

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,

Petitioner,

v.

OZMO LICENSING LLC,

Patent Owner

Case No. IPR2023-00193

U.S. Patent No. 9,264,991

DECLARATION OF DR. JACOB SHARONY

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I, Dr. Jacob Sharony, declare as follows:

I. INTRODUCTION

1. I am over the age of 18 and otherwise competent to make this declaration.
2. I have been retained by Ozmo Licensing LLC (“Patent Owner” or “PO”) as an independent technical expert consultant in this proceeding. I am being compensated at my usual rate of \$ 550 per hour for my work. No part of my compensation is dependent on my opinions or on the outcome of this proceeding. I have no financial interest in any of the parties to this proceeding.
3. I submit this Declaration in support of Patent Owner’s Response to the Petition filed by Unified Patents, LLC in Inter Partes Review No. IPR2023-00193 (“the Petition”).
4. I have over 35 years of experience working in mobile and wireless technologies. My work has resulted in over 50 issued patents and numerous publications in scientific journals and conferences.
5. Since 2010, I have been an Adjunct Professor in Electrical Engineering at Columbia University, teaching graduate level courses on advanced wireless technologies including in the areas of wireless sensing and Auto ID technologies, mmWave communications, and applications for 5G wireless networks and systems.
6. I have served on various government expert panels, including for the

National Science Foundation and National Institutes of Health.

7. I received a Bachelor's Degree (1979) and Master's Degree (1984) in Electrical Engineering from Tel Aviv University as well as M.Phil. (1991) and Ph.D. (1993) Degrees in Electrical Engineering from Columbia University. I also have an M.B.A. Degree (1989) from Tel Aviv University.

8. I have been involved with mobile and wireless networking technologies since the mid-1990s, and during my career have witnessed the change from voice-centric to data-centric networks. For nearly three decades, I have worked as a researcher, developer, and educator on wireless wide, local, and personal area networks (WWAN, WLAN, and WPAN) infrastructure and mobile devices. I have also worked on enterprise mobility products and solutions since the late 1990s.

9. After obtaining my Ph.D., I led the advanced mobile networking group at BAE Systems, developing tactical mesh-based wireless network systems for the United States Department of Defense. I also conducted research and development in advanced mobile and wireless networks. My work resulted in several issued patents, including U.S. Patent No. 5,652,751, titled "Architecture For Mobile Radio Networks With Dynamically Changing Topology Using Virtual Subnets," and U.S. Patent No. 5,742,593, titled "On-line Distributed TDMA/FDMA/CDMA Link Assignment in Mobile Radio Networks With Flexible Directivity."

10. From 1997 to 2005, I held various positions at Symbol Technologies

(acquired by Motorola Solutions). While working at Motorola/Symbol, I gained substantial experience in application-specific mobile devices and wireless networking and architecture solutions in several vertical applications, *e.g.*, transportation and logistics, healthcare, warehousing, retail, and education. As Senior Director, Research and Development, I initiated and led several research and development programs in wireless LAN (local area network) technologies, including mobile device management and security. As Senior Director, Technology Strategy and Development, I was responsible for the research and development of new mobile applications for delivering multimedia-rich content to mobile devices connected over heterogeneous networks. That work resulted in several U.S. patents, including U.S. Patent No. 7,778,649, titled “System and Method for Asset Location in Wireless Networks,” U.S. Patent No. 6,853,293, titled “Wearable Communication System,” U.S. Patent No. 7,039,358 titled “Coexistence Techniques in Wireless Networks,” and U.S. Patent No. 6,925,094, titled “System and Method for Wireless Network Channel Management.”

11. In 2004, I founded Mobius Consulting, a consulting firm providing professional services in mobile wireless strategy, technologies, systems, and applications, including enterprise mobility, wireless communication networks, mobile embedded devices, device management, and mobile applications and services. In this capacity, I have worked with many companies in the mobile and

wireless ecosystem, including service providers and operators, equipment vendors, and semiconductor companies. Since founding Mobius Consulting, I have worked with many enterprises interested in deploying mobile and wireless solutions to become more productive, efficient, and cost effective. These solutions spanned numerous industry sectors and involved various mobile and wireless technologies including 3G/4G/5G Cellular, Wi-Fi, Bluetooth, ZigBee, and RFID. That work resulted in several U.S. patents, including U.S. Patent No. 9,014,702, titled “Location Processing in Small Cells Implementing Multiple Air Interfaces,” U.S. Patent No. 9,088,923, titled “Small Cells Implementing Multiple Air Interfaces,” and U.S. Patent No. 10,080,177, titled “Unlicensed Spectrum Offload Architecture for Small-Cell Base Stations.”

12. Additional details on my background and experience can be found in my *Curriculum Vitae*, filed herewith as Ex. 2005.

