UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,

SAMSUNG ELECTRONICS AMERICA, INC.,

Petitioner,

v.

XIFI NETWORKS R&D, INC.

Patent Owner.

Post Grant Review No. 2025 – 00067

U.S. Patent No. 12,190,198

DECLARATION OF KEVIN ALMEROTH, PH.D., IN SUPPORT OF PETITION FOR POST GRANT REVIEW OF U.S. PATENT NO. 12,190,198

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I, Dr. Kevin Almeroth, declare as follows:

I. Introduction

1. I have been retained by Quinn Emanuel Urquhart & Sullivan, LLP on behalf of the Petitioner Samsung Electronics Co., Ltd. ("Petitioner") as an independent expert in this post grant review (this "Proceeding") before the Patent Trial and Appeal Board of the United States Patent and Trademark Office (the "Board") to review claims 1-30 ("the challenged claims") of U.S. Patent No. 12,190,198 ("the '198 patent"). I have been asked by the Petitioner to assist in evaluating the claims and the disclosure of the '198 patent.

A. Qualifications

2. EX1011 is a true and correct copy of my current CV, which describes my education, patents and publications, employment and research history, and professional activities and awards.

1. Educational Background

3. I hold three degrees from the Georgia Institute of Technology: (1) a Bachelor of Science degree in Information and Computer Science (with minors in Economics, Technical Communication, and American Literature) earned in June 1992; (2) a Master of Science degree in Computer Science (with specialization in Networking and Systems) earned in June 1994; and (3) a Doctor of Philosophy (Ph.D). degree in Computer Science (Dissertation Title: Networking and System

Support for the Efficient, Scalable Delivery of Services in Interactive Multimedia System, minor in Telecommunications Public Policy) earned in June 1997. I have taken a wide variety of courses as demonstrated by my minor. My undergraduate degree also included a number of courses more typical of a degree in electrical engineering, including digital logic, signal processing, and telecommunications theory.

2. Career

4. I am a Professor Emeritus in the Department of Computer Science at the University of California, Santa Barbara (UCSB). While active at UCSB, I held faculty appointments and was a founding member of the Computer Engineering (CE) Program, Media Arts and Technology (MAT) Program, and the Technology Management Program (TMP). I was the Associate Director of the Center for Information Technology and Society (CITS) from 1999 to 2012. I have been a faculty member at UCSB since July 1997.

5. One of the major concentrations of my research has been the delivery of multimedia content and data between computing devices, including various network architectures. In my research, I have studied large-scale content delivery systems, and the use of servers located in a variety of geographic locations to provide scalable delivery to hundreds or thousands of users simultaneously. I have also studied smaller-scale content delivery systems in which content is exchanged

between individual computers and portable devices. My work has emphasized the exchange of content more efficiently across computer networks, including the scalable delivery of content to many users, mobile computing, satellite networking, delivering content to mobile devices, and network support for data delivery in wireless networks.

6. In 1992, the initial focus of my research was on the provision of interactive functions (*e.g.*, VCR-style functions like pause, rewind, and fast-forward) for near video-on-demand systems in cable systems; in particular, how to aggregate requests for movies at a cable head-end and then how to satisfy a multitude of requests using one audio/video stream broadcast to multiple receivers simultaneously. This research has continually evolved and resulted in the development of techniques to scalably deliver on-demand content, including audio, video, web documents, and other types of data, through the Internet and over other types of networks, including over cable systems, broadband telephone lines, and satellite links.

7. An important component of my research has been investigating the challenges of communicating multimedia content, including video, between computers and across networks including the Internet. I have worked on a variety of research problems and used a number of systems that were developed to deliver multimedia content to users. One content-delivery method I have researched is the

one-to-many communication facility called "multicast," first deployed as the Multicast Backbone, a virtual overlay network supporting one-to-many communication. Multicast is one technique that can be used on the Internet to provide streaming media support for complex applications like video-on-demand, distance learning, distributed collaboration, distributed games, and large-scale wireless communication. The delivery of media through multicast often involves using Internet infrastructure, devices and protocols, including protocols for routing and TCP/IP.

8. Starting in 1997, I worked on a project to integrate the streaming media capabilities of the Internet together with the interactivity of the web. I developed a project called the Interactive Multimedia Jukebox (IMJ). Users would visit a web page and select content to view. The content would then be scheduled on one of a number of channels, including delivery to students in Georgia Tech dorms delivered via the campus cable plant. The content of each channel was delivered using multicast communication.

9. In the IMJ, the number of channels varied depending on the capabilities of the server including the available bandwidth of its connection to the Internet. If one of the channels was idle, the requesting user would be able to watch their selection immediately. If all channels were streaming previously selected content, the user's selection would be queued on the channel with the shortest wait time. In

the meantime, the user would see what content was currently playing on other channels, and because of the use of multicast, would be able to join one of the existing channels and watch the content at the point it was currently being transmitted.

10. The IMJ service combined the interactivity of the web with the streaming capabilities of the Internet to create a jukebox-like service. It supported true Video-on-Demand when capacity allowed, but scaled to any number of users based on queuing requested programs. As part of the project, we obtained permission from Turner Broadcasting to transmit cartoons and other short-subject content. We also connected the IMJ into the Georgia Tech campus cable television network so that students in their dorms could use the web to request content and then view that content on one of the campus's public access channels.

11. More recently, I have also studied issues concerning how users choose content, especially when considering the price of that content. My research has examined how dynamic content pricing can be used to control system load. By raising prices when systems start to become overloaded (*i.e.*, when all available resources are fully utilized) and reducing prices when system capacity is readily available, users' capacity to pay as well as their willingness can be used as factors in stabilizing the response time of a system. This capability is particularly useful in systems where content is downloaded or streamed on-demand to users.

12. As a parallel research theme, starting in 1997, I began researching issues related to wireless devices and sensors. In particular, I was interested in showing how to provide greater communication capability to "lightweight devices," *i.e.*, small form-factor, resource-constrained (*e.g.*, CPU, memory, networking, and power) devices. Starting in 1998, I published several papers on my work to develop a flexible, lightweight, battery-aware network protocol stack. The lightweight protocols we envisioned were similar in nature to protocols like Bluetooth, Universal Plug and Play (UPnP) and Digital Living Network Alliance (DLNA).

13. From this initial work, I have made wireless networking—including ad hoc, mesh networks and wireless devices—one of the major themes of my research. My work in wireless networks spans the protocol stack from applications through to the encoding and exchange of data at the data link and physical layers.

14. At the application layer, even before the large-scale "app stores" were available, my research looked at building, installing, and using apps for a variety of purposes, from network monitoring to support for traditional computer-based applications (*e.g.,* content retrieval) to new applications enabled by ubiquitous, mobile devices. For example, my research has looked at developing applications for virtually exchanging and tracking "coupons" through "opportunistic contact" among mobile wireless devices (*i.e.,* communication among devices moving into communication range with each other). In many of the courses I have taught there is

a project component. Through these projects I have supervised numerous efforts to develop new "apps" for download and use across a variety of mobile platforms.

15. Toward the middle of the protocol stack, my research has also looked to build wireless infrastructure support to enable communication among a set of mobile devices unaided by any other kind of network infrastructure. These kinds of networks are useful either in challenged network environments (e.g., when a natural disaster has destroyed existing infrastructure) or when suitable support for network communication never existed. The deployment of such networks (or even the use of traditional network support) are critical to support services like disaster relief, catastrophic event coordination, and emergency services deployment.

16. Yet another theme is monitoring wireless networks, in particular different variants of IEEE 802.11 compliant networks, to (1) understand the operation of the various protocols used in real-world deployments, (2) use these measurements to characterize use of the networks and identify protocol limitations and weaknesses, and (3) propose and evaluate solutions to these problems. I have successfully used monitoring techniques to study wireless data link layer protocol operation and to improve performance by enhancing the operation of such protocols. For wireless protocols, this research includes functions like network acquisition and channel bonding.

17. One theme in my wireless network research has been cross-layer solutions and innovations. As mentioned above, with greater wireless device use and network support, we envisioned new application paradigms and services, for example, when mobile devices come into contact with each other. Instead of relying on existing infrastructure to relay communication, the devices are able to discover each other and communicate directly. Other examples include discovering and using location information to enhance users' experiences. Network support and novel applications use a variety of network architectures supporting users on foot, in vehicles, and across varying terrains and environments. Finally, we studied how communication efficiency can be supported through intelligent handoffs as well as location and movement prediction.

18. Protecting networks, including their operation and content, has been an underlying theme of my research almost since the beginning of my research career. Starting in 2000, I have been involved in several projects that specifically address security, network protection, and firewalls. After significant background work, a team on which I was a member successfully submitted a $4.3M grant proposal to the Army Research Office (ARO) at the Department of Defense to propose and develop a high-speed intrusion detection system. Key aspects of the system included associating streams of packets and analyzing them for viruses and other malware. Once the grant was awarded, we spent several years developing and meeting the

milestones of the project. A number of my students worked on related projects and published papers on topics ranging from intrusion detection to developing advanced techniques to be incorporated into firewalls. I have also used firewalls, including their associated malware detection features, in developing techniques for the classroom to ensure that students are not distracted by online content.

19. Recent work ties some of the various threads of my past research together. I have investigated content delivery in online social networks and proposed reputation management systems in large-scale social networks and marketplaces. On the content delivery side, I have looked at issues of caching and cache placement, especially when content being shared and the cache has geographical relevance. We were able to show that effective caching strategies can greatly improve performance and reduce deployment costs. Our work on reputation systems showed that reputations have economic value, and as such, creates a motivation to manipulate reputations. In response, we developed a variety of solutions to protect the integrity of reputations in online social networks. The techniques we developed for content delivery and reputation management were particularly relevant in peer-to-peer communication.

20. My involvement in the research community extends to leadership positions for several academic journals and conferences. I am the co-chair of the Steering Committee for the ACM Network and System Support for Digital Audio

and Video (NOSSDAV) workshop and on the Steering Committees for the International Conference on Network Protocols (ICNP), ACM Sigcomm Workshop on Challenged Networks (CHANTS), and IEEE Global Internet (GI) Symposium. I have served or am serving on the Editorial Boards of IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE Network, ACM Computers in Entertainment, AACE Journal of Interactive Learning Research (JILR), and ACM Computer Communications Review. I have co-chaired a number of conferences and workshops including the IEEE International Conference on Network Protocols (ICNP), IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), International Conference on Communication Systems and Networks (COMSNETS), IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS), the International Workshop On Wireless Network Measurement (WiNMee), ACM Sigcomm Workshop on Challenged Networks (CHANTS), the Network Group Communication (NGC) workshop, and the Global Internet Symposium, and I have served on the program committees for numerous conferences.

21. Furthermore, in the courses I taught at UCSB, a significant portion of my curriculum covered aspects of the Internet and network communication including the physical and data link layers of the Open System Interconnect (OSI) protocol stack, and standardized protocols for communicating across a variety of

physical media such as cable systems, telephone lines, wireless, and high-speed Local Area Networks (LANs). The courses I have taught also cover most major topics in Internet communication, including data communication, multimedia encoding, and mobile application design. My research and courses have covered a range of physical infrastructures for delivering content over networks, including cable, Integrated Services Digital Network (ISDN), Ethernet, Asynchronous Transfer Mode (ATM), fiber, and Digital Subscriber Line (DSL). For a complete list of courses I have taught, see my curriculum vitae (EX1011).

22. I co-founded a technology company called Santa Barbara Labs that was working under a sub-contract from the U.S. Air Force to develop very accurate emulation systems for the military's next generation internetwork. Santa Barbara Labs' focus was in developing an emulation platform to test the performance characteristics of the network architecture in the variety of environments in which it was expected to operate, and, in particular, for network services including IPv6, multicast, Quality of Service (QoS), satellite-based communication, and security. Applications for this emulation program included communication of a variety of multimedia-based services, including video conferencing and video-on-demand.

23. In addition to having co-founded a technology company myself, I have worked for, consulted with, and collaborated with companies for nearly 30 years. These companies range from well-established companies to start-ups and include

IBM, Hitachi Telecom, Turner Broadcasting System (TBS), Bell South, Digital Fountain, RealNetworks, Intel Research, Cisco Systems, and Lockheed Martin.

24. Through my graduate education, leadership with CITS, involvement in TMP, role in the development of the Internet2 infrastructure, and consulting with ISPs, I have gained a strong understanding in the role of the Internet in our society and the challenges of deploying large-scale production networking infrastructure. CITS, since its inception, has looked at the role of the Internet in society, including how the evolution of technology has created communication opportunities and challenges, including, for example, through disruptive technologies like P2P. TMP looks to focus on non-purely technical issues, including, for example, state-of-the-art business methods, strategies for successful technology commercialization, new venture creation, and best practices for fostering innovation. Through my industry collaborations and Internet2 work, I have developed significant experience in the challenges of deploying, monitoring, managing, and scaling communication infrastructure to support evolving Internet services like streaming media, conferencing, content exchange, social networking, and e-commerce.

25. Additional details about my employment history, fields of expertise, and publications are further included in my CV (EX1011).

3. Other Relevant Qualifications

26. I am a Member of the Association of Computing Machinery (ACM) and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).

27. As an important component of my research program, I have been involved in the development of academic research into available technology in the market place. One aspect of this work is my involvement in the Internet Engineering Task Force (IETF). The IETF is a large and open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. I have been involved in various IETF groups including many content delivery-related working groups like the Audio Video Transport (AVT) group, the MBone Deployment (MBONED) group, Source Specific Multicast (SSM) group, the Inter-Domain Multicast Routing (IDMR) group, the Reliable Multicast Transport (RMT) group, the Protocol Independent Multicast (PIM) group, etc. I have also served as a member of the Multicast Directorate (MADDOGS), which oversaw the standardization of all things related to multicast in the IETF. Finally, I was the Chair of the Internet2 Multicast Working Group for seven years.

28. I am an author or co-author of approximately 200 technical papers, published software systems, IETF Internet Drafts and IETF Request for Comments (RFCs). A complete list of my publications is in my CV (EX1011).

29. I have been awarded numerous teaching awards, including Computer Science Outstanding Faculty Member (1997-98, 1998-99, 1999-2000, 2004-06, UCSB Spotlight on Excellence Award (2000-01), and UCSB Academic Senate Distinguished Teaching Award (2006-07).

B. Previous Expert Witness Testimony

30. The list of recent matters in which I have testified can be found at the end of EX1011.

C. Preparation for this Declaration

31. In forming my opinions, I have considered the '198 patent specification, including the Abstract, the figures, and the claim language itself, as would have been understood by a person of ordinary skill in the art as of the priority date of the '198 patent (a "POSITA"). My understanding of "POSITA" and "priority date" are set forth below. I have also reviewed the file history of the '198 patent, the Exhibits that are listed in the list of Exhibits, and any other material cited in this declaration.

32. In forming my opinions, I have relied on my personal knowledge and professional experience, and on the documents and information referenced in this declaration.

33. This declaration explains, based on facts and information available to me to date, the subject matter and opinions related to this Proceeding. As such, I am

prepared to provide expert testimony regarding opinions formed resulting from my analysis of the issues considered in this declaration if asked about those issues by the Board or by the private parties' attorneys.

34. Additionally, I may discuss my own work, teachings, and knowledge of the state of the art in the relevant time period. I may rely on handbooks, textbooks, technical literature, and the like to demonstrate the state of the art in the relevant period and the evolution of relevant technologies.

35. Throughout this declaration, I refer to specific pages of the '198 patent and other documents. The citations are intended to be exemplary and are not intended to convey that the citations are the only source of evidence to support the propositions for which they are cited.

36. I am being compensated for my time spent on this matter at a rate of $850 per hour, and my compensation is in no way contingent upon the outcome of this matter or on the opinions I offer. All of the opinions expressed in this declaration are my own.

II. Legal Understanding

37. In this section, I describe my understanding of certain legal standards that I have relied upon in forming my opinions set forth in this declaration. I have been informed of these legal standards by Petitioner's attorneys. I am not an attorney,

and I have not thoroughly researched the law on patent invalidity. I am relying only on instructions from Petitioner's attorneys for these legal standards.

A. Claim Construction

38. I have been instructed by counsel that claim construction is a matter of law. I understand that in a post grant review, claims are construed using the same claim construction standard that would be used to construe the claim in a civil action, namely according to their plain and ordinary meaning to a POSITA.

39. I understand that a patent may include two types of claims, independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend on an independent claim or another dependent claim. I understand that a dependent claim includes all the limitations that it recites in addition to the limitations recited in the claim from which it depends.

B. Anticipation

40. I understand that a patent claim is anticipated when a single piece of prior art describes every element of the claimed invention, either expressly or inherently, arranged in the same way as in the claim. For inherent anticipation to be found, it is required that the missing descriptive material is necessarily present in the prior art. I understand that, for the purpose of a post grant review, prior art that

anticipates a claim can include both patents and printed publications from anywhere in the world.

C. Obviousness

41. I understand that a patent claim is unpatentable and invalid if the subject matter of the claim as a whole would have been obvious to a POSITA as of the time of the invention at issue. My understanding of a POSITA is set forth below. I understand that the following factors must be evaluated to determine whether the claimed subject matter is obvious: (1) the scope and content of the prior art; (2) the difference or differences, if any, between each claim of the patent and the prior art; and (3) the level of ordinary skill in the art at the time the patent was filed. Unlike anticipation, which allows consideration of only one item of prior art, I understand that obviousness may be shown by considering more than one item of prior art. Moreover, I have been informed and I understand that the so-called objective indicia of non-obviousness, also known as "secondary considerations," are also to be considered when assessing obviousness. These include: (1) commercial success; (2) long-felt but unresolved needs; (3) copying of the invention by others in the field; (4) initial expressions of disbelief by experts in the field; (5) failure of others to solve the problem that the inventor solved; and (6) unexpected results. I also understand that evidence of objective indicia of non-obviousness must be commensurate in scope with the claimed subject matter.

42. At this time, I am not aware of any evidence of secondary considerations of non-obviousness, have not seen anything identified by the Patent Owner, and do not think anything would overcome the strong showing of obviousness, but I reserve the right to respond if Patent Owner presents evidence or argument of secondary considerations of non-obviousness.

D. Patent-Eligibility

43. I have been informed that a claimed invention must satisfy 35 U.S.C. § 101, which requires the claimed subject matter be a "new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." I have also been informed that there are three exceptions to patent-eligible subject matter under 35 U.S.C. § 101: laws of nature, physical phenomena and abstract ideas. These exceptions are not patent-eligible subject matter.

44. I understand a two-step approach can be used to resolve questions relating to patent-eligible subject matter. The first step is to determine whether the claim at issue is directed to a "patent-ineligible concept" like an abstract idea. If it is, the second step is to identify "what else" is claimed so as to determine whether the claim amounts to "significantly more" than the abstract idea. If a claim does not recite "significantly more" than an abstract idea, it is invalid under Section 101.

45. I understand that the abstract ideas category of patent-ineligible subject matter is grounded in the longstanding rule that an idea of itself is not patentable. I also understand that an abstract idea is one that has no reference to material objects or specific examples—i.e., it is not concrete.

46. I further understand that the addition of general data processing functions and other functions that are well-understood, routine, conventional activities previously known in the industry are not enough to transform an abstract idea into a patentable invention.

47. I further understand that considerations analogous to those of anticipation and obviousness can be helpful to determine the boundary between abstraction and patent-eligible subject matter.

E. Written Description

48. It is my understanding that a patent must contain a written description of the claimed invention that clearly conveys to those skilled in the art that, as of the filing date sought, that the applicant was in possession of the invention claimed. I understand that a claim is invalid if the patent does not contain this written description. I understand that a patent claim is entitled to the date an earlier-filed patent application only if that earlier-filed application provides sufficient written description for that claim. I further understand that when analyzing whether a patent meets the written description requirement, one cannot "bootstrap" the knowledge of

one of skill in the art into the analysis and must look only to the "four corners" of the patent application.

F. Indefiniteness

49. I understand that a claim must, when read considering the patent's specification and the prosecution history, inform a person of ordinary skill in the art about the scope of the invention with reasonable certainty. I understand that claims must particularly point out and distinctly claim the subject matter that the patentee regards as his or her invention. I understand that a claim is indefinite when, considering the specification and the prosecution history, the claim fails to inform, with reasonable certainty, those skilled in the art about the scope of the claimed invention.

III. The '198 patent

50. The '198 patent is titled "Method and Apparatus for Processing Bandwidth Intensive Data Streams Using Virtual Media Access Control and Physical Layers."

51. The '198 patent lists inventor Sal C. Manapragada.

52. The '198 patent was filed as U.S. Patent Application No. 18/819,635 on August 29, 2024, and issued on January 7, 2025.

A. Priority Date

53. The ’198 patent claims priority to U.S. Prov. Patent Application Nos. 61/897,216 and 61/897,219, both of which were filed on October 30, 2013.

B. Specification

54. The ’198 patent relates to evaluating the wireless bandwidth requirements of applications and the wireless bandwidth availabilities of wireless transceiver resources, and allocating bandwidth of the wireless transceivers to satisfy the bandwidth requirements of the applications. EX1001 at Abstract.

55. The architecture “includes an application layer, actual MAC and PHY layers, and a processing layer between the actual MAC and PHY layers.” *Id.* at 2:67-3:2. The processing layer may comprise “virtual MAC and PHY layers” that “enable simultaneous allocation of multiple PHY resources for different signal types associated with different applications.” *Id.* at 3:62-64.

56. In one embodiment, a wireless networking system is shown in an abstract “layer” context, described in Figure 1 below. (*Id.* at 3:25-27).

