wireless apparatus to share its local area network wireless resources in response to the data that indicates that the user desires to participate in allowing the wireless apparatus to share its wireless resources.”), ¶ [0030] (“If the user interface generates data representing that the user desires to participate in allowing the wireless apparatus to share its wireless local area network resources with other proximal wireless units, the method includes, as shown in block 304, enabling the wireless apparatus to share its short-range wireless resources with other proximal wireless units in the local area network.”), ¶ [0036] (“[O]ther wireless apparatus 106b-106n that have agreed to participate to share their short range wireless resources, are used to retransmit portions of the communication that have been split by the wide area network 104 for distribution among the participating proximal wireless apparatus.”), ¶ [0038] (“In this example, each of the wireless

apparatus 106b-106n have been designated as units that will participate in allowing shared use of their short-range wireless resources.”), ¶[0039] (“[T]he method includes locating the proximal wireless units that wish to share their wireless resources and query each of them to determine the amount of available bandwidth for each available local area wireless unit that is considered a proximal wireless unit.”); *id.*, Fig-5 (messages 504B-D: “can you participate”), Fig-6 (at step 602 “locate proximal wireless unit(s) that wish to share their wireless resources”), Fig-8 (showing messages 504B-D: “can you participate” sent to wireless units).

106. Moreover, in my opinion, a POSITA would have known the benefits of allocating bandwidth based on priority and would have understood that the “*RCGs can opt out of bandwidth sharing based upon local demand priority.*” One such consideration would have been the existence of high-priority traffic, in which case a user would opt out of sharing its bandwidth.

D. Ground IIB: Claims 3-5 are Obvious in View of Kotzin and Xin, Or Alternatively in view of Kotzin, Ades and Xin

107. I do not explain every aspect of Kotzin, Ades, and Xin below. I have read and agree with the mapping of that prior art to the claim limitations provided in the Petition. However, to the extent that I believe context from the perspective of a POSITA is helpful, I discuss the ’156 Patent and the prior art. Further, I provide my rationale why I believe Kotzin alone or in combination with Xin or Ades (and Xin) render claims 1-4 obvious.

1. Independent Claim 3

- a. [3.2] “and wherein local demand for bandwidth supersedes a request of a remote RCG for bandwidth sharing.”*

108. In my opinion, a POSITA would have been motivated to modify Kotzin according to Xin to prioritize the bandwidth needs of the wireless units 106 based on the content being transmitted from the WAN communication system 104 to the wireless units as taught by Xin. **First**, a POSITA would have recognized that Kotzin, Ades, and Xin are in the same field of endeavor and directed to the same problem. As I have explained in detail above, both Kotzin and Ades, are directed to the same problem of improving available bandwidth. *See* § IX.C.1.b. Xin similarly discloses methods of improving bandwidth in a network by dividing mobile hosts in one network into different priority classes based on hosts’ different communication requirements. Ex. 1025, 569-71. Accordingly, in my opinion, Kotzin, Ades, and Xin are in the same field of endeavor and directed to solving the same problem—improving available bandwidth in a network.

109. **Second**, in my opinion, a POSITA would have understood that Kotzin, Ades, and Xin involve similar techniques such that integrating Xin’s teachings on dynamic bandwidth allocation, opting out of the transfer, and prioritizing transfer of data based on their importance with Kotzin’s and Ades’s disclosures to improve

overall information throughput simply applies a known technique to improve similar methods and would have yielded predictable results.

110. Accordingly, in my opinion, a POSITA would have been motivated to modify Kotzin and Ades to prioritize the bandwidth requirements of the wireless units 106 based on the content being transmitted from the WAN communication system 104 to the wireless units. Indeed, a QoS-ensured priority system proposed by Xin optimizes performance of high priority traffic such as video and voice. Moreover, as I have explained above, Kotzin recognizes the benefit of providing its users the ability to opt-in or opt-out of resource (*i.e.*, bandwidth) sharing. *See* Ex. 1018, Fig-2. Further, as I explained in Section IX.C.2.a, Kotzin recognizes the importance of “selectable enabling” of resource sharing by wireless units. Ex. 1018, ¶ [0044]. Additionally, implementing Xin’s solution in Kotzin’s system would not present any additional technical complexity and, in my opinion, combining Xin’s, Kotzin’s and Ades’s disclosures would have required only routine experimentation and would have a predictable result, namely, the improvement of bandwidth allocation and throughput in a network. *Id.* Accordingly, it is my opinion that a POSITA would have had a high likelihood of success in making this combination. *Id.*

X. SECONDARY CONSIDERATIONS

111. I have seen no evidence of, and I am not aware of any evidence of secondary considerations that have a nexus to the claimed inventions that would overcome the combinations of prior art cited above in showing the obviousness of the claims of the '156 Patent. The sheer number of independently developed, simultaneous inventions, developed within in a relatively short time-period are persuasive indicia of obviousness. However, should Patent Owner assert any secondary considerations of non-obviousness, I reserve the right to respond.

XI. CONCLUSION

112. For all the reasons discussed above, it is my opinion that each and every claim of the '156 Patent is invalid.

113. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. §1001.

Dated: August 4, 2025

Respectfully submitted,



Bill Lin