II. THE '991 PATENT, THE REFERENCES RELIED UPON, AND THE GROUNDS OF INSTITUTION

A. U.S. Patent No. 9,264,991

13. The '991 Patent discloses a method and system for integrating short-range wireless personal area networks (“WPANs”) into longer-range wireless local area networks (“WLANs”). *See* Ex. 1001, 1:17-21. Specifically, it discloses a *hub, usable for facilitating data communications between two or more wireless devices, one belonging to a WLAN running a WLAN protocol, and the other belonging to a*

WPAN *running a WPAN protocol*, which devices are configured to communicate indirectly with each other, via the network-enabled hub, which itself directly forwards traffic from one of the WPAN or WLAN devices, to the other of the WPAN or WLAN devices. *See* Ex. 1001, 14:39-15:3.

14. An example of a WLAN is an 802.11x (x = a, b, g, n & etc.) network. The 802.11x standard, commonly known as “Wi-Fi,” has been widely deployed for wireless connectivity since its adoption in a variety of settings including in homes, offices, and public establishments. 802.11x WLANs generally support two different configurations: infrastructure mode and ad-hoc mode. *See* Ex. 1001, 1:32-45 and 1:61-63.

15. An 802.11x WLAN configuration in infrastructure mode requires a dedicated access point (“AP”) to manage connections to the Internet or other WLANs for all the STAs that are associated with it. Additional 802.11x-compliant wireless circuits (“stations” or “STAs”), such as laptop computers, desktop computers, tablet computers, mobile phones, printers, smart televisions, and the like, join an infrastructure mode WLAN, to communicate with each other, or to communicate with STAs of other WLANs, *only* by authenticating and associating with an AP (Ex. 1001, 2:5). Association can be a slow process relative to the latency that can be required by an STA (Ex 1001, 10:31-40). Once a STA associates with an AP, all its communications are routed through the AP with

which it has associated. *See* Ex. 1001 at 1:63-2:13.

16. Devices in a WPAN generally are able to communicate directly without the need for an intermediary device such as an AP to manage connections. The most common example of a WPAN at the time was a Bluetooth network. *See* Ex. 1001, 2:14-22.

17. By contrast, a Wi-Fi 802.11x ad hoc mode STA such as a wireless computer may directly *communicate point-to-point with any other ad hoc mode STA such as another wireless computer* that happens to be physically in range, not directing any of its point-to-point communications with the other STA through an AP. There is no association process in ad hoc WLANs (all connections are made on an “ad hoc” basis). *See* Ex. 1029, pp. 23-24.

18. WPANs, unlike WLANs, are designed to extend a computer’s functionality to peripheral devices including headphone speakers and printers for example. A typical WPAN is a computer in wireless communication with such peripherals.

Devices in a WPAN generally are able to form networks and communicate directly with each other within those WPANs, without the need for an intermediary device such as an AP to manage connections. The most common example of a WPAN at the priority date of the challenged patent was a Bluetooth network, which could wirelessly interconnect a computer to locally located headphone speakers without going through an AP. *See* Ex. 1001, 2:14-22.

19. Bluetooth WPAN devices operate in the same 2.4-GHz frequency band in which infrastructure and ad hoc mode WLAN devices frequently operate. The co-existence or co-location of WPAN and WLAN communication protocols in a single frequency band often results in severe interference due to their varying methods of accessing the wireless medium and a lack of synchronization between them. Furthermore, a device's ability to operate in a WLAN or a WPAN may be limited by the hardware and software capabilities of the device, as the Bluetooth WPAN and 802.11 WLAN often require different transceiver integrated circuits and may also require different antennas. While the disharmonious coexistence of Bluetooth WPANs and 802.11 WLANs had long been tolerated, there remained a need for a solution that could seamlessly integrate WPAN and WLAN communication protocols. *See* Ex. 1001, 2:29-36; 3:20-24.

20. The '991 Patent notes that the prior art efforts to address these issues were insufficient. For example, one option was to use WLAN protocols, including ad hoc WLAN protocols, in WPAN devices. But this led to power dissipation and/or low transmission rate problems, since WPAN protocols were designed to operate over shorter distances (within a user's range of his/her wireless computer) and communicate point-to-point computer-to-peripheral traffic, whereas WLANs (including ad hoc WLANs) were designed to operate over longer distances and communicate over areas associated with local area networks such as offices or

homes. Using WLAN protocols in WPAN devices could also introduce undesirable amounts of latency in communications involving the WPAN devices.

See Ex. 1001, 2:37-3:6.

21. The '991 Patent further describes noise, linearity and/or overhead protocol problems with integrating then-existing WPAN and both ad hoc / infrastructure mode WLANs. For example, WLANs typically operated at relatively high data rates compared to WPANs, and abide by a rule requiring some of the communication between an AP and its associated STAs to occur at the lowest common data rate supported by all STAs connected to that AP. It was thus undesirable to have a STA included in a WLAN, that was also communicating with a device in a WPAN (which operated at a data rate that was lower than the data rates supported by any of the nodes on the WLAN), as this will slow down the entire WLAN. *See* Ex. 1001, 3:3-19.

22. Also, although the 802.11x standard specifies power save modes that allow forms of power savings, there was still a need to enable power save modes that were better optimized to meet the needs of WPAN devices such as wireless headphone peripherals. *See* Ex. 1001, 3:15-19.