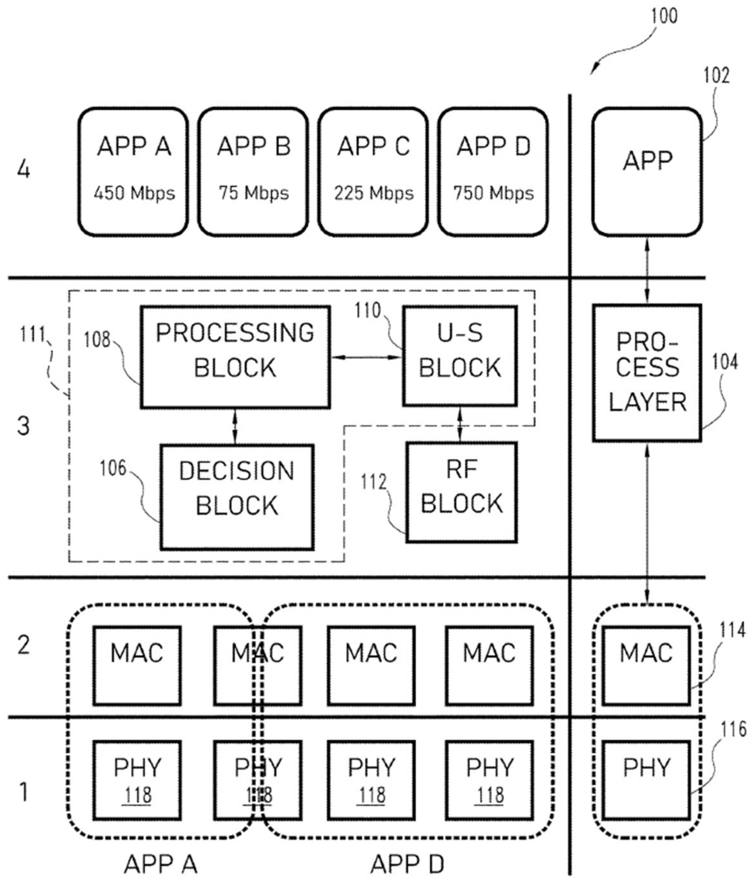


Fig. 1

57. The application layer 102 cooperates with a process layer at 104, which "determines available resources in the actual MAC and PHY layers 114 and 116" and "allocates the available resources to satisfy the bandwidth demands" of the various applications. (*Id.* at 4:34-39).

58. Also illustrative is the embodiment of Figure 6, which demonstrates how the virtual MAC and PHY layers enable the wireless networking device to configure the resources of two separate transceivers to each handle the bandwidth requirement of a respective application. (*Id.* at 5:58-6:3).

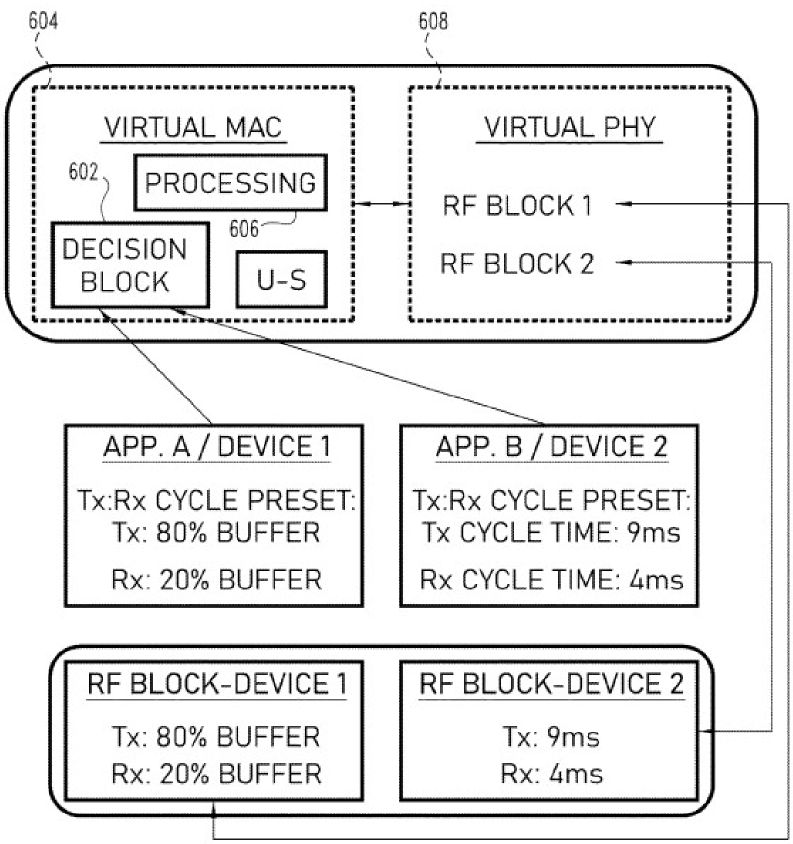


Fig. 6

C. Prosecution History

59. Based on my review of the prosecution history, it is my understanding that The ’198 patent was filed on August 29, 2024 as application 18/819,635, which was a continuation of application 18/787,267 now U.S. Patent 12,169,756 (“’756 patent”). The applicant’s Track One request was granted on September 30, 2024. The Examiner issued a non-final rejection on October 21, 2024, citing indefiniteness of originally drafted claim 24 for lack of antecedent basis for the limitation “the type of information,” and explaining the claim would be allowable if rewritten to address

the lack of antecedent basis. The applicant then rewrote claim 24 to refer to "a signal type associated with" rather than "the type of information carried by." The Examiner issued a notice of allowance on November 21, 2024. A certificate of correction was filed on February 11, 2025. (EX1004.)

D. Level of Ordinary Skill in the Art

60. I understand that a person of ordinary skill in the art ("POSITA") is a hypothetical person who is presumed to be aware of all pertinent art, thinks along conventional wisdom in the art, and is a person of ordinary creativity—not an automaton. In deciding the level of ordinary skill, I understand that the following factors may be considered:

- The levels of education and experience of persons working in the field;
- The types of problems encountered in the field; and
- The sophistication of the technology.

61. I understand that asserted claims must be evaluated from the perspective of a POSITA. I understand that the relevant point in time for determining the qualifications of a person of ordinary skill in the state-of-the-art is the time of the alleged invention, which I assume to be the earliest effective filing date for the patent. Here, I understand that the earliest alleged priority date is October 30, 2013.

62. In my opinion, a person of ordinary skill in the art at the time of the '198 patent ("POSITA") had at least a Bachelor of Science in electrical engineering,

computer engineering, or similar fields and at least two years of practical experience in the field of computer networks and wireless communication applications. More education can supplement for less practical experience, and vice versa.

63. I meet these criteria now and met them at the time of the alleged invention. I have applied this level of skill in my analysis. My opinions would not change if a slightly higher or lower level of ordinary skill applied.

E. Claim Construction

64. I have been instructed by Petitioner to perform my technical analysis of the disclosures of the prior art by applying the plain and ordinary meaning of all claim terms, as understood by a POSITA in view of the specification and prosecution history.

65. I reserve the right to provide additional opinions concerning claim construction or the application of certain claim constructions to the prior art, as appropriate, and to respond to any particular claim construction-related argument advanced by PO and/or its expert.

66. As described in more detail in the remainder of this declaration, the prior art discloses or renders obvious the challenged claims under any reasonable potential claim interpretation.

F. Challenged Claims

67. I understand that claims 1-30 are at issue in Petitioner's petition for post grant review. They are reproduced below for reference.

Claims 1-30	
No.	**Claim Limitation**
1[pre]	A method for improving the operation of circuitry that is adapted to be used in a wireless networking device, the method comprising the steps of:
1[a]	providing a processing interface configured to, during use of the wireless networking device, interact with an application providing a data stream and having a wireless bandwidth requirement;
1[b]	connecting first and second actual MAC interfaces to the processing interface;
1[c]	respectively connecting first and second actual PHY interfaces to the first and second actual MAC interfaces;
1[d]	respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein the first and second wireless transceivers (i) are suitable for use in a wireless local area network, (ii) respectively have first and second bandwidth availabilities up to first and second actual bandwidths, and (iii) are adapted to respectively emit radio waves in first and second different bands of frequencies; and
1[e]	wherein the processing interface comprises, at least one virtual MAC interface, at least one resource monitoring interface that, after the circuitry has been connected to the wireless networking device and during operation of the wireless networking device, provides information regarding the first and second bandwidth availabilities to the virtual MAC interface, and
1[f]	the virtual MAC interface being configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,
1[g]	(i) request or create a first association between a recipient and the first actual MAC and PHY interfaces and a second association between the recipient and the second actual MAC and PHY interfaces, and
1[h]	(ii) use the information provided to it by the resource monitoring interface to make allocation decisions with respect to first and second

	bandwidth availabilities to at least partially satisfy the bandwidth requirement of the data stream.
2	The method of claim 1, wherein the first frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.
3	The method of claim 1, wherein the second frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.
4	The method of claim 1, wherein the at least one virtual MAC interface includes a decision block.
5	The method of claim 1, wherein the at least one virtual MAC interface includes a processing block.
6	The method of claim 1, wherein the at least one virtual MAC interface includes an ultra-streaming block.
7	The method of claim 1, wherein the resource monitoring interface comprises at least one RF block.
8	The method of claim 1, wherein the resource monitoring interface comprises multiple RF blocks.
9	The method of claim 1, wherein the resource monitoring interface is configured to, during use of the wireless networking device, process the data stream before it is sent to any actual MAC interface.
10	The method of claim 1, wherein the processing interface comprises multiple resource monitoring interfaces.
11	The method of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.
12	The method of claim 1, wherein the processing interface comprises a bandwidth allocator.
13	The method of claim 1, wherein the resource monitoring interface is not contiguous with the virtual MAC interface.
14	The method of claim 1, wherein the wireless networking device comprises a wireless access point.
15	The method of claim 1, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual PHY interfaces.
16	The method of claim 1, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received

	by the resource monitoring interface directly from at least one of the first and second actual MAC interfaces.
17	The method of claim 1, wherein the allocation decisions involve use of at least some of the first and second bandwidth availabilities.
18[a]	The method of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used and in a manner transparent to any layer of the wireless networking device above the processing interface,
18[b]	(i) identify at least one portion of the actual bandwidth of one of the first and second wireless transceivers, the identified bandwidth portion comprising a set of given resources, and
18[c]	(ii) transmit the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable to thereby at least partially satisfy the bandwidth requirement.
19[a]	The method of claim 18, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,
19[b]	(i) evaluate at least one data transfer characteristic of a first identified bandwidth portion of each of the first and second wireless transceivers, and
19[c]	(ii) transmit the data stream to the recipient using the first identified bandwidth portion of either the first or second wireless transceiver based upon a comparison of the evaluated data transfer characteristics.
20	The method of claim 19, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability.
21	The method of claim 20, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability and received signal strength of at least one communication from the recipient.
22	The method of claim 18, wherein the first identified bandwidth portion of the first wireless transceiver comprises two non-contiguous portions of the bandwidth of the first wireless transceiver.
23	The method of claim 22, wherein the first identified bandwidth portion of the second wireless transceiver comprises two non-contiguous portions of the bandwidth of the second wireless transceiver.

24	The method of claim 18, wherein the allocation decisions are based at least upon a signal type associated with the data stream.
25	The method of claim 18, wherein the processing interface is configured to, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate a first identified bandwidth portion of the first wireless transceiver with a first identified portion of the second wireless transceiver to at least partially satisfy the bandwidth requirement of the application.
26	The method of claim 18, wherein the processing interface is configured to, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface, transmit the data stream to the recipient using the first wireless transceiver and to receive a second data stream that is transmitted from the recipient using the second transceiver.
27	The method of claim 26, wherein the transmission of the data stream from the first wireless transceiver is at least partially simultaneous with the reception of the second data stream by the second wireless transceiver.
28	The method of claim 27, wherein the transmission of the data stream from the first wireless transceiver is simultaneous with the reception of the second data stream by the second wireless transceiver.
29	The method of claim 27, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the first wireless transceiver to transmit the data stream to the recipient.
30	The method of claim 27, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the second wireless transceiver to receive the second data stream from the recipient.

IV. State of the Art

68. As the ’198 patent recognizes, various signal protocols for transmitting and receiving data existed well before its priority date. (EX1001 at 4:1-11). In fact, prior to the ’198 patent priority date, developments in networking protocols had given rise to each of the concepts covered by the asserted claims.

69. For example, the foundational principles of Multiple-Input Multiple-Output (MIMO) technology were well-established in the 1990s, centering on the use of multiple antennas to exploit multipath propagation. Instead of treating multiple signal paths as interference, MIMO leverages them to improve data throughput and link reliability. The two primary techniques that defined this capability were spatial multiplexing and spatial diversity. Spatial multiplexing, in particular, was a significant development as it allowed for the transmission of multiple, independent data streams over a single radio frequency channel. This concept was extensively detailed in foundational works of the period, including U.S. Patent No. 5,345,599 (“Paulraj”, EX1014) and a 1996 paper from Bell Labs by Gerard J. Foschini, which described a “Layered Space-Time Architecture” for achieving linear increases in data rates by adding antennas (Foschini, *Bell Labs Technical Journal*, 1(2), at 41-59, EX1015).

70. The subsequent formalization of these long-standing MIMO principles into industry standards serves as clear evidence of their maturity and status as

established art. The development of the IEEE 802.11n standard, initiated in the early 2000s, was not based on the invention of new MIMO concepts, but rather on the codification of the well-understood techniques from the previous decade. The standard's primary purpose was to leverage the known benefits of spatial multiplexing and related space-time coding schemes to achieve the significant leap in Wi-Fi data rates that the market was demanding. The integration of these established MIMO techniques into a major interoperability standard like IEEE 802.11n confirms that the technology's fundamental aspects were considered thoroughly vetted and were already part of the existing body of technical knowledge.

71. Concepts of link and bandwidth aggregation similarly predated the '198 patent. As taught by WO 2013/126859A2 ("Chincholi"), a unique control layer, referred to as an "Opportunistic Multiple-Medium Access Control (OMMA) Aggregation" sits below the device's IP layer but above the individual network technology stacks. (EX1005 at [0003]). This layer makes intelligent decisions about how to route and potentially split IP packet traffic across the available networks. *Id.* at [0004]-[0007]. It operates by monitoring the estimated data arrival rate for each network interface and sending packets over a specific network when a corresponding variable, which increments with data arrival, exceeds a set threshold. *Id.* This allows the system to aggregate bandwidth and make efficient use of multiple network connections based on real-time conditions and feedback.

72. Concepts of addressing carrier-specific interference in bandwidth channels also existed during this timeframe. U.S. Patent 9,055,592 ("Clegg") discloses an IEEE 802.11 system designed for carrier specific interference mitigation. Clegg's technique "utilize[s] carriers across multiple sub-channels, even across disjointed bands (e.g., 2.4 GHz, 5 GHz, and or 60 GHz bands), without regard to whether those carriers are within an otherwise unavailable sub-channel." (EX1009 at 1:32-37). This allows an 802.11 device to "fully utilize the available spectrum." (EX1009 at 1:32).

73. Additionally, work was being done to enable full-duplex single channel (FDSC) communication and managing the interference caused by a device transmitting and receiving on the same frequency simultaneously. For example, U.S. Patent 10,567,147 ("DiFazio") describes a system designed to support a mix of devices, including a "first wireless transmit/receive unit (WTRU) configured for FDSC communication" and a "second WTRU configured for half-duplex (HD) communication," managing them on a single channel by allocating appropriate timeslots (EX1010 at 2:33-54). DiFazio offers a robust, multi-layered approach, noting that the system may have "at least three levels of interference . . . suppression," which it specifies as "antenna, analog, and/or digital." *Id.* at 30:39-43. To achieve this, the system's suppression algorithms are initially set using "preconfigured data" that can be "read from memory when the device may be

powered-on." *Id.* at 31:1-7. This provides a starting point that aides or speeds convergence to a more optimal state, which is then refined as the "algorithms operate" to adapt to changing conditions and achieve a much higher degree of interference suppression. *Id.* at 31:8-13.

74. Further, in the field of 802.11 systems, each associated terminal is assigned a unique association identifier ("AID"), and it was well-known that avoiding disassociation after initial association was desirable, as repeatedly re-forming associations was inefficient and disruptive. For example, U.S. Patent 9,379,868 ("Wang"), describing how an AP operating device must dissociate a non-AP device with undesirable AID and re-associate it with more desirable AID, states that such an approach is "undesirable, can be blunt and can disrupt the on-going services (e.g., requires disassociation)." EX1008 at 24:42-43; *see also id.* at 24:57-62 ("The lack of update/change of the AID values . . . after an initial AID assignment is inherently inflexible and can prevent the realization power saving, among other considerations, that an update/change of the AID values can provide.") Indeed, recognizing this issue, Wang describes techniques in a multiple transceiver/MIMO system for effectuating an update to a recipient's unique association identifier ("AID") through various interactions with the system without requiring a disassociation of a wireless device from an access point. (EX1008 at 24:63-25:57).

75. Monitoring of bandwidth availability in order to dynamically switch different frequency sub-bands was also known. U.S. Patent No. 7,206,840 ("Choi") (EX1016) discloses a dynamic frequency selection scheme for 802.11 Wi-Fi networks. Choi's method involves "measuring the channel quality of a plurality of frequency channels by at least one of the plurality of STAs; reporting the quality of the plurality of frequency channels in terms of a received signal strength indication (RSSI), Clear Channel Assessment (CCA) busy periods and periodicity; and, selecting one of the candidate channels based on the channel quality report for use in communication between the AP and the plurality of STAs." (EX1016, Abstract.)

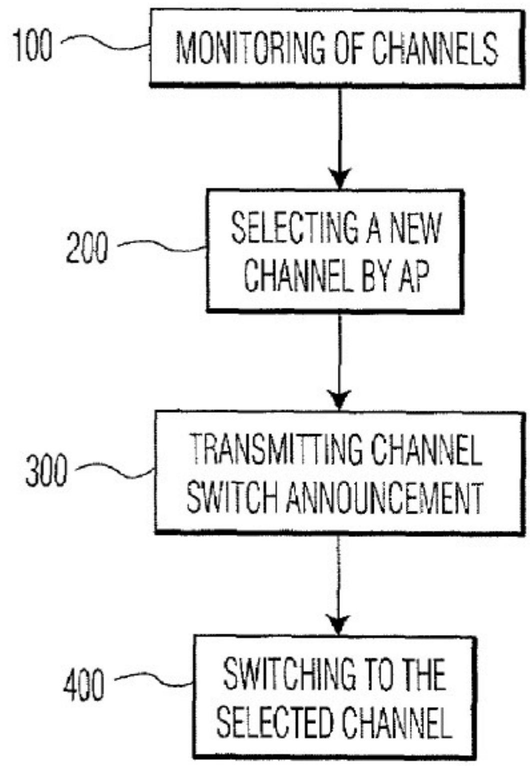


FIG. 3

76. Further, Choi explains the selecting one of the candidate channels based on the channel quality report involves a determination that the selected channel will have the least RSSRI or CCA value. EX1016, 8:19-20, Figure 7:

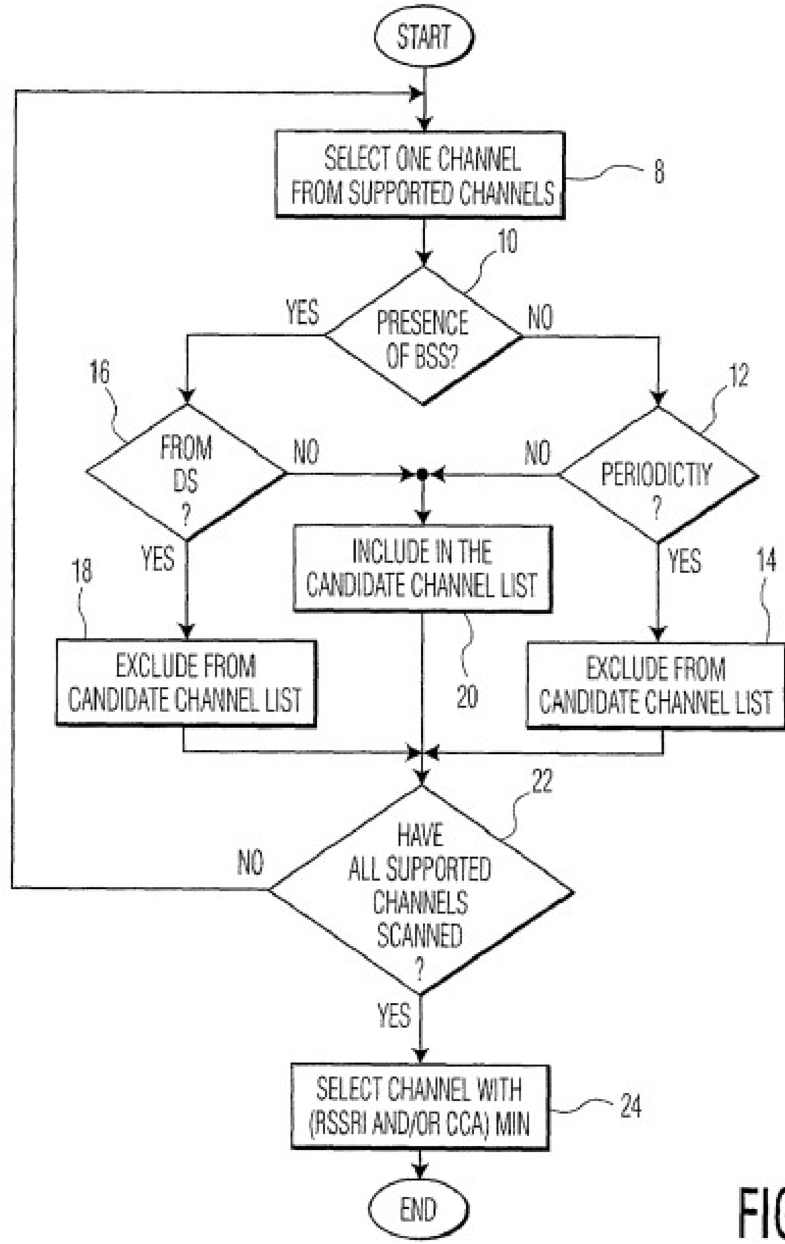


FIG. 7

V. Grounds

Ground	Claims	Grounds
1	1–30	§103: Obvious In View Of WO 2013/126859 ("Chincholi") in combination with US 9,055,592 ("Clegg")
2	1–30	§101: Patent-ineligible
3	1–30	§112 ¶1: Inadequate Written Description

4	1–30	§112 ¶2: Indefiniteness

VI. Ground 1: Chincholi in Combination With Clegg Renders Claims 1-30 Obvious

A. Overview and Motivation to Combine

77. In my opinion, Chincholi in combination with Clegg renders claims 1-30 obvious. As discussed in more detail below, Chincholi teaches the same architecture as the ’198 patent, including a wireless networking device with multiple transceivers, each having actual MAC and PHY interfaces. Chincholi uses a single "***Opportunistic Multiple-Medium Access Control (MAC) Aggregation layer***," positioned above the actual MAC-PHY layers of each transceiver, to aggregate available bandwidth portions to efficiently meet the requirements of data streams from one or more applications. (EX1005 ¶[0122-0123].)

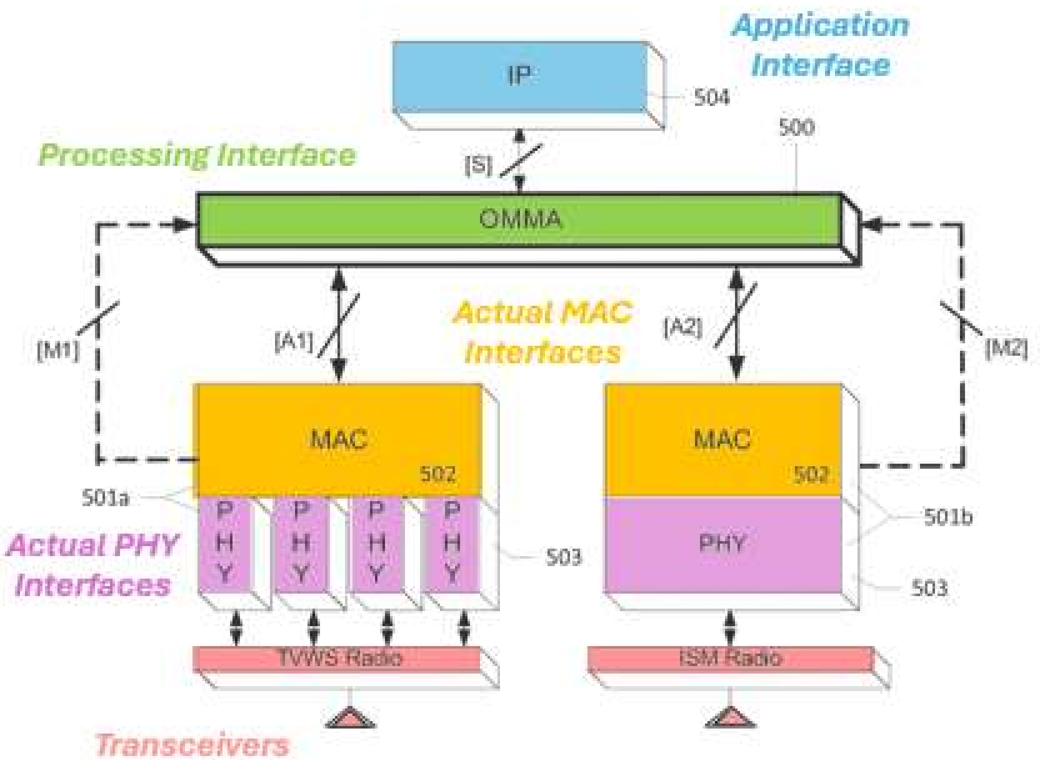


FIG. 5

78. Chincholi teaches continuous monitoring of the "number of available resources on the medium" and techniques for distributing IP packets across the RATs accordingly. (EX1005 ¶[0161].) Chincholi's approach enables the system to respond to bandwidth channels, or portions of bandwidth channels, becoming unavailable during transmission of a data stream. A POSITA would have understood that Chincholi's monitoring and response techniques could be further enhanced by the teachings of Clegg. Clegg teaches techniques for addressing carrier-specific interference within bandwidth channels, allowing for any given channel full usage of the channel bandwidth that is not unavailable for

communication. Like Chincholi, Clegg arises in the field 802.11 wireless communication networks and is addressed to increasing bandwidth efficiency. (EX1009 at 1:25-37.)

79. A POSITA would have been motivated to incorporate the teachings of Clegg to improve the Chincholi system by allowing it to more flexibly and efficiently utilize available bandwidth channels that may experience carrier-specific interference within the channels. Chincholi already teaches dynamic allocation of contiguous or non-contiguous channels, and Clegg merely provides additional detail on how to mitigate carrier-specific interference within any given channel. The teachings of Clegg are complementary to Chincholi, and a POSITA would have recognized that Clegg's teachings could be easily implemented into Chincholi without technical challenge.

80. In my analysis below, the combined prior art system will be referred to as Chincholi/Clegg.

B. Limitation-By-Limitation Analysis

1. Claim 1

(a) 1[pre]: A method for improving the operation of circuitry that is adapted to be used in a wireless networking device, the method comprising the steps of:

81. In my opinion, Chincholi/Clegg discloses "[s]ystems, methods, and instrumentalities . . . for managing multiple radio access technology (RAT) interfaces" (EX1005, Abstract; [0003]) and "enabl[ing] opportunistic RAT selection and aggregation for sending data traffic over the RAT interfaces." (EX1005 ¶[0003].) "In multi-RAT systems reception and/or transmission may be performed over multiple RATs. For example, ***a network terminal (NT)*** (e.g., an ***access point (AP)*** . . .) and ***a wireless transmit/receive unit (WTRU)*** . . . may communicate over multiple parallel paths." (EX1005 ¶[0002].)

82. Chincholi discloses that a network terminal ("NT"), such as an access point, or a wireless transmit/receive unit ("WTRU") "may be configured to work in an infrastructure mode or an adhoc mode, for example, in an IEEE802.11 based Wi-Fi system," *i.e.*, both are a ***wireless networking device***. (EX1005 ¶[0115].) Thus, as discussed in the below limitations, Chincholi/Clegg discloses a method for improving the operation of circuitry that is adapted to be used in a wireless networking device.

(b) 1[a]: providing a processing interface configured to, during use of the wireless networking device, interact with an application providing a data stream and having a wireless bandwidth requirement;

83. In my opinion, Chincholi/Clegg discloses this limitation.

84. ***"an application providing a data stream":*** Chincholi discloses that "[u]sing multiple RATs simultaneously may provide the benefit of increased bandwidth for an ***application*** (*e.g.*, an IP flow) as well as increased reliability." (EX1005 ¶[0191]) The data stream of the application is referred to as an "IP flow." (EX1005 ¶[0132] ("***A single IP flow may refer to a stream of IP packets belong to a particular application***.").) In an 802.11 embodiment (Figure 5), IP packets associated with an application data stream come from or are destined to an IP layer 504, and thus the IP flow (*i.e.* ***data stream***) is provided by the application ***when the wireless networking device is being used***. (EX1005 ¶[0138]], Table 1 ("S" interface is for "Incoming/Outgoing IP Packets").) The "[S]" interface from the IP layer for the IP stream is therefore an ***application interface associated with an application.***

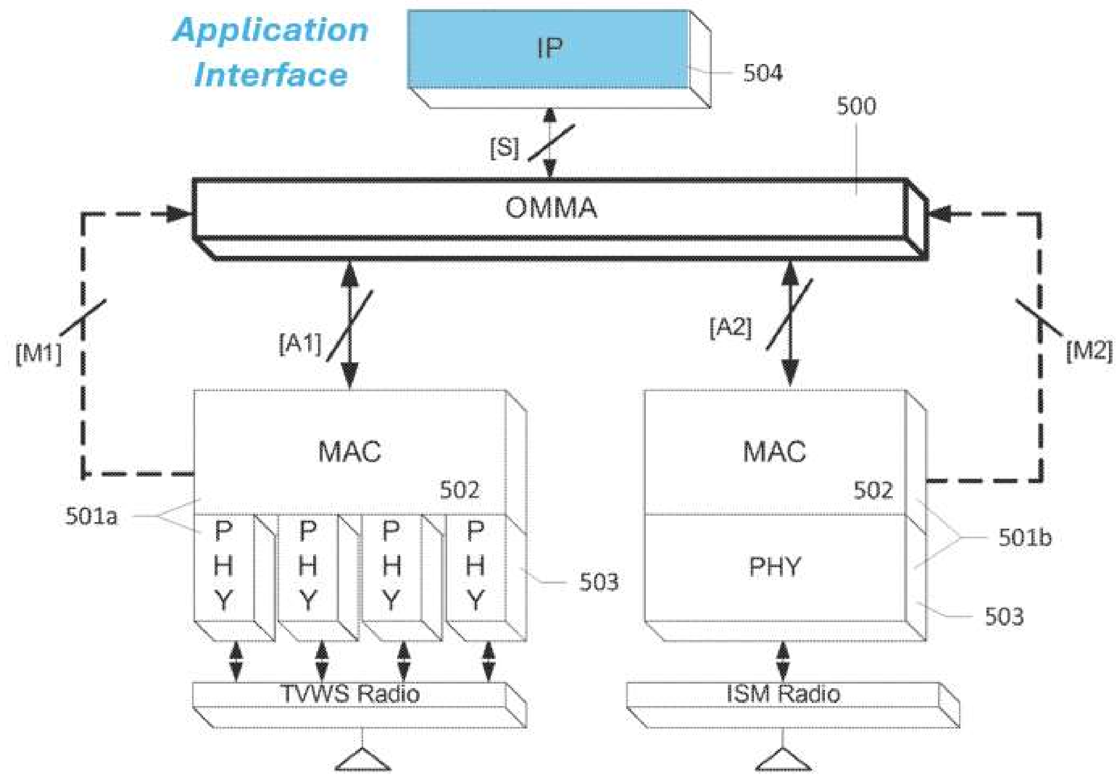


FIG. 5

85. ***"a processing interface configured to… interact with an application":*** Chincholi further discloses that its "application" is connected to a "processing interface." Chincholi's ***processing interface*** is referred to as an "***Opportunistic Multiple-Medium Access Control (MAC) Aggregation (OMMA) layer***." (EX1005 ¶[0003].) A POSITA would have understood that the plain meanings of "interface" and "layer" in the context of the '198 patent are congruent, which is underscored by the specification describing layers having the same functionality as the claimed interfaces, and the prosecution history of the predecessor '591 patent, where Applicant interchangeably used the terms "layer" and "interface" to describe Figure

1. (EX1017, 8/8/23 Response to Non-Final Office Action). The OMMA layer is a common layer/module between the IP layer/module and the multiple RAT layers/modules. (EX1005 ¶[0137]; *see also id.* ¶[0120] ("[T]he single thin software layer may enable one RAT to operate over industrial scientific medical (ISM) and another RAT to operate over a TVWS band for the same IP flow.").) An exemplary OMMA layer enabling a dual-RAT aggregation device in a 802.11n network is shown in Figure 5:

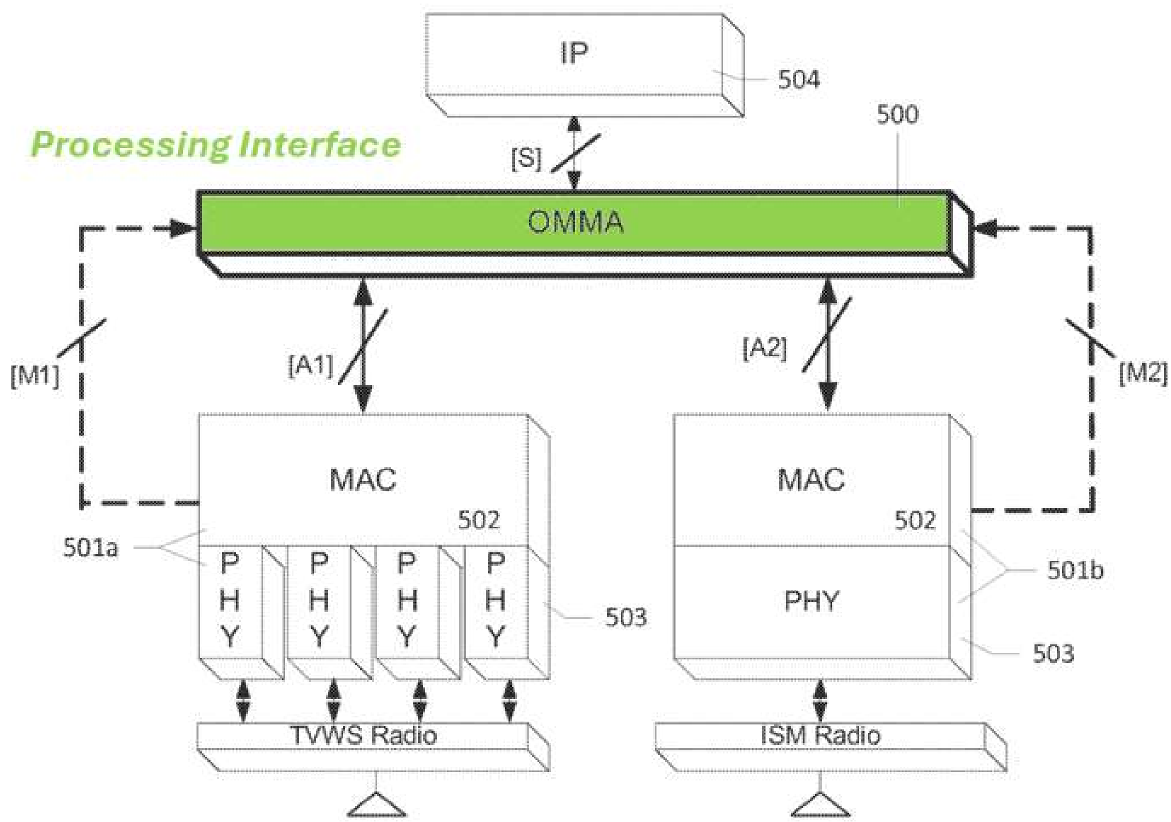


FIG. 5

86. The IP layer is connected to the OMMA layer and provides IP packets that the OMMA layer processes. (EX1005 ¶[0138]). The OMMA "may allow for enhanced throughput and reduced latency for a single IP flow." (EX1005 ¶[0120].) The OMMA layer is therefore a processing layer, which processes IP packets and provides an ***interface*** between the IP layer and actual MAC layers, *i.e.*, a ***processing interface***.

87. ***"application ... having a first wireless bandwidth requirement":*** Chincholi teaches "a bandwidth requirement for an IP flow." (EX1005 ¶[260])

(c) 1[b]: connecting first and second actual MAC interfaces to the processing interface;

88. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses first and second ***actual MAC interfaces*** connected to the processing interface (*i.e.*, the common OMMA layer). Figure 5, for example, depicts a "dual-RAT aggregation" with the common OMMA layer existing above and connected to two RATs 501a and 501b, which comprise first and second actual MAC interfaces 502, respectively. (EX1005 ¶[0138] ("***The RATs 501a, 501b may comprise a*** *MAC layer/module 502* and one or more physical layers/modules 503.").)

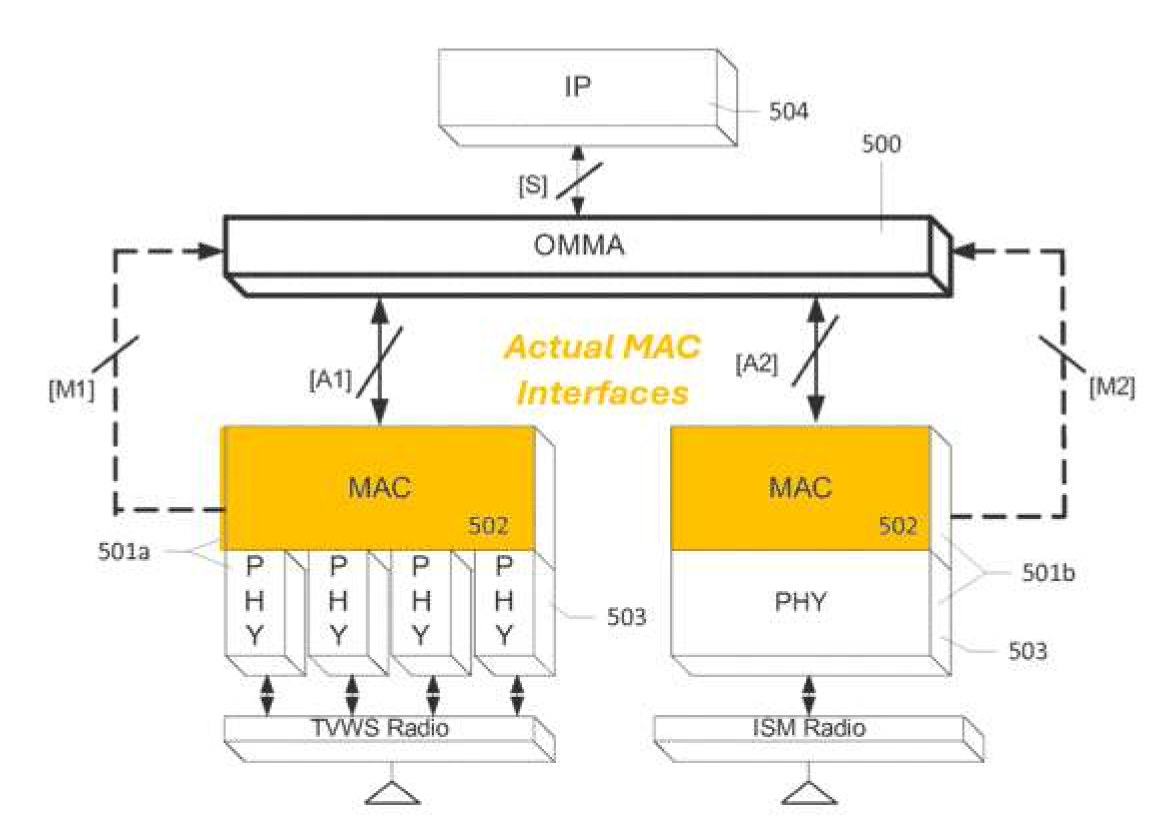


FIG. 5

(d) 1[c]: respectively connecting first and second actual PHY interfaces to the first and second actual MAC interfaces;

89. In my opinion, Chincholi/Clegg discloses this limitation. Each RAT in Chincholi comprises ***one or more physical layers***. (EX1005 ¶[0138] ("The RATs 501a, 501b may comprise a MAC layer/module 502 and ***one or more physical layers/modules 503***.").) The actual PHY layers are respectively connected to the actual MAC interfaces:

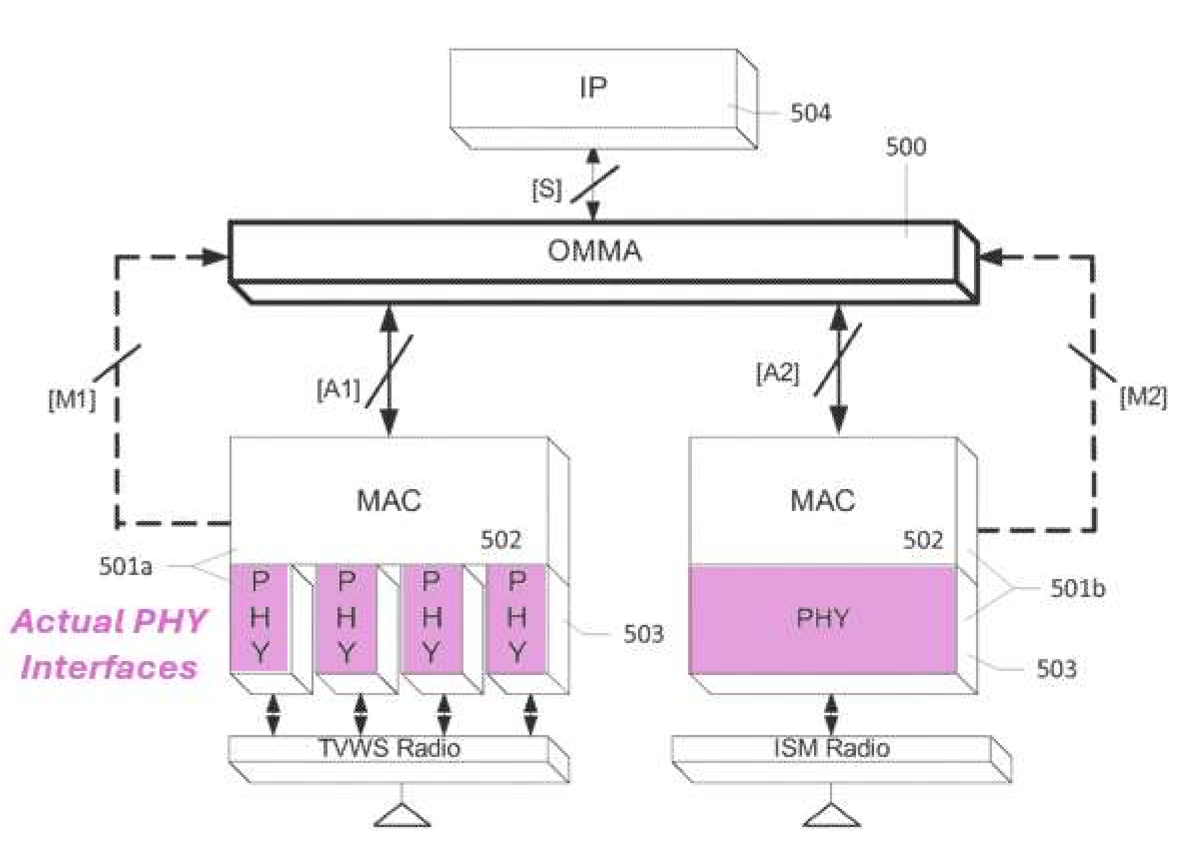


FIG. 5

(e) 1[d]: respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein the first and second wireless transceivers (i) are suitable for use in a wireless local area network, (ii) respectively have first and second bandwidth availabilities up to first and second actual bandwidths, and (iii) are adapted to respectively emit radio waves in first and second different bands of frequencies; and