23. The '991 Patent discloses an apparatus that provided a technical solution to these unsolved technological problems by integrating a WPAN into a WLAN infrastructure, without subjecting the WPAN to the foregoing problems that arose

when using WLAN protocols in WPAN devices. *See* Ex. 1001, 3:20-33. The '991 Patent improved upon existing wireless communications, which were unable to integrate a WPAN into a WLAN infrastructure without suffering from one or more of the aforementioned problems, by deploying a novel hub designed to forward traffic between a WPAN and a WLAN. The hub initiates *and* maintains connections with a node of an external wireless network (typically a WLAN) via a first network connection using a first network protocol, *and* a node of a second external wireless network (typically a WPAN) via a second network connection using a second network protocol that is an overlay protocol with respect to the first network protocol in that the second network protocol is partially consistent with the first network protocol. *See* Ex. 1001, 14:39-15:3. In doing so, the '991 Patent taught both (1) a novel WPAN protocol that was an overlay of a WLAN protocol and that was partially consistent with the WLAN protocol, and (2) a hub capable of *forwarding* traffic between one external device using a standard WLAN protocol, and another external device using the new WPAN protocol. This combination of features in the hub allows it to better integrate a WPAN into a WLAN. *See id.*

24. Compared to the prior art, the claimed apparatus for integrating a WPAN into a WLAN is more cost effective to design, since the communications using the second network protocol impinge on at least some antennae used for communications using the first network protocol. *See* Ex. 1001, 8:64-65.

25. Compared to the prior art, the claimed wireless apparatus for integrating a WPAN into a WLAN allows the two networks to operate in the same frequency spectrum without causing excessive interference with each other. *See* Ex. 1001, 9:52-66.

26. Compared to the prior art, the claimed wireless infrastructure for integrating a WPAN into a WLAN is also more energy efficient, which can extend the battery life of WPAN devices that are battery powered. *See* Ex. 1001, 9:16-24.

27. In addition, compared to the prior art, the claimed wireless infrastructure for integrating a WPAN into a WLAN, also enables lower latency communication involving WPAN devices. *See* Ex. 1001, 10:31-65.

B. References Relied Upon in the Petition and Grounds of Institution

28. Dr. Haas relies on various combinations drawn from a pool of four references: U.S. Patent No. 7,389,352 (“Cromer,” Ex. 1004); S. Ganu *et al.*, *Architecture and Prototyping of an 802.11-Based Self-Organizing Hierarchical Ad-Hoc Wireless Network (SOHAN)* (“Ganu,” Ex. 1005); International Pub. No. WO 2006/000617 (“Sinivaara,” Ex. 1006); and International Pub. No. WO 01/52447 (“Judd,” Ex. 1019).

29. I am informed by counsel for Ozmo that these references all qualify as prior art. I briefly summarize the disclosures of these references below.

C. U.S. Patent No. 7,389,352 (“Cromer”) (Ex. 1004)

30. Cromer recognized that a limitation of Wi-Fi technology (*i.e.*, 802.11 technology) in supporting WPAN environments was that it did not allow a single client device, such as a personal computer (PC), to support both infrastructure and point-to-point (or “peer-to-peer”) environments using a single Wi-Fi subsystem (or adapter), thereby requiring a PC to include two separate Wi-Fi subsystems, one for each environment. *See* Ex. 1004, 1:46-55; Ex. 2006 at 22:4-8, 26:13-17, 36:1-37:5. Cromer sought to avoid the increased costs arising from including two different Wi-Fi subsystems in a computer system such as a PC. *See* Ex. 2006 at 36:1-37:5.

31. To solve this problem, Cromer teaches a client device 100 that uses a single Wi-Fi subsystem to operate concurrently in both infrastructure mode and ad hoc mode by using a watchdog timer to switch between the two modes. In infrastructure mode, the Wi-Fi subsystem of Cromer loads information included in an infrastructure register 110 (Layer 1), and the client device 100 controls the Wi-Fi subsystem using an infrastructure driver 120 (Layer 2) to send and receive information over the network. Likewise, in ad-hoc mode, the Wi-Fi subsystem of Cromer loads information included in an ad-hoc register 130 (Layer 1), and the client device controls the Wi-Fi subsystem using an ad-hoc driver 140 (Layer 2) to send and receive information over the network. *See* Ex. 1004, 3:24-38 and FIGs. 1 and 2.

32. The client device 100 of Cromer is described as a user device, such as a PC. *See* Ex. 2006 at 22:4-8, 26:13-17. In particular, it is described as a user's client device that can display a presentation stored on it by interfacing with a projector over an ad hoc connection in one time slot, and can then request access to the Internet (the purpose of such access is not described) over an infrastructure connection in another time slot. *See* Ex. 1004, 2:1-13.

33. Cromer does not disclose that the client device can act as a hub that forwards traffic between a node in a WPAN and a node in a WLAN; it does not indicate that the client device can for example get a video file or any other file from the internet, and forward it to any peripheral, including the projector. *See* Ex. 1004.