90. In my opinion, Chincholi/Clegg discloses this limitation.

91. "***respectively associating first and second wireless transceivers with the first and second actual PHY interfaces… wherein the first and second wireless transceivers… are suitable for use in a wireless local area network***": Chincholi

Figure 5 illustrates that each actual PHY interface of each RAT is associated with an ***antenna/radio frequency (RF) front-end pair***. (EX1005 ¶[0133].) The ***antenna/radio frequency (RF) front-end pairs*** in Figure 5 include ***first and second transceivers.***

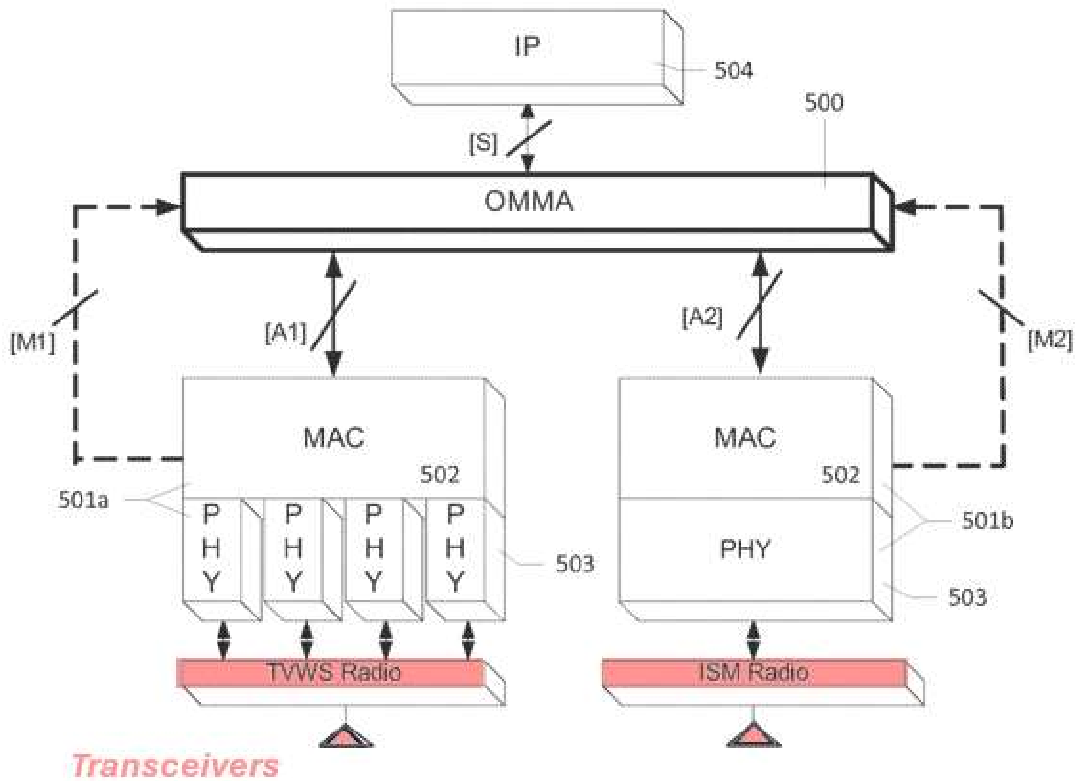


FIG. 5

A POSITA would have understood that a "transceiver" is a physical device that can both transmit and receive information. Thus, each of Chincholi's disclosed "antenna/RF front-end pairs" are a transceiver because they operate on wireless protocols that both transmit and receive data, such as IEEE802.11, IEEE802.11ac, IEEE802.11af, LTE, WCDMA, etc. (EX1005 ¶[0134].)

92. A POSITA would have further understood that the transceivers in Figure 5 would be associated with the actual PHY layer of each respective RAT, as the PHY layer is understood as the physical connection between a transceiver and the rest of the RAT.

93. Chincholi also teaches that each RAT may be implemented as a Wi-Fi RAT, and thus their associated transceivers are suitable for use in a wireless local area network. (EX1005 ¶[0134])

94. "***the first and second wireless transceivers… respectively have first and second bandwidth availabilities up to first and second actual bandwidths***": A POSITA would have recognized that each transceiver has an "actual" bandwidth (i.e., total bandwidth of the transceiver) with a "bandwidth availability" that may be a subset of the actual bandwidth (i.e., sub-portions of the total bandwidth that are available for use). Indeed, as Chincholi teaches, the RATs associated with each transceiver provide "meta-data feedback" allowing the OMMA layer to split IP packets amongst the RATs based on their available bandwidth. (EX1005 ¶[0138]; ¶[0161] (listing "Channel bandwidth(s)" sent by the PHY layer as an example of "feedback metric[] used by an OMMA layer"); see also id. ¶[0167] ("At startup, the OMMA layer may receive the ***available bandwidth of each of the one or more***

RATs.")).) Thus, Chincholi discloses that each of the two transceivers has a bandwidth availability up to an actual bandwidth.

95. ***"the first and second wireless transceivers… are adapted to respectively emit radio waves in first and second different bands of frequencies;":*** Chincholi discloses that each of the transceivers may be adapted to emit radio waves in respective different bands of frequencies. In the context of Figure 4, for example, Chincholi discloses that "[f]or multiple RATs 401, ***each RAT 401 may be operating on a specific band.*** For example, a 802.11n PHY/MAC operating over 2.4GHz ISM band, a 802.11af PHY/MAC operating over 512 MHz-698 MHz TVWS band, an LTE RAT operating of a licensed band (e.g., 700 MHz band), a Bluetooth RAT operating on 2.4 GHz ISM band, etc." (EX1005 ¶[0135].)

(f) 1[e]: wherein the processing interface comprises, at least one virtual MAC interface, at least one resource monitoring interface that, after the circuitry has been connected to the wireless networking device and during operation of the wireless networking device, provides information regarding the first and second bandwidth availabilities to the virtual MAC interface, and

96. In my opinion, Chincholi/Clegg discloses this limitation. According to the '198 patent, the virtual MAC layers "enable[s] simultaneous allocation of multiple PHY resources for different signal types associated with different applications." (EX1001 at 3:62-64.) The virtual MAC layer comprises the

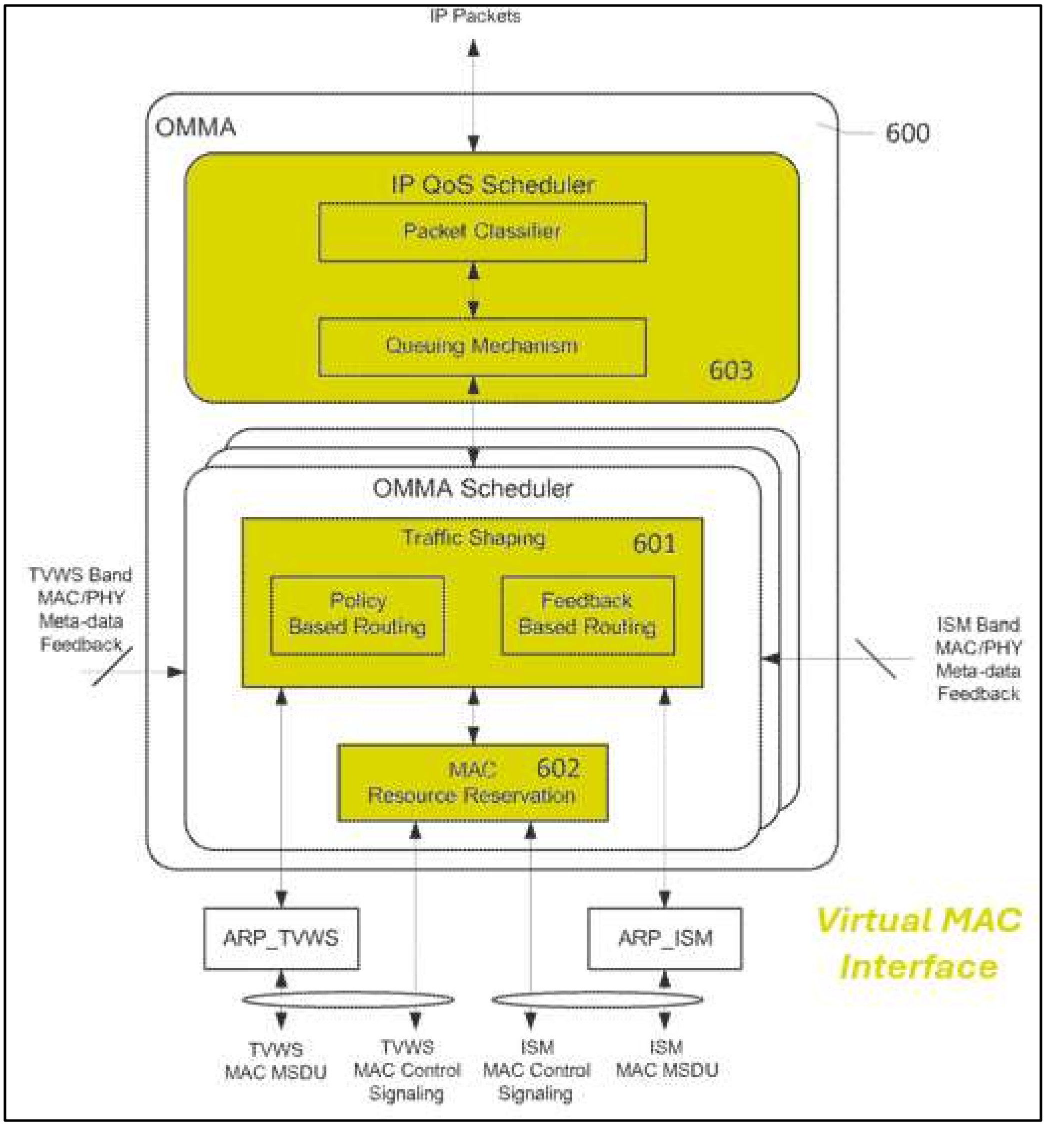
functionality of "decision," "processing," and "ultra streaming" blocks. (EX1001 at 4:59-61.)

97. The patent does not disclose or describe a generic "resource monitoring interface." However, the patent's description of the "virtual PHY layer" provides that a virtual PHY may include multiple RF blocks, each representing the virtual use of some set of allocated transceiver resources. (EX1001 at 4:62-64; *see also* Fig. 3 (depicting two RF blocks associated with "two sets" of transceiver resources).) "By employing a virtual MAC and virtual PHY between an application layer and an actual MAC and PHY layer, wireless transceiver resources may be allocated more efficiently to handle various data bandwidth requirements from different applications." (EX1001 at 6:14-18.)

98. *First*, Chincholi discloses that the OMMA (*i.e.*, the processing interface) includes the claimed "***virtual MAC interface***" formed within it. Indeed, "OMMA" is an abbreviation for "opportunistic multi-medium access control ***(MAC) aggregation***," which refers to the fact that the OMMA layer aggregates multiple MAC interfaces, as depicted in Figure 5. (EX1005 ¶[0120].) The OMMA layer includes an interface acting as a "virtual MAC interface" because it transparently "distributes and/or combines" packets between the IP layer and the RATs. (EX1005 ¶[0192].) A POSITA would have recognized that this "virtualizes" a MAC interface because the OMMA would effectively appear to the IP layer as a single interface for

exchanging packets that are ultimately sent or received by the actual MAC-PHY pairs.

99. Chincholi's OMMA layer also includes all of the functionality that the '198 patent associates with the "virtual MAC interface." Specifically, Figure 6 of Chincholi is a block diagram of an OMMA layer, comprising an IP QoS Scheduler 603, a MAC Resource Reservation module 602, and a Traffic Shaping Module 601. (EX1005 ¶[0139].)



100. The IP QoS Scheduler classifies incoming packets of a packet stream, and may segregate them into distinct IP QoS streams (EX1005 ¶[0143]), which a POSITA would have recognized to fulfill the functionality of the "decision block" (EX1001 at 3:41-44). The MAC Resource Reservation module determines the time duration or spectral fragment/bandwidth required by a packet or set of packets (EX1005 ¶[0142]), which a POSITA would have recognized to fulfill the

functionality of the "processing block" (EX1001 at 3:44-46). Finally, the Traffic Shaping module determines the way packets are routed across RATs using either policy based routing or feedback based routing (EX1005 ¶[0139]), which a POSITA would have recognized to fulfill the functionality of the "ultra-streaming block" (EX1001 at 3:46-50). Thus, a POSITA would have recognized that Chincholi's OMMA layer includes a "***virtual MAC interface***."

101. Second, Chincholi discloses that its processing interface comprises the "***at least one resource monitoring interface*** " that, after the circuitry has been connected to the wireless networking device and during operation, provides information regarding the first and second bandwidth availabilities to the virtual MAC interface. A POSITA would understand that the "resource monitoring interface formed in the processing interface" requires merely a component capable of receiving feedback statistics regarding the available resources of the wireless transceivers.

102. Chincholi discloses the capability of receiving feedback statistics regarding the available resources of the wireless transceivers. Specifically, the traffic shaping module of the OMMA (*i.e.*, part of the "virtual MAC interface") may determine packet routing using "feedback based routing." (EX1005 ¶[0139].) In feedback based routing, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of***

available resources on the medium," *i.e.* information regarding bandwidth availabilities. (EX1005 ¶[0161].)

103. Figures 28, 29, and their associated descriptions describe how Chincholi collects feedback from each RAT for the traffic shaping module. Figure 28 illustrates how the OMMA layer includes an OMMA Controller, which interfaces with each RAT to collect metrics regarding the channel quality and number of resources available on the medium. Specifically, using interface A2 in Figure 28, "[a] RAT (*e.g.*, ***each RAT***) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 ***per device (e.g., WTRU or NT) per access category supported at that RAT***." (EX1005 ¶[0205].)

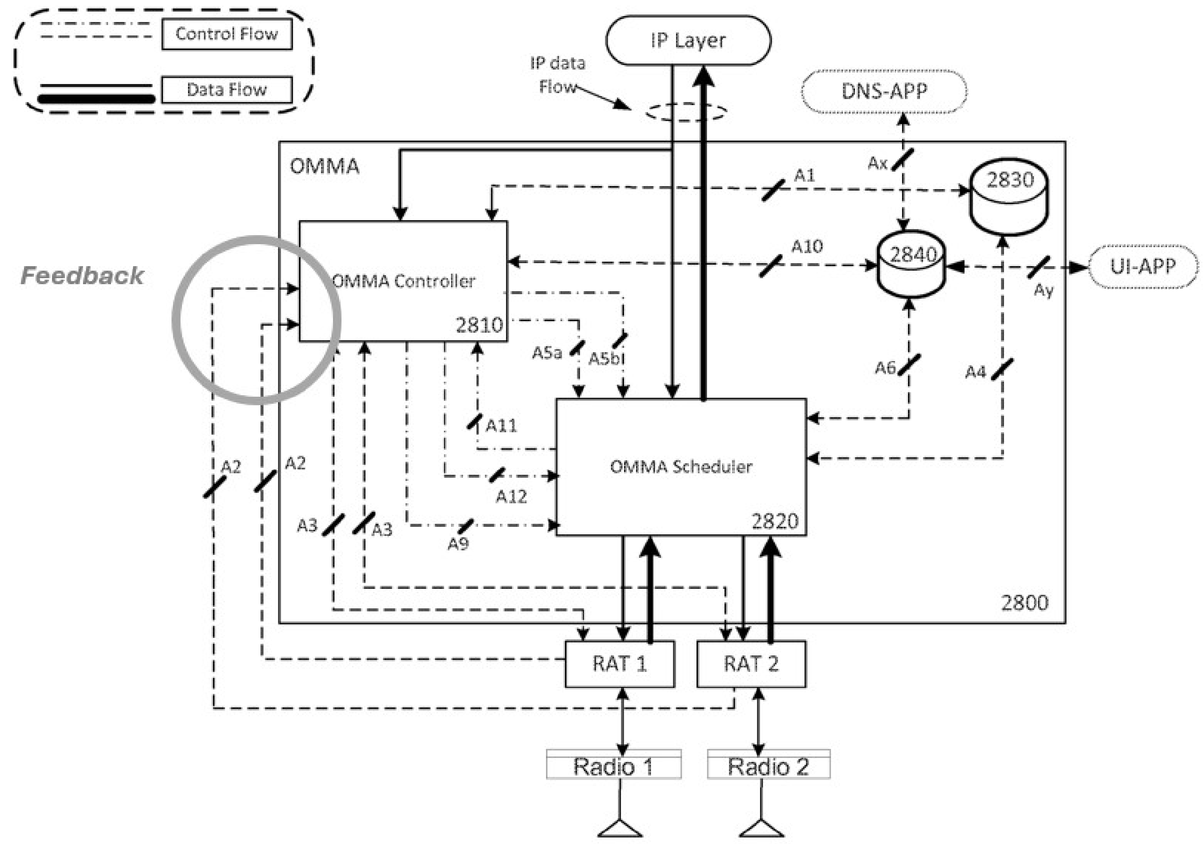


FIG. 28

104. The OMMA Controller includes a ***Feedback Device Classifier module 2930***. (EX1005 ¶[0205].) The Feedback Device Classifier collects information regarding the first and second transceiver resources/requirements over the "A2" interfaces in the diagram above so that this information may be provided to the OMMA Scheduler (i.e., the virtual MAC interface). Specifically, "[a] RAT (*e.g.*, each RAT) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 ***per device (e.g., WTRU or NT) per access category supported at***

that RAT." A POSITA would have recognized that the ability of the ***Feedback Device Classifier*** module of the OMMA Controller to collect feedback per device, per access category supported by each RAT discloses the "***resource monitoring interface***" as claimed by the '198 patent. The Feedback Device Classifier provides feedback, including information regarding the first and second bandwidth availabilities to the virtual MAC interface.

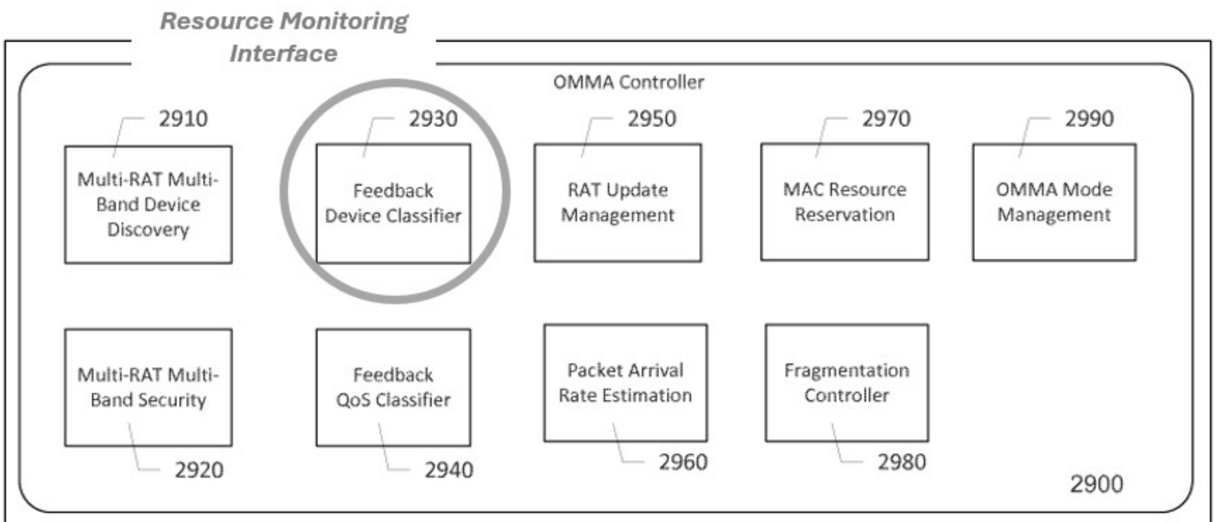


FIG. 29

(g) 1[f]: the virtual MAC interface being configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

105. In my opinion, Chincholi/Clegg discloses this limitation.

106. Chincholi discloses that its OMMA layer (*i.e.*, processing interface) is configured to operate in a manner transparent to any higher layer. For example, Chincholi discloses that "[t]he OMMA layer ***may be transparent***, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 ¶[0192], ¶[0126].) This is as opposed to a "non-transparent" configuration in which the OMMA layer would "add[] additional headers at the transmitter, and/or reads and removes the headers at the receiver." (EX1005 ¶[0126].)

(h) 1[g]: (i) request or create a first association between a recipient and the first actual MAC and PHY interfaces and a second association between the recipient and the second actual MAC and PHY interfaces, and

107. In my opinion, Chincholi/Clegg discloses this limitation.

108. Chincholi discloses techniques for network terminals and WTRUs to discover one another using active and passive scanning procedures. (EX1005 ¶[0145].) After an authentication procedure, Chincholi discloses that WTRUs may transmit a request to associate with one or more RATs of the network terminal and the network terminal may provide an association response signal accepting or rejecting the request of the WTRU. (EX1005 ¶[0149].) A POSITA would have recognized these scanning procedures disclose the ability of Chincholi's OMMA layer to request or create a first association between a recipient and the first actual

MAC and PHY interfaces and a second association between the recipient and the second actual MAC and PHY interfaces.

109. When operating transparently with respect to higher layers, *see* limitation 1[f], Chincholi's OMMA layer handles the request/response and creation of associations with WTRUs. (EX1005 ¶[0127] ("[A]ssociation request/response frames may be updated by the OMMA layer to include OMMA device discovery parameters, for example, such as but not limited to OMMA modes, OMMA schemes, OMMA packet distribution modes, etc."). Thus a POSITA would have recognized that the request or creation by Chincholi's OMMA layer of associations between recipients and the actual MAC and PHY interfaces would be performed in a manner transparent to higher level layers.

(i) 1[h]: (ii) use the information provided to it by the resource monitoring interface to make allocation decisions with respect to first and second bandwidth availabilities to at least partially satisfy the bandwidth requirement of the data stream.

110. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses that the virtual MAC interface uses feedback information to make bandwidth allocation decisions. Chincholi's OMMA layer receives various feedback information from each RAT. (EX1005 ¶¶[0123], [205].) For example, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the number of available resources on the

medium." (EX1005 ¶[0161].) Amongst the available resources provided as part of the feedback information are the "number of channels" and "channel bandwidth" (*i.e.*, the width of the channel, such as 20/40 MHz in the case of the ISM band). (EX1005 ¶[0161].) Table 2 of Chincholi provides examples of feedback metrics used for evaluation, including "Medium Access Delay," "RSSI," "Frame error rate," "Data rate," "Queuing latency," and "End-to-end delay." (EX1005 Table 2.) As discussed in limitation 1[e], the Feedback Device Classifier (resource monitoring interface) collects information regarding the first and second transceiver resources/requirements over the "A2" interfaces so that this information may be fed back to the OMMA Scheduler.

111. Chincholi discloses the OMMA layer allocates bandwidth resources to the transceiver resources based on this feedback information. "[T]he OMMA layer may determine a time duration and a bandwidth requirement for an IP flow." (EX1005 ¶[260].) Specifically, the OMMA layer may request resources on a RAT "based on the time duration and the bandwidth requirement for the first IP packet and the second IP packet of the IP flow." (EX1005 ¶[0260].) "The resources are characterized by the time duration and the bandwidth requirement." (EX1005 ¶[0260].) This functionality may be performed, for example, by a "MAC Resource Reservation module 602" of the OMMA layer, which "determine[s] an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of

packets." (EX1005 ¶[0142].) With knowledge of this total bandwidth requirement, as well as the feedback information indicating the number of channels available on each RAT, the "OMMA layer may intelligently manage data traffic across multiple RATs as a function of the link quality of each RAT." (EX1005 ¶[0194].) Because this bandwidth allocation is based on the bandwidth requirement of the IP flow, the allocation decision ***partially satisfies the bandwidth requirement of the data stream***.

2. Claim 2: The method of claim 1, wherein the first frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.

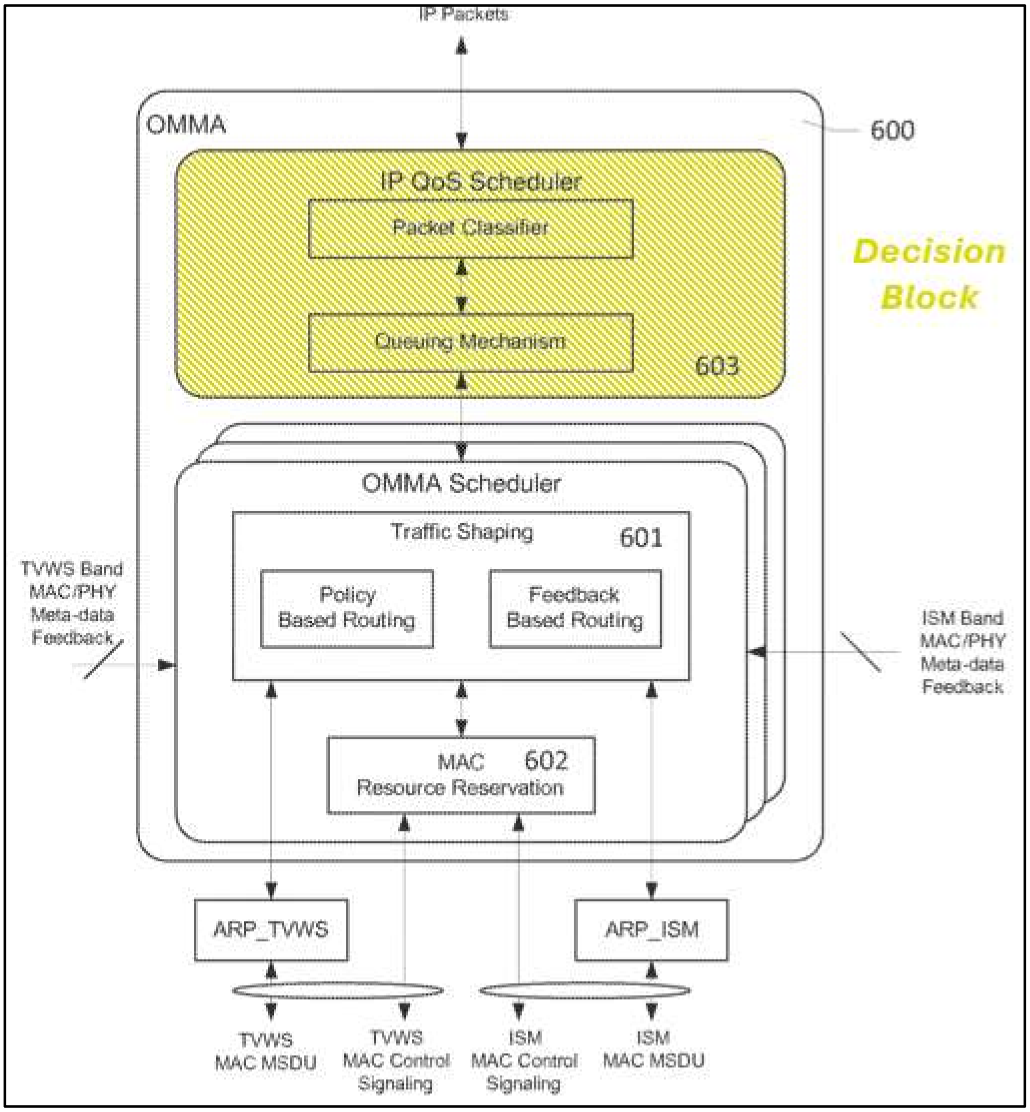
112. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi teaches that its techniques can be used to implement an IEE 802.11 based Wi-Fi system. (EX1005 ¶[0121].) Thus, "[t]he NT 201 may operate using one flavor of the 802.11 system (*e.g.*, 11a/b/g/n) at any given time over a specific band (*e.g.*, 2.4GHz or 5GHz) when communicating with a WTRU." (EX1005 ¶[0121].) Chincholi was filed prior to October 30, 2013. Moreover, a POSITA would have recognized that the 802.11 standards expressly disclosed ("11a/b/g/n") where in existence as of October 30, 2013.

3. Claim 3: The method of claim 1, wherein the second frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of Oct. 30, 2013.

113. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi teaches that its techniques can be used to implement an IEE 802.11 based Wi-Fi system. (EX1005 ¶[0121].) Thus, "[t]he NT 201 may operate using one flavor of the 802.11 system (*e.g.*, 11a/b/g/n) at any given time over a specific band (*e.g.*, 2.4GHz or 5GHz) when communicating with a WTRU." (EX1005 ¶[0121].) Chincholi was filed prior to October 30, 2013. Moreover, a POSITA would have recognized that the 802.11 standards expressly disclosed ("11a/b/g/n") where in existence as of October 30, 2013.

4. Claim 4: The method of claim 1, wherein the at least one virtual MAC interface includes a decision block.

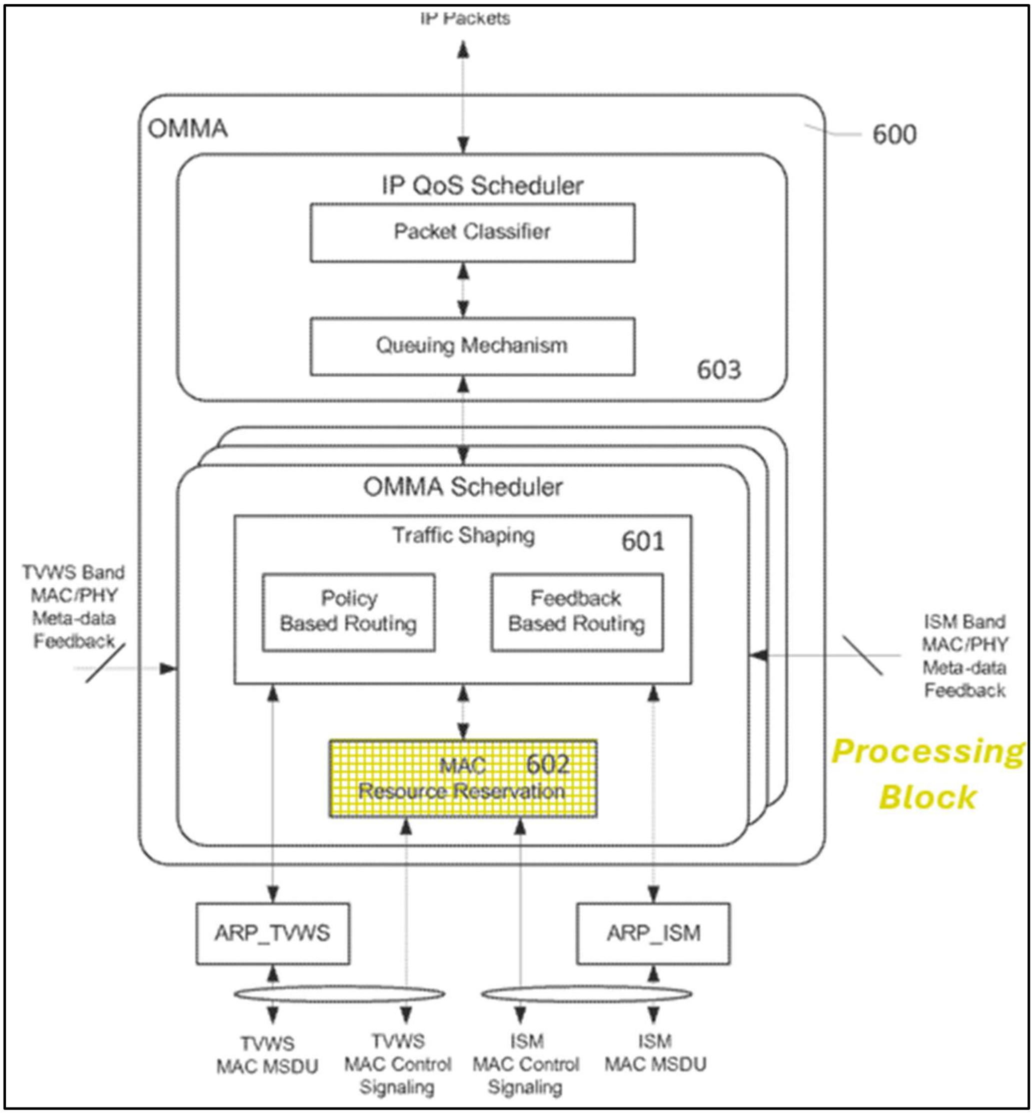
114. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses the claimed ***decision block*** in the form of the ***IP QoS Scheduler module 603***. As Chincholi teaches, "[t]he ***IP QoS Scheduler 603*** may segregate single IP packet stream comprising multiple IP QoS types into distinct IP QoS streams, for example, so that the traffic shaping module 601 may treat each IP QoS stream independently and satisfy the specific QoS requirements when routing IP packets." (EX1005 ¶[0143].)



5. Claim 5: The method of claim 1, wherein the at least one virtual MAC interface includes a processing block.

115. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses the claimed ***processing block*** in the form of the ***MAC Resource Reservation module 602***. As Chincholi teaches, "[t]he ***MAC Resource Reservation module 602*** may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets. This module may

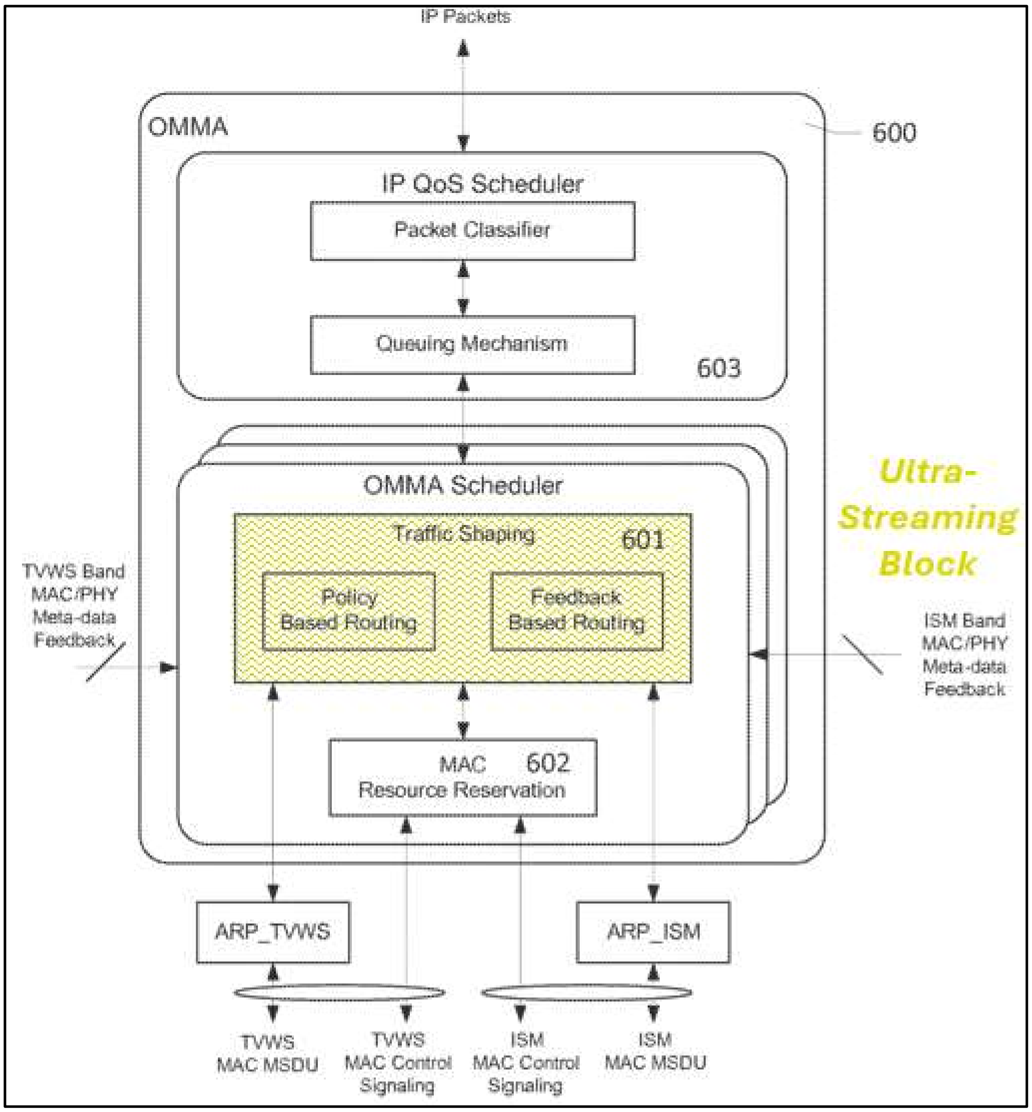
transmit specific requests to the RATs over the A1/A2 interface." (EX1005 ¶[0142].)



6. Claim 6: The method of claim 1, wherein the at least one virtual MAC interface includes an ultra-streaming block.

116. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses the claimed ***ultra-streaming block*** in the form of the ***Traffic Shaping Module 601***. As Chincholi teaches, "[t]he ***traffic shaping module 601*** may [be]

responsible for determining the way packets are routed across RATs. For example, the traffic shaping module may determine the way a packet is routed using policy based routing or feedback based routing." (EX1005 ¶[0139].)



7. Claim 7: The method of claim 1, wherein the resource monitoring interface comprises at least one RF block.

117. In my opinion, Chincholi/Clegg discloses this limitation.

118. A POSITA would have understood the claimed "RF block" to merely be a component capable of receiving and reporting information about the availability of RF resources.

119. As discussed for limitation 1[e], Chincholi discloses that the Feedback Device Classifier Module of the OMMA Controller receives feedback metrics regarding resource availability from RATs over the "A2" interfaces so that this information may be fed back to the OMMA Scheduler. Specifically, "[a] RAT (*e.g.*, each RAT) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 per device (e.g., WTRU or NT) per access category supported at that RAT." Because this discloses the capability of receiving and reporting information about the availability of the transceiver resources (*i.e.*, RF resources), a POSITA would have understood the Feedback Device Classifier Module (*i.e.*, the "resource monitoring interface") to comprise an "RF block."

8. Claim 8: The method of claim 1, wherein the resource monitoring interface comprises multiple RF blocks.

120. In my opinion, Chincholi/Clegg discloses this limitation.

121. *See* Claim 7, describing how Chincholi discloses its resource monitoring interface to comprise at least one RF block. The '756 patent explains

that "multiple RF blocks" "denote[s] the virtual use of [multiple] sets of allocated transceiver resources."

122. As shown in Figure 28, Chincholi collects feedback from ***each RAT***. Specifically, there are two interfaces A2 shown in Figure 28 correlating to RAT 1 and RAT 2—"[a] RAT (*e.g.*, ***each RAT***) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 ***per device (e.g., WTRU or NT) per access category supported at that RAT***." (EX1005 ¶[0205].)

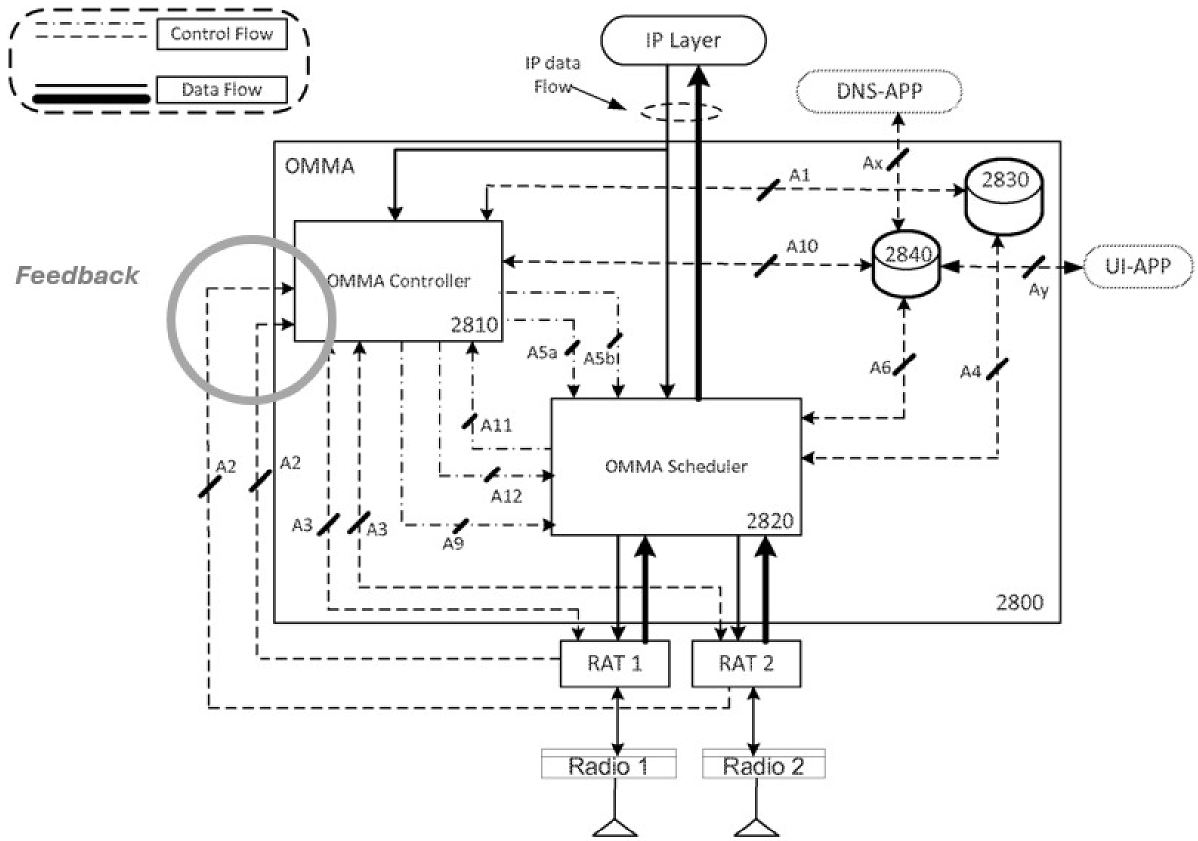


FIG. 28

123. The Feedback Device Classifier collects information regarding the first and second transceiver resources/requirements over the "A2" interfaces so that this information may be fed back to the OMMA Scheduler. A POSITA would have recognized that the ability of the Feedback Device Classifier module of the OMMA Controller to collect feedback per device, per access category would require multiple RF blocks (*i.e.*, one RF block per transceiver, or at least one RF block per each virtualized set of similarly configured transceivers) to receive the feedback statistics regarding RF resources over each A2 interface.