D. S. Ganu *et al.*, Architecture and Prototyping of an 802.11-Based Self-Organizing Hierarchical Ad-Hoc Wireless Network (SOHAN) ("Ganu") (Ex. 1005)

34. Ganu teaches a self-organizing hierarchical ad-hoc WLAN to provide improvements in system capacity and performance relative to "flat" ad-hoc WLANs. *See* Ex. 1005 at pg. 880, col. 1. According to Ganu, the "proposed hierarchical ad-hoc network is motivated by the fact that flat ad-hoc architectures do not scale well as the number of radio nodes becomes large." *See* Ex. 1005, pg. 880, col. 1. Ganu has nothing to do with infrastructure mode WLANs.

35. The hierarchical network of Ganu includes low-power end-user "mobile nodes" (MNs) at a lowest routing tier, higher-power radio "forwarding nodes"

(FNs) that support multi-hop routing at a middle routing tier, and wired access points (APs) that provide connections to the Internet at a highest routing tier. *See* Ex. 1005, pg. 880, col. 2 and Figure 1. The highest tier APs of Ganu are capable of connecting to any lower tier FN or equivalent tier AP within range. Turning to the Ganu APs in particular, unlike typical 802.11 WLAN infrastructure mode APs, the APs of Ganu operate in ad-hoc mode. *See* Ex. 1005, pg. 881, col. 1.

36. The FNs of Ganu's prototype system included two interfaces, one to communicate with other equal routing tier FNs and lower tier MNs, and another to communicate with highest routing tier APs, with the two interfaces each operating on different channels to minimize interference with one another. *See* Ex. 1005, pg. 881, col. 2.

37. The network architecture of Ganu self-organizes in a discovery phase, during which ad hoc mode wi-fi beacons generated by an application running on an ad-hoc Wi-Fi protocol stack are sent by FNs and APs, while MNs running an ad-hoc Wi-Fi protocol stack scan different channels, listen to the ad hoc Wi-Fi beacons, and send an "association" message to the best "cost" higher tier FN or AP using a discovery metric the MN receives from other nodes in the network. The "association" message basically tells a node in the Ganu network to route traffic to a particular higher tier FN or AP as a next hop in the network (this "association" message is therefore not the same as an infrastructure mode Wi-Fi "association")

message, which tells an STA the particular AP that will communicate all inbound and outbound network traffic to/from the STA). The discovery metric is a transmit power of each outgoing beacon from the APs/FNs and a received signal strength for each incoming beacon at the MNs; each MN uses these metrics to select as a next-hop FN (or AP) node for outbound network traffic from among the many nodes that the MN can see, and seeks to minimize transmit power it needs to use, or maximize the received signal strength it is getting, in selecting a next hop FN node. *See* Ex. 1005, pg. 882, cols. 1-2.

38. The FNs and APs exchange entries to be inserted in local neighbor tables on each node, the tables indicating at each such node, which other APs and FNs can exchange traffic with that node, and the transmit power and received signal strength when traffic is exchanged with a particular other FN. This exchange enables each node to efficiently route data between MNs and APs (via FNs) using the connection requiring each MN to spend the least amount of transmit power, with each FN maintaining a latest, most up-to-date best-cost (i.e., lowest transmit power) path toward an AP. Also, if routings table entries for a particular node are not populated, connections between the node with the missing table entry and the node that is the subject of the missing entry are not maintained, meaning the latter FN is disconnected from the network, a routing failure occurs and packets to/from that FN are discarded. *See* Ex. 1005, pg. 881, col. 2 and Table 1.

E. International Pub. No. WO 2006/000617 (“Sinivaara”) (Ex. 1006)

39. Sinivaara teaches methods of enabling a short-range wireless device to operate in an ad-hoc Wi-Fi mode without leaving another Wi-Fi infrastructure network by disassociation. *See* Ex. 1006, 3:14-17. Sinivaara teaches that a drawback of contemporary networks was that, if a user enters an ad-hoc operation mode, an existing association with an infrastructure network is lost, and the user’s terminal must then repeat authentication to form a new association with the infrastructure network to re-associate with the infrastructure network. *See* Ex. 1006, 2:25-34. To solve this problem, Sinivaara teaches that the terminal moves to spoof/feign a power save state with respect to the infrastructure network, thus avoiding disassociating from the infrastructure Wi-Fi network, when also operating in a Wi-Fi ad-hoc mode. In particular, Sinivaara sets forth a procedure in which the device’s operations in the ad-hoc network take place while the device is on a power save state with respect to the Wi-Fi infrastructure mode network, and then the Wi-Fi ad hoc mode operations are suspended at regular intervals such that the terminal can occasionally receive beacons of the infrastructure network to remain associated with the infrastructure network. *See* Ex. 1006, 3:18-33.

F. International Pub. No. WO 01/52447 (“Judd”) (Ex. 1019).

40. Judd teaches repeaters for use in wireless communication systems. *See* Ex. 1019, 1:4-5. Judd further teaches that such repeaters include features which

improve isolation between antennas, thereby achieving greater system gain and extended system range. *See* Ex. 1019, 1:13-20.