9. Claim 9: The method of claim 1, wherein the resource monitoring interface is configured to, during use of the wireless networking device, process the data stream before it is sent to any actual MAC interface.

124. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi teaches that its Feedback Device Classifier module (i.e., the resource monitoring interface), in addition to collecting information regarding the first and second transceiver resources/requirements over the "A2" interfaces, "may classify the metrics for each device address… so that the OMMA controller 2900 may send feedback metrics to each device's OMMA layer… for example, through interface A5a… and/or interface A5b." (EX1005 ¶[0205]) Based on this collection and classification, the "OMMA layer may intelligently manage data traffic across multiple RATs as a function of the link quality of each RAT." (EX1005 ¶[0194].) Thus, a POSITA recognizes that the Feedback Device Classifier module's collection and classification of feedback information and transmission to the OMMA layer to manage the data traffic (***processing the data stream***) is performed before being sent to the RAT for transmission (***before the data stream is sent to any actual MAC interface***).

10. Claim 10: The method of claim 1, wherein the processing interface comprises multiple resource monitoring interfaces.

125. In my opinion, Chincholi/Clegg discloses this limitation.

126. As discussed for limitation 1[e], Chincholi discloses an OMMA Controller that interfaces with each RAT on the "A2" interfaces to collect metrics regarding channel quality and resources. (EX1005 ¶[0205].) The OMMA Controller comprises a ***Feedback Device Classifier module 2930***, which is a "resource monitoring interface" for collecting and analyzing this feedback information (EX1005 ¶[0205].)

127. A POSITA would have been motivated to implement multiple Feedback Device Classifier Modules into the OMMA Controller of Chincholi. In a multi-RAT system with groups of similarly configured RATs, a POSITA would have been motivated to implement virtualized physical interfaces, each capable of collecting and consolidating the feedback metrics for its respective grouping of similarly configured RATs. Providing this sort of virtualized physical interface for transceivers in an 802.11 system is known to be particularly beneficial as it allows an access point to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. Virtualization of the physical interface for this purpose is taught, for example, in background reference U.S. Patent Application 2009/0141691 ("Jain"). (*See* EX1007 ¶¶[0034]-[0037].)

128. In implementing virtualized physical interfaces, a POSITA would recognize that each interface to a grouping of similarly configured RATs would comprise a separate, "resource monitoring interface."

11. Claim 11: The method of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

129. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses wireless communication systems comprising multiple base stations operating in a radio access network (RAN) that communicate with wireless devices using a multiple input, multiple output ("MIMO") architecture. (EX1005 ¶[0109].) This is disclosed, for example, in Figure 1E.

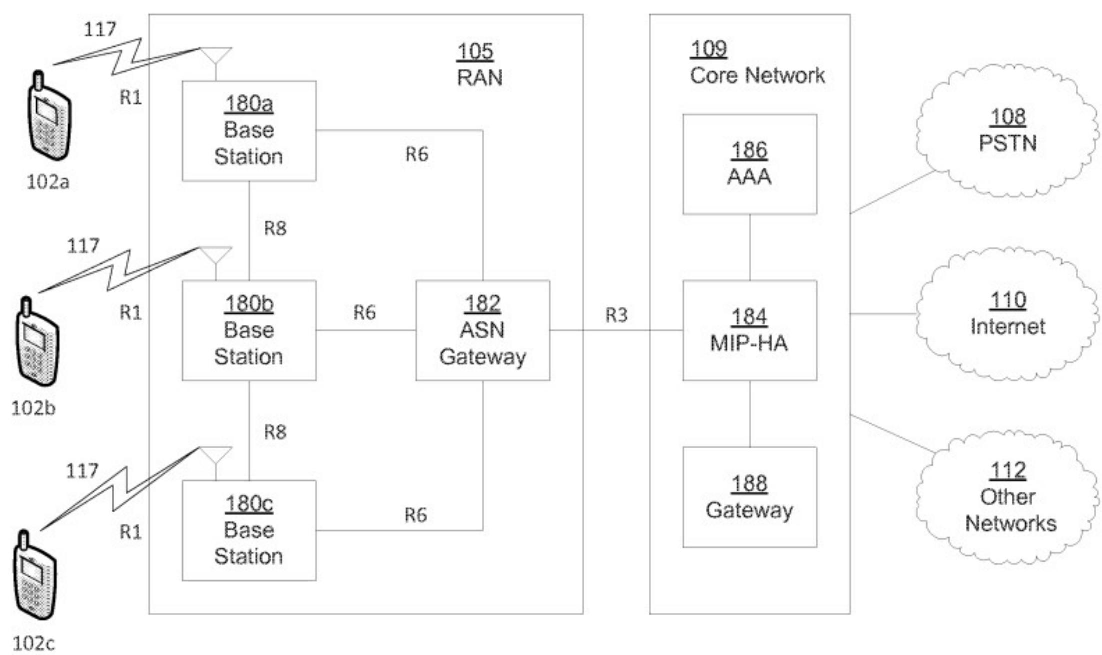


FIG. 1E

130. A POSITA would have recognized that each base station in Figure 1E would comprise its own OMMA layer (*i.e.*, virtual MAC interface). A POSITA would have further recognized that an additional obvious implementation would have been to combine the multiple virtual MAC interfaces of the system in Figure 1E into a single wireless communication device. Combining this functionality into a single device could, for example, leverage common hardware increasing the efficiency of a base station.

12. Claim 12: The method of claim 1, wherein the processing interface comprises a bandwidth allocator.

131. In my opinion, Chincholi/Clegg discloses this limitation. A POSITA would have understood that a ***bandwidth allocator*** refers to functionality within the processing layer capable of allocating the bandwidth availabilities of multiple transceivers to meet a bandwidth requirement of one or more data streams.

132. Chincholi discloses the functionality of the claimed "bandwidth allocator." Specifically, Chincholi teaches that "the traffic shaping module may determine how a packet is routed using policy based routing ***or feedback based routing***." (EX1005 ¶[0139].) In feedback based routing, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of available resources on the medium***." (EX1005 ¶[0161].) Using this feedback mechanism, the "OMMA layer may intelligently

manage data traffic across multiple RATs as a function of the link quality of each RAT." (EX1005 ¶[0194].) The OMMA layer also has the capability "to readjust the assigned medium resources to a WTRU on each RAT, for example, based on global knowledge of resource assignment on other RATs." (EX1005 ¶[0196].) Thus, the "OMMA layer may utilize MAC resource reservation to achieve ***globally optimal resource allocation across RATs***." (EX1005 ¶[0196].)

133. From these disclosures, a POSITA would have recognized Chincholi discloses a processing layer capable of allocating the bandwidth availabilities of multiple transceivers to meet a bandwidth requirement of one or more data streams. Chincholi thus discloses a bandwidth allocator.

13. Claim 13: The method of claim 1, wherein the resource monitoring interface is not contiguous with the virtual MAC interface.

134. In my opinion, Chincholi/Clegg discloses this limitation.

135. As discussed for limitation 1[e], Chincholi's OMMA Controller includes a Feedback Device Classifier module. As shown in Figure 28, the OMMA Controller and the OMMA Scheduler are distinct blocks that communicate via control flow interfaces. A POSITA would have understood from this disclosure that the resource monitoring interface is not contiguous with the virtual MAC interface.

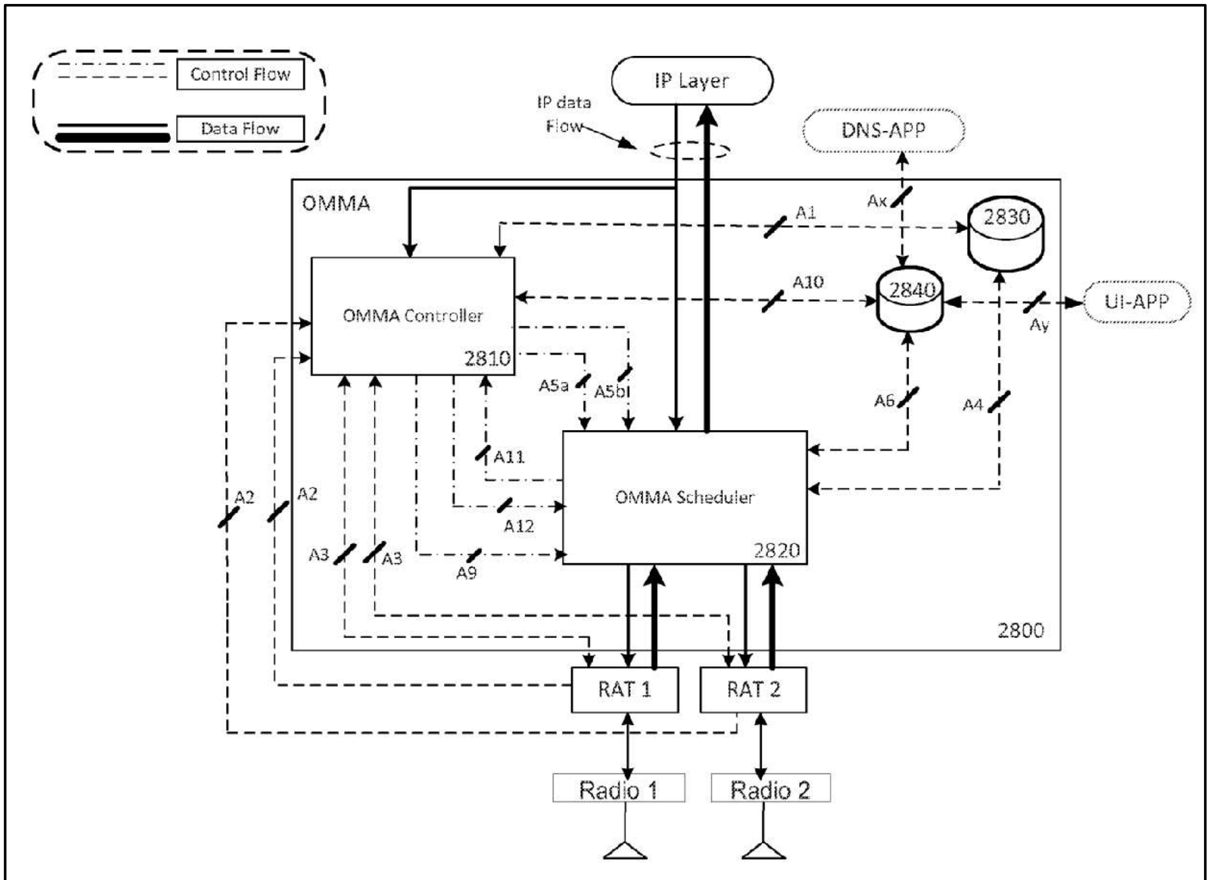


FIG. 28

14. Claim 14: The method of claim 1, wherein the wireless networking device comprises a wireless access point.

136. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses that the wireless networking device comprises a "wireless access point." (EX1005 ¶[0002].) An example of Chincholi's network terminal ("NT") is an "***access point***" (AP). (EX1005 ¶[0002].) Indeed, Chincholi discloses that a node of its wireless communication network may include a "***WiFi access point***." (EX1005 ¶[0115].)

15. Claim 15: The method of claim 1, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual PHY interfaces.

137. In my opinion, Chincholi/Clegg discloses this limitation. *See* infra Claim 16, describing receiving feedback information directly from the actual MAC interfaces. While Chincholi teaches that the provision by each RAT of feedback metrics "***may*** be performed through interface A2," and thus directly from the actual MAC interfaces (EX1005 ¶[0205]), Table 2 shows that the sender of the feedback metrics may be ***either*** the actual MAC or PHY interfaces. (EX1005 ¶[0106].) Specifically, Table 2 shows that the RSSI is sent by the actual PHY interface, and that the number of channels and channel bandwidth may be sent by either the actual PHY or MAC interfaces. (*Id.*) Thus, a POSITA recognizes that Chincholi discloses that the information provided to the Feedback Device Classifier module (i.e. resource monitoring interface) may be provided directly from at least one of the first and second actual PHY interfaces.

16. Claim 16: The method of claim 1, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual MAC interfaces.

138. In my opinion, Chincholi/Clegg discloses this limitation.

139. As described in limitation 1[e], Figures 28, 29, and related descriptions, show how Chincholi collects feedback directly from each RAT for the traffic shaping module. Using interface A2 in Figure 28, "[a] RAT (*e.g.*, each RAT) may provide feedback metrics (*e.g.*, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 per device (e.g., WTRU or NT) per access category supported at that RAT." (EX1005 ¶[0205].)

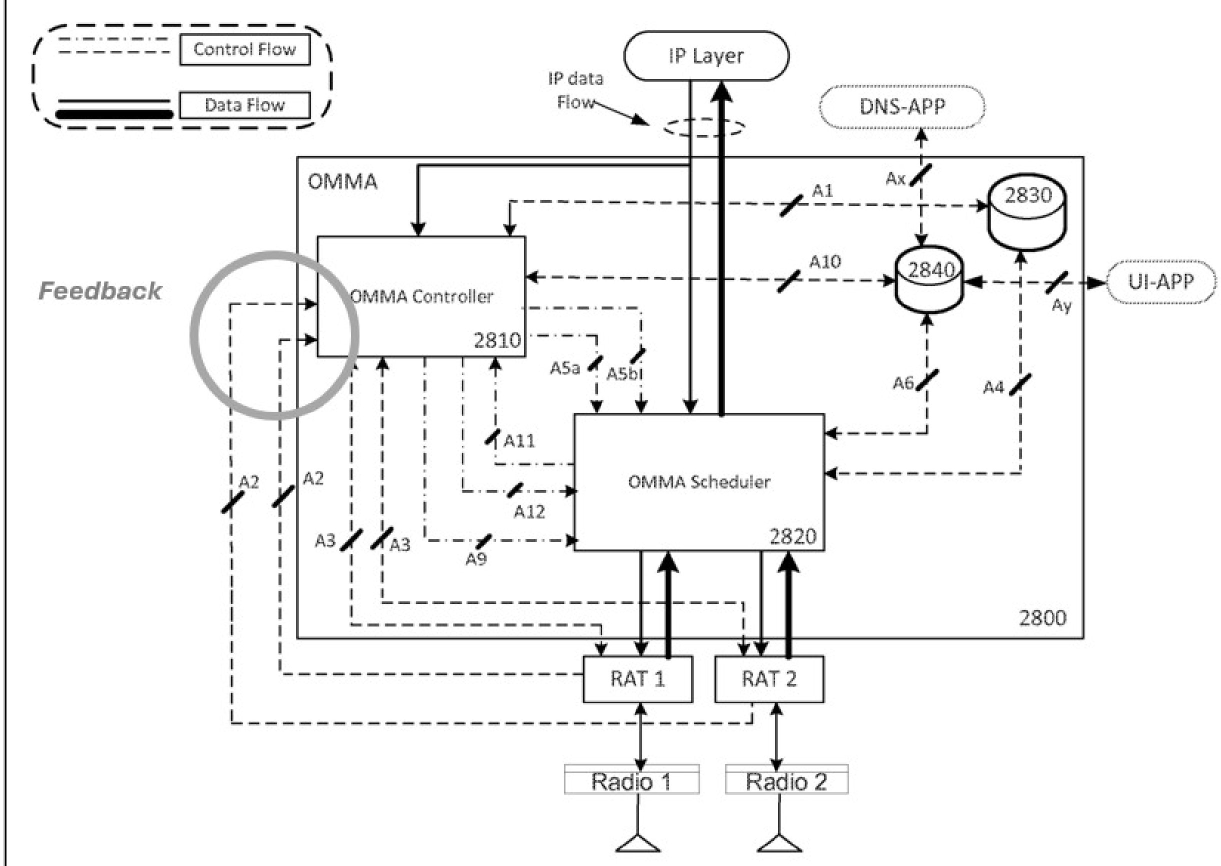


FIG. 28

140. The Feedback Device Classifier module (i.e. resource monitoring interface) collects information directly from each of the first and second transceiver resources/requirements over the "A2" interfaces in the diagram above so that this information may be fed back to the OMMA Scheduler. Chincholi's Figure 5 shows that the RAT-side of the "A2" interface is the ***actual MAC interfaces***:

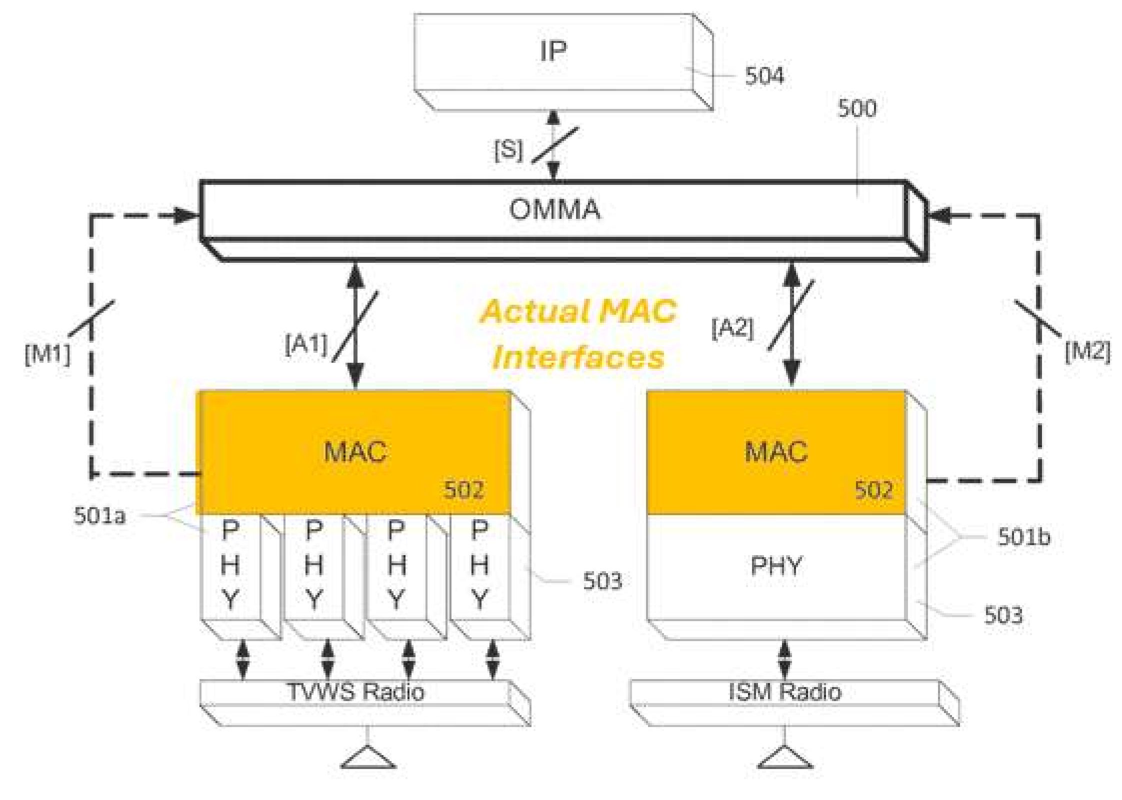


FIG. 5

See also Table 1 (describing both interface "A1" and "A2" as "Incoming/Outgoing MAC MSDUs… and MAC resource reservation control signaling"). Chincholi's Table 2 also shows that the feedback metrics may be sent by either actual MAC or PHY interfaces. (EX1005 ¶[0106].)

141. Therefore, a POSITA recognizes that the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual MAC interfaces.

17. Claim 17: The method of claim 1, wherein the allocation decisions involve use of at least some of the first and second bandwidth availabilities.

142. In my opinion, Chincholi/Clegg discloses this limitation.

143. As described for limitation 1[e], in feedback based routing, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the ***number of available resources on the medium***," *i.e.* information regarding bandwidth availabilities. (EX1005 ¶[0161].) And as described in limitation 1[h], Chincholi discloses the OMMA layer allocates bandwidth resources to the transceiver resources based on this feedback information. Thus, a POSITA recognizes that the allocation decisions in Chincholi involve use of the first and second and second bandwidth availabilities.

18. Claim 18

(a) 18[a] The method of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used and in a manner transparent to any layer of the wireless networking device above the processing interface,

144. For the reasons I disclosed above for limitation 1[f], it is my opinion that Chincholi/Clegg discloses this limitation.

(b) 18[b] (i) identify at least one portion of the actual bandwidth of one of the first and second wireless transceivers, the identified bandwidth portion comprising a set of given resources, and

145. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi teaches that NTs and WTRUs communicate with one another over "channels," which are portions of a transceiver bandwidth availability. Specifically, "[t]he NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band, for example, 2.4 GHz ISM band, or 5 GHz ISM band, or TVSWS band, or 60 GHz band, ***using a channel within the band or aggregating multiple contiguous or noncontiguous channels***." (EX1005 ¶[0118]; *see also id.* ¶[0121] ("An 802.1 1 based system may operate in a time division duplexing (TDD) mode, for example, ***on a band over a single 20/40MHz channel in the case of ISM band or a single 5/10/20 MHz channel in television white space (TVWS) band*** using contiguous/non-contiguous carrier aggregation.").)

146. Chincholi also discloses identifying available bandwidth channels for communication. The OMMA layer receives various feedback information from each RAT. (EX1005 ¶[0123].) For example, "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality

metrics and the ***number of available resources on the medium***." (EX1005 ¶[0161].) Amongst the available resources provided as part of the feedback information are the "number of channels" and "channel bandwidth" (*i.e.*, the width of the channel, such as 20/40 MHz in the case of the ISM band). (EX1005 ¶[0161].)

147. A POSITA would have understood that the ability of Chincholi's OMMA layer to receive from each RAT a number of channels and channel bandwidth is an identification of "at least one first and second portions of the first actual bandwidth" (*i.e.*, available channels, or an aggregation of multiple contiguous or non-contiguous channels) of the first actual bandwidth of the first wireless transceiver.

(c) 18[c] (ii) transmit the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable to thereby at least partially satisfy the bandwidth requirement.

148. In my opinion, Chincholi/Clegg discloses this limitation. A POSITA would have understood that the plain meaning of a resource being "unavailable" in the context of the '756 patent broadly includes resources that are partially or completely unavailable or that have less bandwidth availability than another resource. Indeed, during prosecution of the prior related '591 patent, the applicant expressly stated in arguing patentability to overcome a prior art rejection that "[i]t is applicant's intention that these words ["unavailable" and

"unavailability"] refer to, for example, a partial or complete loss of certain transceiver resources as well as a situation where a different band than the one currently in use provides more bandwidth available for transmission." (*See* EX1017, Aug. 8, 2023 Applicant Remarks).

149. As discussed above, *see* limitation 1[e], Chincholi discloses "feedback based routing" wherein the "number of available resources on the medium" of each RAT is monitored and IP packets are distributed across the RATs accordingly. (EX1005 ¶[0161].) The OMMA layer may, for example, maintain a "RAT capability database" storing the available RAT capability for an associated WTRU/NT (EX1005 ¶[0233], and "continuously updat[ing]" this information based on feedback metrics, (EX1005 ¶[235].) The OMMA transmitter uses these measurement metrics fed back from each RAT for transmission. (EX1005, ¶[161].) A POSITA would have understood Chincholi's use of feedback metrics to continuously monitor available resources for transmission to disclose transmitting the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable.

150. This limitation is further taught by Clegg. Clegg teaches a technique for a multi-band 802.11 device to "increase data throughput by aggregating one or more of the available sub-channels for simultaneous use in transmitting and receiving data." (EX1009, 1:25-28.) To accomplish this, Clegg teaches the use of an "ultra-

wideband tuner to evaluate the entire available spectrum between several communication bands." (EX1009, 3:60-63.) Specifically, an 802.11 access point may "search across 1) available bands (e.g., the 2.4 GHz, 5 GHz, and/or 60 GHz bands), and 2) sub-channels within each band, and measure interference on a carrier-by-carrier basis across those bands and sub-channels." (EX1009, 4:5-9.) Each carrier is evaluated to determine whether interference is "too high or above a threshold amount." (EX1009, 7:16-17.) Clegg can use this information to create a "channel map" identifying the available carriers across entire communication bands or discrete sub-channels "so that a user can select subcarriers from across those bands to form a cluster for communication." (EX1009, 7:19-22.)

151. A POSITA would have understood Clegg's carrier-by-carrier evaluation of interference and selection of a cluster of carriers for transmission to disclose transmission of the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable .

152. For the reasons discussed above, *see* Section VI.A, a POSITA would have been motivated to combine Clegg's teachings about how to mitigate carrier-specific interference into system of Chincholi. The resulting combination would implement Chincholi's ability to dynamically allocate contiguous or non-contiguous bandwidth channels along with Clegg's ability to mitigate interference within

channels on a carrier-by-carrier basis, thus increasing the bandwidth efficiency of the combined system.

19. Claim 19

(a) 19[a] The method of claim 18, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

153. For the reasons I disclosed above for limitation 1[f], it is my opinion that Chincholi/Clegg discloses this limitation.

(b) 19[b] (i) evaluate at least one data transfer characteristic of a first identified bandwidth portion of each of the first and second wireless transceivers, and

154. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi teaches evaluation of data transfer characteristics through a feedback-based routing mechanism, where "the OMMA transmitter may use measurement metrics fed back from each RAT," which include "channel quality metrics and the number of available resources on the medium" (***the given resources of both the first and second identified bandwidth portions***). (EX1005 ¶[0161].) Table 2 of Chincholi provides examples of feedback metrics used for evaluation, including "Medium Access Delay," "RSSI," "Frame error rate," "Data rate," "Queuing latency," and "End-to-end delay." (EX1005 Table 2.) These metrics are all data transfer

characteristics of the identified bandwidth portions of a give RAT that are evaluated by the OMMA layer.

155. For example, Chincholi discloses that in a "ramp up" phase, the RSSI metric may be assumed to have converged to provide a reliable indication of the instantaneous channel quality of each RAT. (EX1005 ¶[0164].) "RSSI" stands for received signal strength and is a measure of the data transfer characteristics of the wireless transceivers associated with each RAT. Chincholi further discloses that in a "steady state" phase, all feedback metrics may be assumed to have converged to provide a reliable indication of the channel quality, including medium access delay, frame error rate, etc. (Ex. 1005 at [0165].) Thus, in both the "ramp up" and "steady state" phases, Chincholi discloses evaluating the data transfer characteristics of the identified bandwidth portions of both the first and second transceivers.

(c) 19[c] (ii) transmit the data stream to the recipient using the first identified bandwidth portion of either the first or second wireless transceiver based upon a comparison of the evaluated data transfer characteristics.

156. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi discloses the OMMA layer allocates bandwidth resources to the transceiver resources for transmission based on a comparison of the evaluated data transfer characteristics. As Chincholi teaches, "the OMMA layer may determine a time duration and a bandwidth requirement for an IP flow." (EX1005 ¶[260].)

157. This functionality may be performed, for example, by a "MAC Resource Reservation module 602" of the OMMA layer, which "determine[s] an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets." (EX1005 ¶[0142].)

158. Chincholi discloses that the OMMA layer uses feedback metrics indicating data transfer characteristics to calculate the ratio of IP packets to distribute between the first bandwidth portions of the first and second transceivers. For example, during the "ramp up" phase, Chincholi discloses the following calculation for determining the ratio:

$$\left\lceil \frac{avg(RSSI_{ISM})}{\max(RSSI_{ISM})} \times BW_{ISM} \right\rceil : \left\lceil \left[\sum_{k=1}^{N} \frac{avg(RSSI_{TV}^{k})}{\max(RSSI_{TV}^{k})} \right] \times BW_{TVWS}^{k} \right\rceil.$$

(EX1005 ¶[0164].) In the "steady state" phase, Chincholi discloses the following calculation for determining the ratio:

$$\left\lceil (1 - FER_{ISM}) \times BW_{ISM} \right\rceil : \left| \left[\sum_{k=1}^{N} (1 - FER_{TVWS}^{k}) \right] \times BW_{TVWS}^{k} \right|.$$

(EX1005 ¶[0165].) A POSITA would have understood from these calculations that a higher ratio of IP packets will be allocated to the transceiver whose identified bandwidth portions have better data transfer characteristics at a given time. Further, where the data transfer characteristics of the first bandwidth portion of the first transceiver are substantially better than those of the first bandwidth portion of the second transceiver, a POSITA would understand the capability to transmit the entire first data stream using only the first bandwidth portion of the first transceiver.

20. Claim 20: The method of claim 19, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability.

159. As discussed above for limitation 18[c], Chincholi allocates IP packets between the first and second transceiver according to the available bandwidth of each transceiver and one or more metrics indicating the quality of the transceiver link. Additionally, as discussed above for limitation 18[c], Clegg discloses the capability of considering unavailable carriers within a bandwidth portion in order to more fully utilize the bandwidth availability of a transceiver. Based on these disclosures, a POSITA would have recognized that Chincholi/Clegg disclose an evaluation of the data transfer characteristics of the first and second transceivers that includes and evaluation of bandwidth unavailability.

21. Claim 21: The method of claim 20, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability and received signal strength of at least one communication from the recipient.

160. In my opinion, Chincholi/Clegg discloses this limitation.

161. As described for claim 20, Chincholi/Clegg's evaluation of the data transfer characteristics of the first and second transceivers includes an evaluation of

bandwidth unavailability. Additionally, as described for limitation 19[b], Chincholi provides examples of feedback metrics used for evaluation, including "RSSI," i.e. received signal strength indication from the recipient. (EX1005 Table 2.) A POSITA recognizes that the Chincholi/Clegg combination evaluates data transfer characteristics in terms of both bandwidth unavailability and received signal strength.

22. Claim 22: The method of claim 18, wherein the first identified bandwidth portion of the first wireless transceiver comprises two non-contiguous portions of the bandwidth of the first wireless transceiver.

162. In my opinion, Chincholi/Clegg discloses this limitation.

163. As explained for limitation 18[b], Chincholi teaches that NTs and WTRUs communicate with one another over "channels," which are portions of a transceiver bandwidth availability. Specifically, "[t]he NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band, for example, 2.4 GHz ISM band, or 5 GHz ISM band, or TVSWS band, or 60 GHz band, using a channel within the band or aggregating ***multiple*** contiguous or ***noncontiguous channels***." (EX1005 ¶[0118]; *see also id.* ¶[0121] ("An 802.1 1 based system may operate in a time division duplexing (TDD) mode, for example, on a band over a single 20/40MHz channel in the case of ISM band or a single 5/10/20 MHz channel in television white space (TVWS) band using contiguous/***non-***

contiguous carrier aggregation.”).) A POSITA recognizes that Chincholi therefore discloses that the first identified bandwidth portion may comprise two non-continguous portions of bandwidth.

23. Claim 23: The method of claim 22, wherein the first identified bandwidth portion of the second wireless transceiver comprises two non-contiguous portions of the bandwidth of the second wireless transceiver.

164. Claim 23 is identical to Claim 22, except it involves the second wireless transceiver rather than the first transceiver. Chincholi discloses Claim 23 for the same reasons as Claim 22. In my opinion, a POSITA would have recognized from the analysis in Claim 22 that the Chincholi/Clegg combination discloses Claim 23.

24. Claim 24: The method of claim 18, wherein the allocation decisions are based at least upon a signal type associated with the data stream.

165. In my opinion, Chincholi/Clegg discloses this limitation.

166. As described for limitation 1[h], Table 2 of Chincholi provides examples of feedback metrics used for evaluation and bandwidth allocation decisions. The Table 2 metrics include “MAC Type,” i.e. “CSMA/CA, OFDMA, etc.” (EX1005 ¶[0161]) which a POSITA recognizes are different ***signal types associated with the data stream***.

167. Additionally, Chincholi teaches that “[t]he OMMA layer may communication with a plurality of RATs, which for example, may comprise any

combination of RAT types." (EX1005 ¶[0134].) As discussed for limitation 18[c], the OMMA layer may maintain a "RAT capability database" storing the available RAT capability for an associated WTRU/NT (EX1005 ¶[0233], "continuously update" this information based on feedback metrics (EX1005 ¶[235]), and use these measurement metrics fed back from each RAT for transmission. (EX1005, ¶[161].) A POSITA recognizes that the "type of RAT (*e.g.,* LTE, 802.11n, HSPA, *etc.*)" (another ***signal type***) may be indicated in the RAT capability database.

25. Claim 25:

(a) 25[a]: The method of claim 18, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

168. For the reasons I disclosed above for limitation 1[f], it is my opinion that Chincholi/Clegg discloses this limitation.

(b) 25[b]: aggregate a first identified bandwidth portion of the first wireless transceiver with a first identified portion of the second wireless transceiver to at least partially satisfy the bandwidth requirement of the application.

169. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi may "aggregate" the identified bandwidth portions of the first and second transceivers to simultaneously transmit the first data stream to the recipient to at least partially satisfy the bandwidth requirement of the application. (EX1005 ¶[0120] ("A

mechanism to aggregate two or more RATs operating independently on two or more bands to enhance the total IP throughput of the link may be described herein.").

170. Specifically, Chincholi discloses a "multiplexing mode" where, if the channel quality for one or more RATs is determined to exceed an upper threshold, the OMMA layer may transmit different independent IP packets from the same IP flow across one or more of the RATs. (EX1005 ¶[0152].) In this scenario, Chincholi is able to reserve resources (*i.e.*, a specific subset of frequencies corresponding to the identified portions of available bandwidth) of multiple transceivers and thereby aggregate the identified bandwidth portions of a first and second transceiver for simultaneous transmission.

171. Chincholi discloses simultaneous transmission of a first data stream using first and second transceivers. Figure 11, for example, shows how the OMMA layer splits a single IP stream of packets (*i.e.*¸ "MAC Service Data Units" or "MSDUs") for transmission across two RATs simultaneously.

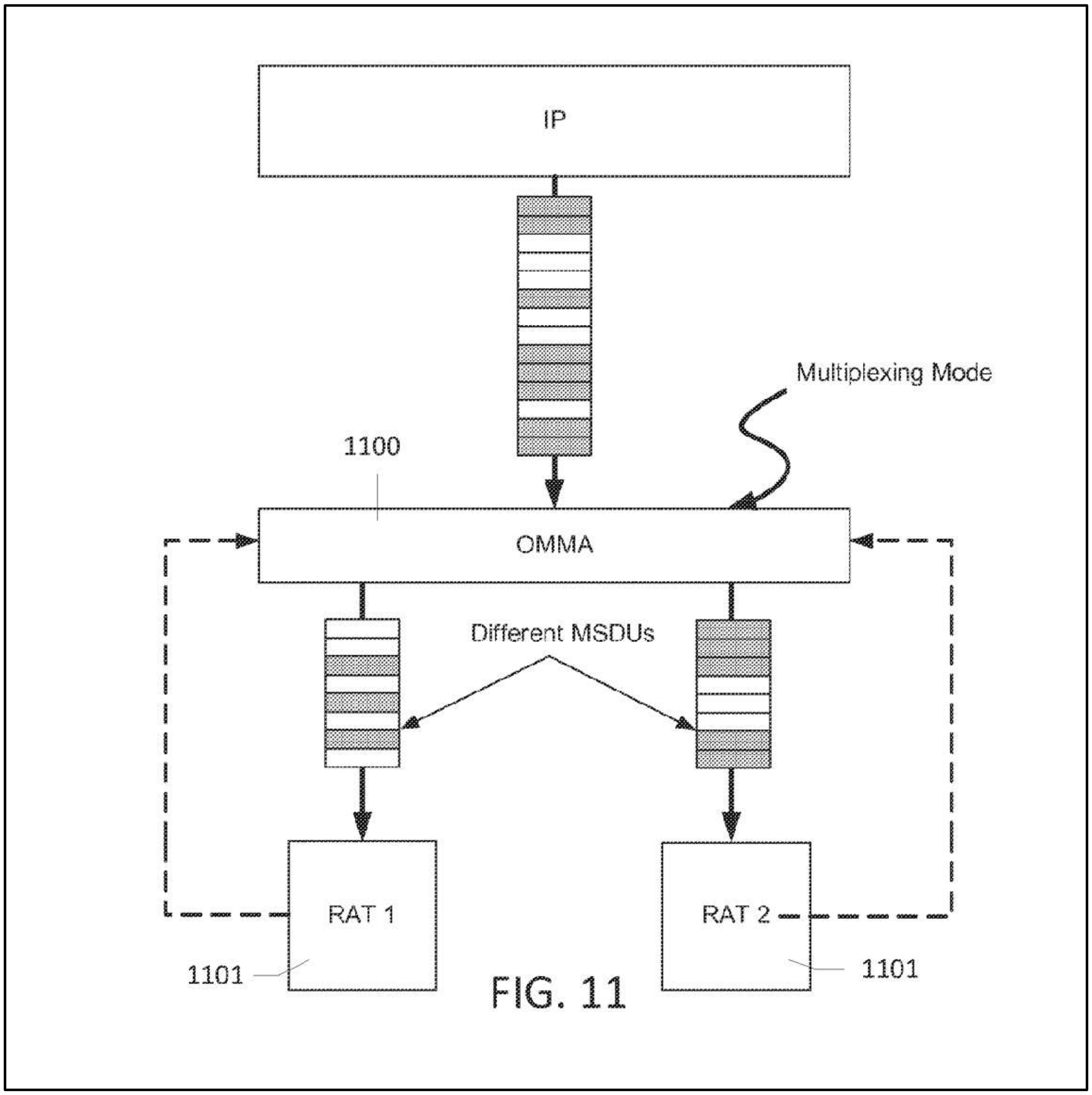


FIG. 11

172. As Chincholi discloses, "[u]sing multiple RATs ***simultaneously*** may provide increased bandwidth and/or increased reliability for an application." (EX1005 ¶[0194].)

173. Chincholi discloses that the transceiver selection, data stream preparation, and simultaneous transmission is all performed by the OMMA in a manner transparent to higher levels: "[t]he OMMA layer *may be transparent*, in that

it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 ¶[0192], ¶[0126].)

26. Claim 26:

(a) The method of claim 18, wherein the processing interface is configured to, after the circuitry has been connected to the wireless networking device, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

174. For the reasons I disclosed above for limitation 1[f], it is my opinion that Chincholi/Clegg discloses this limitation.

(b) transmit the data stream to the recipient using the first wireless transceiver and to receive a second data stream that is transmitted from the recipient using the second transceiver.

175. In my opinion, Chincholi/Clegg discloses this limitation. A POSITA would have recognized that the ability to implement Chincholi's system to simultaneously transmit a data stream using the first transceiver and receive a second data stream from the recipient using the second transceiver.

176. First, in addition to enabling simultaneous transmission of an IP flow from two separate transceivers, Chincholi discloses how its OMMA layer enables aggregation of the available bandwidth on two separate transceivers to, in a manner transparent to higher layers, provide for simultaneous receipt of an IP flow. Figure

5, for example, depicts a two-way data flow between the actual MAC layer and the OMMA layer on links "A1" and "A2":

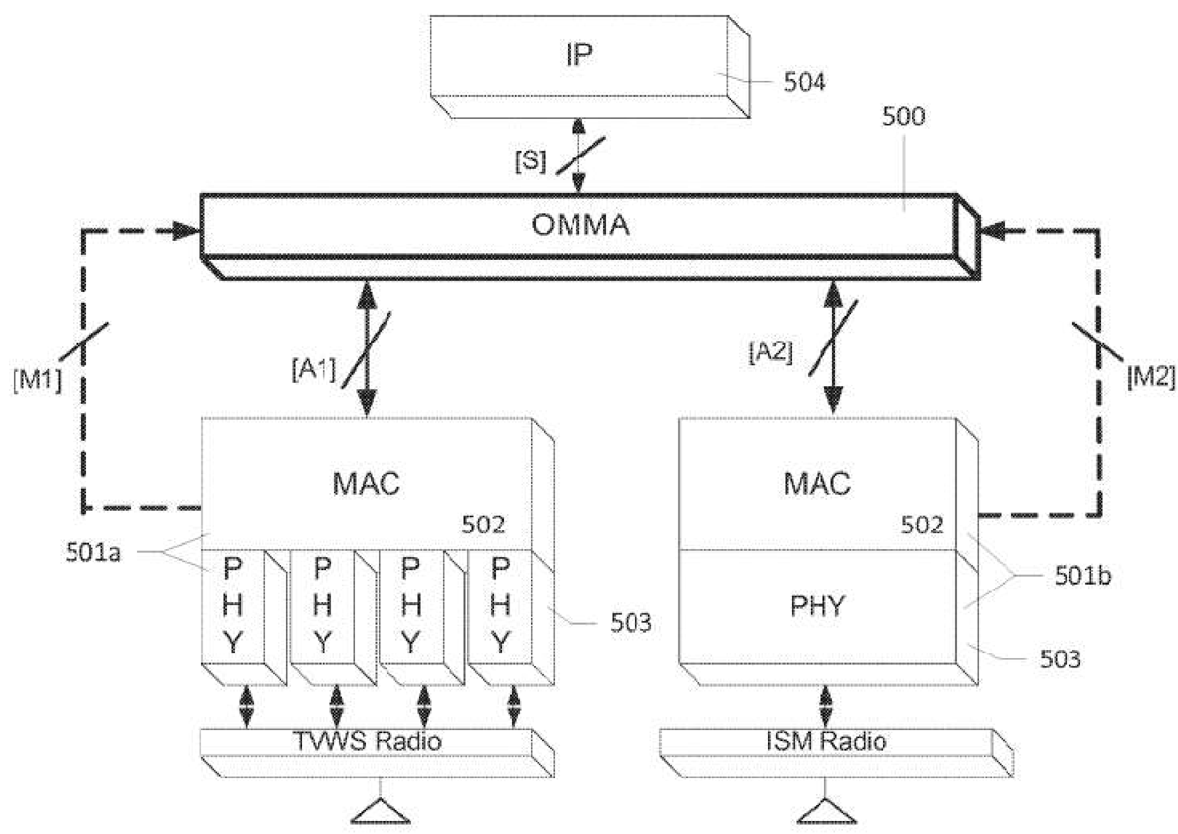


FIG. 5

177. Further, Table 1 of Chincholi describes the "A1" and "A2" links of Figure 5 as involving both the "Incoming" and "Outgoing" MAC MSDUs (MAC service data units). (EX1005 ¶[0138].) Indeed, Chincholi describes that the OMMA layer aggregates bandwidth across multiple RATs, in a manner transparent to higher levels, to either "distribute[]" or "***combine[]***" packets from different RATs. A POSITA would have understood that the ability of the OMMA layer to "combine"

packets relates to combining simultaneously received packets across multiple RATs from a single IP flow prior to transmission up to the IP layer.

178. Second, because Chincholi's system is capable of implementing multiple antenna/RF pairs, each operating on a different specific frequency band (EX1005 ¶[0136]), a POSITA would recognize the ability to implement Chincholi as a simultaneous transmit and receive system.