G. Grounds of institution

41. The grounds are summarized in the table below:

Ground	'991 Patent Claims	Primary Reference	Secondary Reference(s)	Type of Challenge
1	1, 3-4, 6-7, 14, and 16-17	Cromer	Ganu	pre-AIA 35 U.S.C. § 103
2	1, 3-4, 6-7, 14, and 16-17	Cromer	Ganu, Sinivaara	pre-AIA 35 U.S.C. § 103
3	15, 18	Cromer	Ganu, Judd	pre-AIA 35 U.S.C. § 103
4	15, 18	Cromer	Ganu, Sinivaara, Judd	pre-AIA 35 U.S.C. § 103

42. The challenged independent claim is as follows.

43. Independent Claim 1 reads:

A network-enabled hub, usable for facilitating data communications between two or more wireless devices that are configured to communicate indirectly with each other via the network-enabled hub, comprising:

an interface to a wireless radio circuit that can send and receive data wirelessly, providing the hub with bi-directional wireless data communication capability;

a processor configured to:

process data received via the wireless radio circuit;

generate data to be transmitted by the wireless radio circuit;

initiate and maintain network connections with nodes of a wireless network external to the network-enabled hub, maintaining at least a first network connection using a first network protocol and a second network connection using a second network protocol, that can be maintained, at times, simultaneously with each other, wherein the second network

protocol is an overlay protocol with respect to the first network protocol in that communications using the second network protocol are partially consistent with the first network protocol and wherein at least some of the communications using the second network protocol impinge on at least some antennae used for communications using the first network protocol; and

implement data forwarding logic, implemented in a network-enabled hub using hardware and/or software, that forwards data between an originating node and a destination node, wherein the originating node is a node in one of the first and second networks and the destination node is a node in the other of the first and second networks.

III. RELEVANT LEGAL STANDARDS

A. Law Regarding Obviousness

44. I am not a lawyer, so I have been informed on relevant aspects of patent law by counsel for Ozmo. I do not offer any legal opinions in this Declaration.

45. I am informed that claims of a patent must be both new (i.e., “novel”) and non-obvious in order to be valid. I am further informed that the Petition does not allege that any claim of the ’991 patent is not novel.

46. I am further informed by counsel for Ozmo that a novel claim can be rendered invalid as obvious if the differences between the claim and the prior art are such that the claim as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art (“POSITA”) to which the claim pertains. Considerations concerning this inquiry include the scope and content of the prior art, the differences between the prior art and the claim, the level of ordinary skill in the art, and other objective indicia, or

so-called “secondary considerations,” of non-obviousness.

47. I am further informed by counsel for Ozmo that secondary considerations of non-obviousness include commercial success of products covered by the claims, a long-felt but unsolved need for the invention, failed attempts by others to make the invention, copying of the invention by others, unexpected results achieved by the invention as compared to the closest prior art, praise of the invention by others in the field, expressions of surprise by experts and POSITAs at the invention, as well as other factors. I am informed, however, that these secondary considerations apply only if an appropriate nexus can be made between any of these considerations and the claimed invention itself.

48. I am further informed by counsel for Ozmo that all of the above analyses should be made from the perspective of a POSITA. I am informed that such a POSITA is of average skill, intelligence, and ability in the relevant field. I am informed that a POSITA is not an expert, but also is not an “automaton,” but rather possesses ordinary knowledge, skill, and creativity. I am further informed that a POSITA is assumed to be aware of all of the prior art in the relevant field, which he or she can arrange “like pieces of a puzzle.” I am also informed, however, that there must be some objective reason for a POSITA to combine prior art references, be it a motivation to combine that is present in the prior art, or from the common sense and ordinary creativity of a POSITA. It is my understanding that this is to

guard against what is known as “hindsight bias,” that is, using the claims themselves or the novel teachings of the subject patent as a guide to combining prior art references.

B. Person of Ordinary Skill in the Art

49. I have read Dr. Haas’ opinion regarding the level of ordinary skill in the art, and in my opinion it is reasonable. *See* Ex. 1003, ¶¶ 42-45. Based on my education and experience, I am familiar with the level of ordinary skill of a POSITA around 2005, and I believe I am qualified and capable of viewing the ’991 Patent and prior art from that perspective.

C. Claim Construction

50. I am informed by counsel for Ozmo that a federal district court has construed several terms from the ’991 Patent (and other related patents). *See* Ex. 1010; Ex. 2002.

51. In my opinion, for the reasons provided below the district court’s construction of “overlay protocol” is germane to this proceeding. The court construed “overlay protocol” to mean “a protocol governing a second network, which protocol has aspects in common with a first network protocol to reduce interference such that the second and first networks can co-exist.” *See* Ex. 1010 at pgs. 23-26, 36; Ex. 2002 at pgs. 6-7.

52. In addition, in my opinion, for the reasons provided below the district

court's construction of "partially consistent/partially compliant" is also germane.

The court construed "partially consistent/partially compliant" to mean "conforms to a part, but not the entirety of." *See* Ex. 1010 at pgs. 27-31; Ex. 2002 at pg. 2. In my opinion, this construction includes some notion of rule breaking or violation. For example, in a WLAN an infrastructure AP cannot go to sleep and should be always available to its clients, but in the WPAN of the invention this rule is violated and the "hub" (which serves virtually as an AP for its WPAN devices) coordinates mutually agreeable inactivity periods so it can leave the WPAN and go back to the WLAN. *See* Ex. 1001, 11:44-50.

53. In view of having been informed by counsel for Ozmo that claim terms need not be construed unless required to resolve a dispute between the parties (and then only to the extent that such terms require construction), it is my opinion that no claim constructions are needed for the other claim terms that are discussed herein.

54. It is my understanding that Dr. Haas, the Petitioner's retained expert, has construed the words of the claims according to their plain and ordinary meanings, except for the term "data forwarding logic," which he has also alternatively construed as a so-called "means-plus-function" term. *See* Ex. 1003, ¶¶ 32, 36-39.

IV. GROUND 1: COMBINATION OF CROMER AND GANU

A. There Would Have Been No Motivation to Combine Cromer and Ganu.

55. In my opinion, the combination of Cromer and Ganu does not render any

challenged claim obvious because there would have been no motivation for a POSITA to combine these references.

56. Cromer discloses a client device capable of being a node in an 802.11 Independent Basic Service Set (“IBSS”) WPAN (*i.e.*, a node configured to be in an “ad hoc mode”). *See* Ex. 1004, 5:36-42, 46-52, 60-65; Fig. 5; Ex. 2006 at 22:4-8, 26:13-17. A POSITA at the time would have known that an 802.11 ad hoc node can communicate directly with other nodes in the same ad hoc network, but *generally* not with nodes in other WLANs, e.g., nodes in an 802.11 infrastructure network. *See* Ex. 1029 at pp. 23-24. Though Petitioner claims a POSITA would have used the particular teachings of Ganu, to add to the Cromer node 100 the ability to route and therefore forward traffic from an ad hoc Wi-Fi node to an infrastructure Wi-Fi node, simple techniques for enabling such routing and forwarding were already widely known rendering such a Cromer-Ganu combination useless.

57. Dr. Haas quotes from the prior art publication “Network Security Bible” that “[c]ommunication outside of the [ad-hoc] cell can take place if a cell member operates as a routing service.” Ex. 1003, ¶ 86; Ex. 1028, p. 398. I agree with Dr. Haas that a POSITA at the time would have known that a node in a wireless ad hoc network could provide a routing service, *e.g.*, a dual-network device or “hub,” on behalf of other nodes in the network. *See id.* Wireless routers were known at the

time, and wireless routing functionality could be included in wireless devices by those of ordinary skill in the art at the time. For example, wireless mesh networks were known, wherein nodes could send, receive, and relay wireless signals. For example, U.S. Pat. No. 5,652,751, of which I was the inventor and was issued on July 29, 1997, teaches an architecture for a radio mesh network having mobile nodes, where a communication path between a source node and a destination node is routed by intermediate nodes. *See* Ex. 2007, Abstract.

58. Cromer further discloses that the wireless device could operate in a “dual configuration mode” in which it could maintain concurrent connections with an 802.11 WPAN (i.e., an IBSS) and an 802.11 WLAN (*i.e.*, a BSS or ESS). *See* Ex. 1004, 5:38-45, 5:66-6:23; Fig. 5.

59. Thus, Cromer’s wireless device had all the hardware components, and at least most of the software components, needed to serve as a “routing service” for the 802.11 ad hoc network disclosed in Cromer. *See* Ex. 1004, 6:24-25; 7:7-45; Fig. 6; Fig. 7.

60. Given the above, it would have been well within the ability of a POSITA at the time to add to Cromer’s wireless device a “routing service provider” (*i.e.*, a “hub”) capable of facilitating communications between a node in a WLAN and a node in a WPAN, thus rendering any combination with Ganu pointless. This facilitation of communications could have been implemented by simply adding

forwarding and routing software to the Cromer client device that is located between the ad hoc WLAN and the infrastructure mode WLAN. See for example, US2004/0071123 published on April 15, 2004 and titled “Apparatus and Method for Linking Bluetooth to Wireless LAN.” *See* Ex. 2008 at [0009]-[0010]. At the time, 802.11 packets already had three address fields: Destination Address, Source Address, and (I)BSSID. *See* Ex. 1029 at pp. 43-44. Frames from an AP also had “ToDS” and “FromDS” fields, to inform higher layer protocols in STAs of higher layer routing parameters. *See* Ex. 1029 at p. 44. This would have been all the information needed by a POSITA for Cromer’s wireless device to serve as a virtual AP or router for the ad hoc IBSS once standard routine software is added to the Cromer device.