179. Operating a multi-transceiver system like Chincholi to simultaneously transmit from one transceiver and receive from another was well-known and obvious to a POSITA at the time of the '756 patent. This is explained, for example, in background reference U.S. Patent 10,567,147 ("DiFazio") (EX1010). DiFazio, teaches that a "full duplex" system is one that transmits and receives the radio frequency RF signal simultaneously. (EX1010 at 1:24-26.) This is most often accomplished by implementing "frequency division duplexing (FDD) where the Tx and RX bands may be sufficiently separated in frequency such that filters can adequately attenuate any energy from the Tx signal that would leak into the Rx signal path and otherwise corrupt the Rx signal and prevent proper operation." (EX1010 at 1:26-31; *see also id.* at 16:51-67, 17:48-18:23.) Additionally, DiFazio teaches a "full duplex single channel" (FDSC) capability, wherein a base station may even simultaneously transmit and receive data streams in a single frequency channel. (EX1010 at 13:31-56.)

180. A POSITA would have been motivated to implement a simultaneous transmit and receive functionality into the system taught by Chincholi to achieve greater network efficiency and throughput. As DiFazio teaches, for example, the ability to simultaneously transmit and receive using FDSC can achieve 70% greater throughput as compared to conventional half-duplex systems. (EX1010 at 16:29-30.) To the extent not explicitly disclosed by Chincholi, implementing a simultaneous transmit and receive functionality into its disclosed system would have been technologically feasible and could be accomplished in straightforward manner with a reasonable expectation of success.

27. Claim 27: The method of claim 26, wherein the transmission of the data stream from the first wireless transceiver is at least partially simultaneous with the reception of the second data stream by the second wireless transceiver.

181. In my opinion, Chincholi/Clegg discloses this limitation. As described for limitation 26[b], Chincholi discloses, and a POSITA would have recognized Chincholi discloses, the second data stream is received by the second transceiver simultaneously with the transmission of the first data stream from the first wireless transceiver, in light of background reference DiFazio. Therefore, Chincholi describes "at least partially simultaneous" reception and transmission.

28. Claim 28: The method of claim 27, wherein the transmission of the data stream from the first wireless

transceiver is simultaneous with the reception of the second data stream by the second wireless transceiver.

182. In my opinion, Chincholi/Clegg discloses this limitation. *See* Claim 27, describing simultaneous reception and transmission. In my opinion, a POSITA would have recognized from the analysis in Claim 27 that the Chincholi/Clegg combination discloses Claim 28.

29. Claim 29: The method of claim 27, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the first wireless transceiver to transmit the data stream to the recipient.

183. In my opinion, Chincholi/Clegg discloses this limitation. Chincholi Figures 4 and 5 show at least three and up to "N" number of antenna/RF front-end pairs, and thus Chincholi discloses at least a third wireless transceiver. For example, Figure 4—a more general block diagram of the architecture set forth in Figure 5—depicts the OMMA layer existing above any number of RATs each with its own transceiver.

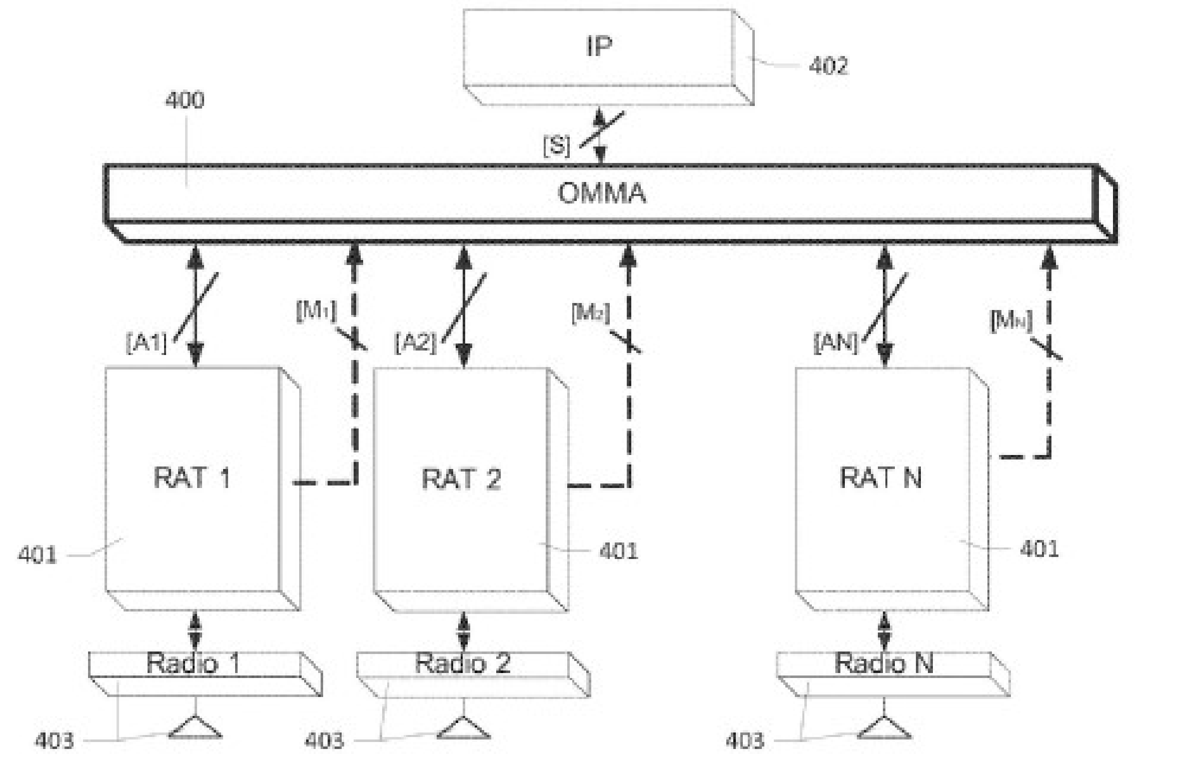


FIG. 4

184. Consistent with Figure 5, Chincholi explains that a given "RAT 401" can comprise a "PHY/MAC," i.e. includes an actual MAC interface. (EX1005 at [0135].) A POSITA would have understood that in a typical 802.11 implementation, each one of the three RATs would have actual MAC and PHY interfaces.

185. A POSITA would recognize from Chincholi's disclosures the ability to aggregate the bandwidth of up to three separate transceivers, with the bandwidth portions of the first and third transceivers being aggregated for simultaneous transmission of the first data stream in the manner discussed for limitation 25[b], and the bandwidth portion of the second transceiver being aggregated for

simultaneous receipt of the second data stream in the manner discussed for limitation 26[b].

30. Claim 30: The method of claim 27, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the second wireless transceiver to receive the second data stream from the recipient.

186. In my opinion, Chincholi/Clegg discloses this limitation. Claim 30 is identical to Claim 29, except the bandwidth portions of the second and third wireless transceivers are aggregated to receive the second data stream. As described in Claim 29, Figure 5 depicts a two-way data flow (transmission or reception) between the actual MAC layer and the OMMA layer on links "A1" and "A2," and Table 1 describes the "A1" and "A2" links of Figure 5 as involving both the "Incoming" and "Outgoing" MAC MSDUs (MAC service data units). (EX1005 ¶[0138].)

187. Thus, a POSITA would recognize from Chincholi's disclosures the ability to aggregate the bandwidth of up to three separate transceivers, with the bandwidth portions of the second and third transceivers being aggregated for simultaneous receipt of the second data stream in the manner discussed for limitation 26[b], and the bandwidth portion of the first transceiver being aggregated for simultaneous transmission of the first data stream in the manner discussed for limitation 25[b].

VII. <u>Ground 2</u>: Patent-Ineligible Under 35 U.S.C. §101

A. No "Inventive Concept" in The Claims

188. In my opinion, the Challenged Claims recite no inventive concept. The language of the Challenged Claims confirms that they merely require conventional networking components that were well-known to a POSITA, *e.g.*: a processing interface, actual and virtual MAC and PHY interfaces, and wireless transceivers. This is further demonstrated in ground 1, which demonstrates how the claims merely recite routine, conventional, and well-known components in wireless communication technology. The claims do not require any specific improvements to the existing technology involving multi-transceiver wireless communication systems. Rather, the claims simply recite generic components doing generic things.

189. As a further example, the claims require that the virtual MAC interface "use the information provided… by the resource monitoring interface to make allocation decisions with respect to first and second bandwidth availabilities." But it does not require a specific manner of using this information and it provides no guidance on how to do so. This same problem permeates all of the claim limitations: *e.g.*, the claim requires operation "in a manner transparent to any layer of the wireless networking device" but it does not say how to implement this transparency.

190. The '198 specification tacitly admits that the purported invention involves nothing more than conventional, routine and well-understood applications. For example, the claimed components and their combination (including the use of

virtual MAC and PHY layers) do not confer an inventive concept because "[t]hose skilled in the art will appreciate that the [described] embodiments… enable wireless networking systems to operate at high levels of performance and with better efficiencies." '198 at 6:11-14; *see also* 10:58-65 (explaining POSITAs will appreciate the benefits of employing linear and radial wireless access system architectures).

191. The remaining Challenged Claims are dependent upon claim 1, and likewise are directed to the abstract idea of evaluating and selecting available communication resources. They add nothing more than routine and conventional techniques such as:

- Requiring the device to be an access point (Claim 14),
- Using frequency bands specified in IEEE 802.11 (Claims 2-3),
- Using conventional functional blocks, interfaces, and components (Claims 4-8, 10-12),
- Timing of functions and position of components (Claim 9, 15-16)
- Bandwidth contiguity and availability, and other conventional information for bandwidth allocation decisions (Claims 13, 17-24), and
- Bandwidth aggregation, simultaneous transmission/receipt, and using multiple transceivers (Claims 25-30).

VIII. <u>Ground 3</u>: Invalid For Lack of Written Description

A. Background

192. On October 29, 2013—well after the releases of 802.11 (Wi-Fi) in 1997 and 802.11n (Wi-Fi 4, which incorporated multiple-input and multiple-output ("MIMO") radio technology) in 2009—the '198 inventor filed U.S. Provisional Applications 61/897,216 ('216 Appl.) and 61/897,219 ('219 Appl.). Beginning in 2021—eight years later and after the release of 802.11ac (Wi-Fi 5) and 802.11ax (Wi-Fi 6 and 6E)—the inventor started filing many new non-provisional patent applications claiming priority to the '216 and '219 Applications. The '198 patent, filed in 2024, is one of the most recent of now 11 patents, spanning well over 250 claims that have been written since 2021. XiFi has asserted in the co-pending litigation that these newly-drafted claims now read upon features required by the latest version of the WiFi specification (802.11be, Wi-Fi 7). (EX1018 ¶2, ¶42.)

193. As I explain below, the Challenged Claims of the '198 patent have gone far beyond the scope of the purported invention disclosed in the specification and are therefore invalid under Section 112.

B. Relevant Summary of '198 Specification

194. The '198 patent describes an alleged problem that wireless architectures were unable to provide adequate resources to efficiently provide optimum range and coverage for wireless network users, and fail to take advantage of resources available. (EX1001 at 1:63-2:2.) To allegedly address this issue, the patent discloses nothing more than a conventional system comprised of results-

oriented components. Specifically, it describes a wireless networking system including a "a processing layer" (*id.* 3:1), which includes a "virtual MAC layer" comprised of a "decision block," "processing block," and "ultra-streaming block" (*id.* 3:9-60). The patent further describes a "virtual PHY layer" that include an "RF block" (*id.* 3:61), and wireless transceivers (*id.* 3:8).

195. The '198 patent describes that the decision block determines the size and type of the data stream, and the type of processing necessary to transmit it. (*id.* 3:41-44.) The processing block then processes the stream and couples to the ultra-streaming block, which manages the processing of streams and substreams given the available resources. (*id.* 3:44-50.) The ultra-streaming block also feeds data to and from the RF block, and monitors available resources. (*id.* 3:50-55.)

196. Neither these disclosures nor the specification conveys that the inventor had possession of the below limitations ("WD Limitations"). Indeed, as I explained in Ground 1, the prior art disclosure of these features is far more robust and detailed than anything in the specification, which establishes that the Challenged Claims are not just obvious, but also invalid for lack of written description support.

C. Deficient Written Description Limitations ("WD Limitations")

1. "in a manner transparent to any layer… above the processing interface" (Claims 1, 18-19, 25-26)

197. In my opinion, there is no adequate written description of this limitation in the '198 specification. All the Challenged Claims recite that the claimed wireless networking device must perform one or more functions "in a manner transparent to any layer… above the processing interface." The specification, however, nowhere mentions operation in a "transparent" manner as claimed—neither the word "transparent" nor any similar concept appears anywhere in the specification.

198. In prosecuting an ancestor patent, Patent Owner did not identify anything in the common specification supporting this limitation. The limitation related to transparency first appeared during prosecution of related U.S. Patent 11,818,591 (hereafter "'591 patent") originally filed on September 7, 2021. On August 8, 2023, Applicant cancelled all originally-filed claims and added 20 new claims, including for the first time this transparency limitation. (EX1017, 8/8/2023 Claims.) Applicant "believed that the… new claims are supported by the application as originally filed," and included a chart mapping to alleged support in the specification. But nowhere did Applicant point to any disclosure related to transparency. (*Id.*, p.13-14 [pointing to the '216 provisional application's Figure 1 layer format, page 2 description about radios, and page 6 description about the RF block, but no disclosure about transparency], p.17 [pointing to the '216 provisional

application's description about the RF block].) Accordingly, in my opinion, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device operating in a manner transparent to any layer above the processing interface.

2. "evaluate at least one data transfer characteristic of a first identified bandwidth portion of each of the first and second wireless transceivers, and (ii) transmit the data stream to the recipient using the first identified bandwidth portion of either the first or second wireless transceiver based upon a comparison of the evaluated data transfer characteristics" (Claim 19)

199. In my opinion, there is no adequate written description of this limitation in the '198 specification. Claim 19 requires evaluation of the data transfer characteristics of a bandwidth portion of each of the wireless transceivers, and compare the evaluated data transfer characteristics for the data stream transmission. Nowhere in the specification is there any description about data transfer characteristics, any evaluation of such data transfer characteristics, or any use of such evaluation to transmit the data stream. Indeed, the written description of the '198 patent never even mentions data transfer characteristics or any relative evaluation of bandwidth portions.

200. The limitations related to data transfer characteristics appeared in the '198 patent family for the first time in the December 7, 2023 patent application that would later issue as the '105 patent. The Examiner issued a notice of allowance for

the ’105 patent without any office action or expressly analyzing whether the applied-for claims were supported by the ’216 and ’219 provisional applications.

201. While the ’198 specification makes some passing references to data transfer cycles (EX1001 at 3:17-22), data transfer rates (*id.* 3:31-33, 8:19-21), data transfer capability (*id.* 4:9, 8:65-66), data transfer efficiency (5:60-61), and data transfer optimization by controlling link transmit and receive times (*id.* 6:18-21), it never discusses any evaluation of data transfer ***characteristics***, and—more importantly—never explains how or what it means to ***evaluate*** data transfer characteristics and ***compare*** them. Indeed, the focus of the ’198 specification is not on transfer characteristics, but on bandwidth requirements and availability. (*E.g.*, *id.* 3:31-33 (“The individual applications, for example, may have different peak bandwidth requirements in terms of data transfer rates”).)

202. Accordingly, in my opinion, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device including evaluation of data transfer characteristics.

3. “resource monitoring interface” (Claims 1, 7-10, 13, 15-16)

203. In my opinion, there is no adequate written description of this limitation in the ’198 specification. Claim 1 of the ’198 requires at least one “resource monitoring interface” formed in the processing interface that provides information regarding the bandwidth availabilities of the transceivers to the virtual MAC

interface. The '198 specification nowhere describes a resource monitoring interface. While the specification describes a virtual PHY layer formed by RF block 112 (3:61), which communicates with the ultra-streaming block about actual resource availability (4:64-66), a generic resource monitoring interface is a broader element that is not supported by mere description of virtual PHY layers. Thus, the '198 patent fails to provide adequate written description support for this limitation because it does not convey to POSITA that the patentee had possession of the ***full scope*** of the claimed invention. *See ICU Med.*, 558 F.3d at 1378 (holding that specification teaching a medical device with a spike failed to support claims for a more generic device without a spike); *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1259 (Fed. Cir. 2004) (holding that written description requirement requires sufficient disclosure to show "the inventor actually ***invented the full scope of the invention*** as finally claimed in the patent") (emphasis added). In my opinion, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device comprising a resource monitoring interface.

4. "the first and second wireless transceivers, respectively . . . are adapted to emit radio waves in first and second different bands of frequencies" (Claim 1)

204. In my opinion, there is no adequate written description of this limitation in the '198 specification. The '198 patent specification fails to provide written

description support for the first and second wireless transceivers respectively adapted to emit radio waves in first and second different bands of frequencies. Nowhere does the specification describe one transceiver operating in one band of frequency and another transceiver operating in a mutually exclusive, different one. Nowhere in the specification does it even use the word "band" or even discuss the allocation of frequency spectrum to the respective transceivers.

205. I understand Patent Owner touts this limitation of using multiple frequency bands, an aspect of multilink operation, as a novel feature in its complaint in the district court case. EX1018 ¶2 ("The claimed inventions enable Samsung to offer superior devices that perform multi-link WiFi operations"), ¶40 ("The XiFi Patents further allow Multi-Link Operation (MLO), which is a significant aspect of Wi-Fi 7. MLO-enabled Wi-Fi 7 devices minimize the significant overhead of switching bands."). But nowhere in the '198 specification is this concept even mentioned.

206. In my opinion, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device wherein the first and second wireless transceivers, respectively, are adapted to emit radio waves in first and second different bands of frequencies.

5. "request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces…" (Claim 1)

207. In my opinion, there is no adequate written description of this limitation in the '198 specification. The '198 patent specification fails to provide written description support for requesting or creating associations between a recipient and MAC and PHY interfaces.

208. Limitations regarding "association" between a recipient and MAC and PHY interfaces first appeared in the '198 patent family during the prosecution of the application that later issued as the '591 patent in an August 8, 2023 amendment. Applicant claimed that there was support in the '216 provisional application. Specifically, Applicant cited a portion at page 6 of the '216 provisional that mentions that an RF block (part of the virtual PHY interface) communicates with the ultra-streaming block (part of the virtual MAC interface), and Figure 1 that shows that the actual PHY layers each contains a radio. (EX1017, 8/8/23 Claims, p.14.) Applicant claimed that this was enough to "indicate, for example, that the processing interface creates an association between a recipient and each one of the… MAC and PHY layers." (*Id.*)

209. In my opinion, these cited portions of the provisional applications identified by applicant during prosecution do not indicate to a POSITA possession

of the claim limitation. Nowhere do the provisional applications explain what the recipient is, or disclose any process of creating an association between the network device's MAC and PHY interfaces and a recipient. The fact that the PHY layers contain radios does not expressly or inherently explain creating associations as claimed. Indeed, radios can broadcast information without making links or associations with recipients.

210. In my opinion, a POSITA reading the specification would not understand that the alleged inventor possessed the claimed wireless networking device comprising a processing interface configured to request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces and (ii) a second association between the recipient and the second actual MAC and PHY interfaces.

IX. Ground 4: Invalid For Indefiniteness

A. "partially simultaneously" (Claim 27)

211. In my opinion, The term "partially simultaneously" is indefinite because it is a term of degree, and the patent fails to provide sufficient guidance for determining its scope. The claims here are particularly problematic, because it involves one term of degree ("partially") upon another potential term of degree ("simultaneous") compounding uncertainty to a POSITA.

212. Here, nothing in the claims or intrinsic record provide guidance regarding what degree of simultaneity qualifies as "partially" simultaneous. For example, it is not clear whether transmission or receipt of a data stream within one microsecond, millisecond, second, or minute is within the scope of "partially" simultaneous or simultaneous (as used in claim 28). It is entirely unclear whether the claimed simultaneity/partial simultaneity requires simultaneity with respect to the beginning of transmission/receipt of two data streams, simultaneity with respect to the end of transmission/receipt of two data stream, or requires perfect overlap between the duration of two data streams. Because the '198 patent recites both "partially simultaneous" and "simultaneous," there must be a difference between the two terms. But the specification fails to provide any objective guidance to understand what would be "partially" simultaneous compared to "substantially" simultaneous.

213. My opinion here is consistent with my opinion regarding obviousness because Chincholi discloses simultaneous transmission and receipt, thus meeting any degree of "partially" or "substantially" simultaneous. As such, the prior art I identify clearly discloses these limitations regardless of the ambiguity.

B. "partially satisfy" (Claims 1, 18, 25)

214. The term "partially satisfy" is indefinite because it is a term of degree, and the patent fails to provide sufficient guidance for determining its scope. Here,

nothing in the claims or intrinsic record provide guidance regarding what qualifies as "partially" satisfying the bandwidth requirement of a data stream. For example, for an application with a peak bandwidth requirement of 750 Mbps, it is not clear whether aggregating bandwidth portions of two transceivers to allocate 1, 5, or 10 Mbps would qualify as "partially" satisfying the bandwidth requirement of the data stream. Additionally, the specification discusses only situations that *satisfy* the bandwidth requirement, never *partially*. (*See, e.g.*, EX1001 at 2:63-64, 4:38-39, 4:55-56). Indeed, within the context of the claims, a POSITA would not understand what it would mean to "partially" satisfy a bandwidth requirement, as it implies a system that may allocate bandwidth portions of multiple transceivers yet still fall short of satisfying the peak bandwidth requirement of the application by some indeterminate amount. Thus, the specification fails to provide any objective guidance to understand how far short the system can fall from satisfying the application bandwidth requirement while still falling within the scope of "partially satisfying" the requirement.

215. My opinion here is consistent with my opinion regarding obviousness because Chincholi discloses fully satisfying the bandwidth requirement of the applications, and fully satisfying the bandwidth requirement encompasses "partially satisfying."

X. Conclusion

216. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

* * *

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on the information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Respectfully submitted,

/s/ Kevin C. Almeroth

Date: July 21, 2025

Kevin C. Almeroth, Ph.D.