61. Therefore, a POSITA would have had no need to look elsewhere besides Cromer, since the knowledge and creativity possessed by a POSITA would have lead him/her to easily create a dual-network wireless device capable of forwarding packets between Cromer’s AP and peripherals and vice versa. Moreover, there would have been no interference issues for a POSITA to solve in such a scenario, because infrastructure mode 802.11x WLANs and ad hoc mode 802.11x WLANs do not interfere with one another.

62. Thus, such a POSITA would not have found it necessary or even prudent to incorporate “a protocol governing a second network [*e.g.*, an 802.11 ad hoc

network], which protocol has aspects in common with a first network [*e.g.*, an 802.11 infrastructure network] protocol to reduce interference such that the second and first networks can co-exist,” (*i.e.*, an “overlay protocol” as construed by the district court) because co-existence would not have been a problem in the “modified” Cromer “network-enabled hub” system described above.

63. Cromer makes no mention of interference or “co-existence” problems. *See* Ex. 1004. In my opinion, that is because Cromer’s system would not have experienced such problems. Cromer’s unmodified wireless device was already capable of being configured as a node in an 802.11 infrastructure network (WLAN) and as a node in an 802.11 “ad hoc” network (WPAN). Ex. 1004; 1:63-

67. A POSITA would have understood and appreciated that there were many ways of reducing interference between two 802.11 networks without modifying a network protocol. For example, if the two networks were operating on different channels, interference between them would be minimal. Conversely, if the two networks were using the same channel, devices within range of both networks would hear frames from both networks and would avoid interference via the CSMA-CA techniques specified in the 802.11 standard, to which both Cromer’s WLAN and WPAN devices would have conformed. *See* Ex. 1004, 1:24-26, 2:7-13; Ex. 1029, pp. 41-42.

64. Moreover, Ganu does not disclose a plurality of overlapping wireless

networks at all, but rather is directed to the entirely different problem of improving system capacity and performance relative to conventional “flat” ad hoc networking approaches. *See* Ex. 1005, p. 880. Dr. Haas appears to agree with my view of the problem taught by Ganu. *See* Ex. 2006 at 54:1-3, 54:5-55:21, 60:10-14, 61:9-12, 61:14-15, 62:9-14. Thus, a POSITA at the time would not have had any reason at all to look to Ganu for guidance in modifying Cromer’s client device to serve the additional role of a wireless hub between nodes in Cromer’s WLAN and WPAN networks.

65. It is my understanding that Dr. Haas opines that wireless interference and co-existence were known issues at the time, so a POSITA would have been drawn to Ganu for its teachings of FNs and implementation of an overlay protocol to apply to Cromer’s system, even though Cromer is silent regarding interference between different co-located wireless networks. *See* Ex. 1003, ¶ 143. Dr. Haas admits that Cromer’s system is designed, not to address any co-existence or interoperability problems between two networks by implementing the claimed hub, but instead for a completely different purpose: to overcome the “limitation” that, with “technology that existed prior to Cromer,” connecting separately to two different networks “would require a computer system”—e.g., a user device, such as a PC—“equipped with two Wi-Fi devices, [thereby] increasing a computer system’s equipment cost.” Ex. 2006 at 22:4-8, 26:13-17, 36:1-37:5.

66. For the reasons set forth above, I disagree. Like Cromer, Ganu is silent on the issue of interference and co-existence between different networks. And the reason for Ganu’s silence on the issue is even more straightforward: Ganu does not disclose overlapping wireless networks at all. *See* Ex. 1005. Rather, as Dr. Haas acknowledges, Ganu teaches a single “proposed network” that is “three tiered” and consists of ad hoc MNs, ad hoc FNs, and ad hoc APs. Ex. 2006 at 62:9-14; *see also id.* at 60:10-14, 61:9-12, 61:14-15. Dr. Haas further admits that Ganu’s “energy considerations” simply related to an ad hoc MN “choosing the least cost” ad hoc FN or ad hoc AP based on, *inter alia*, “minimum transmit power” (Ex. 2006 at 70:21-71:10)—which considerations again have nothing to do with co-existence or interoperability of two disparate networks. Thus, Dr. Haas would have a POSITA look to a secondary reference (Ganu) that is not germane to co-existence issues to solve a purported interference problem that is not germane to the primary reference (Cromer).

67. Dr. Haas also cites Ganu’s purported power saving algorithm as a motivation for a POSITA to combine Cromer with Ganu. *See* Ex. 1003, ¶ 133. I disagree that a POSITA would have selected Ganu—of all potential prior art references to choose from—because of a motivation to lower power consumption in Cromer’s WPAN devices. First, 802.11 already had “STA Power Management modes.” *See* Ex. 1029, p. 129. In my opinion, a POSITA at the time therefore

would not have had to look beyond Cromer (and the 802.11 standard behind Cromer's invention) to achieve power savings in Cromer's WPAN devices such as "a projector or printer" (*see* Ex. 1004, 2:25-29) that likely would have been main line powered in any event (which may explain why Cromer is silent on power management issues). Second, in my opinion, even if a POSITA would have been motivated to improve power savings in Cromer's WPAN devices, Ganu's hierarchical ad hoc network algorithm would have been a disadvantaged choice because it would have added increased overhead and complexity to Cromer's system for questionable power-saving benefits.

68. In my opinion, Dr. Haas appears to have started his analysis with the '991 Patent claims in hand, and then worked his way back to his obviousness opinion, using the claims themselves and the teachings of the '991 Patent as a roadmap to pick and choose references to arrive at the proposed combination.

69. Moreover, in my opinion, a POSITA at the time would not have found Ganu's suggestion regarding modifying 802.11 ad hoc beacon frames to include "Tx Power" and "Rx Power" to be of any benefit to Cromer's modified wireless device. In fact, in my opinion modifying the 802.11 beacons would more likely have made Cromer's so-modified hub wireless device experience performance degradation, due to higher overhead. Ganu includes experimental results demonstrating high "discovery overhead," high packet loss, and "extremely large

discovery times.” *See* Ex. 1005, pgs. 883-884. In my opinion, a POSITA would understand that Cromer would experience performance degradations even larger than Ganu did because of the incompatibility issues mentioned above.

70. Despite Dr. Haas’ assertions that a POSITA would have readily been able to modify Cromer’s device driver to implement Ganu’s modified beacons, in my experience modifying existing wireless protocols requires a great deal of testing to ensure network and performance stability. Established wireless protocols like 802.11 are rigorously stress tested to ensure interoperability and expected performance. All network devices must be able to read and understand protocol frames (especially management frames like beacon frames) so that they take appropriate actions at appropriate times. MAC “deployability problems” are noted by Rao, *et al.*, for example, in their 2004 paper “An Overlay MAC Layer for 802.11 Networks.” *See* Ex. 2009, p. 1. In my opinion, Dr. Haas has not given these facts due consideration.

71. Accordingly, it is my opinion that there would have been no motivation for a POSITA at the time to combine Cromer and Ganu.

**B. A POSITA Would Not Have Been Able to Implement the
“Cromer Modification” Successfully**

- 1. As Modified By Ganu, Cromer Could Not Maintain
Concurrent Connections to Both an AP and a Node in an
IBSS Network Without Violating a Central Objective of
Ganu to implement a Self-Organizing Ad Hoc Network**

**With a Routing Protocol that decides which connections to,
use based on dynamic variables such as received signal
strength and transmit power**

72. In the Cromer Modification that Dr. Haas constructs in discussing claim limitation [1e.2], he purports to combine the teachings of Cromer and Ganu in a particular manner. According to Dr. Haas, the network connection between the client device 100 and Access Point 160 of Cromer is maintained on a WLAN in infrastructure mode, as taught by Cromer (*i.e.*, the “first network connection”), while the network connection between the client device 100 and the peer-to-peer device 180 of Cromer is maintained on a WPAN that is modified “using Ganu’s modified-802.11 ad-hoc protocol” (*i.e.*, the “second network connection”). *See* Ex. 1003 at ¶¶ 129-130.

73. Thus, Dr. Haas asserts that Ganu represents a modification to a conventional 802.11 ad-hoc protocol, and that this purported modified ad-hoc protocol is used in place of the ad-hoc protocol of Cromer for the WPAN connection between the client device 100 and the peer-to-peer device 180. In further support of this position, Dr. Haas points to Fig. 4 of Ganu, and states: “*Ganu* taught modifying the 802.11 ad-hoc protocol by ... having FNs ‘append transmit power to each outgoing beacon’ and MNs ‘append ...the received signal strength for each incoming beacon.’” *See* Ex. 1003, ¶ 131.

74. I disagree that the Cromer modification would have been achievable in this

way by a POSITA at the time. In particular, the Cromer Modification relies on the client device 100 being configured to: (1) form a WLAN (*i.e.*, 802.11 infrastructure mode) connection with access point 160, and (2) form a WPAN (*i.e.*, 802.11 ad-hoc mode) connection with peer-to-peer device 180, with only the WPAN connection being “modified” (*i.e.*, to include Ganu’s beacon structure). *See* Ex. 1003, ¶ 130.

75. In my opinion, the Cromer Modification as described by Dr. Haas regarding limitation [1e.2] is clearly not a device that can also satisfy limitation [1pre]. Ganu teaches a network structure in which all network connections operate in 802.11 ad-hoc mode. *See* Ex. 1004, pg. 880-81 and Fig. 1. Specifically, Ganu teaches an “802.11-based self-organizing hierarchical ad-hoc wireless network (SOHAN),” in which all the MNs, FNs, and APs operate in, specifically, ad-hoc mode such that the FNs enable relay functions between MNs and APs. *See id.* (“three-tier hierarchical ad-hoc network”); *see also* Ex. 2006 at 71:11-21 (“Ganu does not use the infrastructure mode with the operation of his forwarding nodes. ... [T]he operation of Ganu does not rely on this infrastructure mode for its AP operation.”).

76. In my opinion, for a client device 100 to be configured as a Ganu FN to enable data relay functions, as set forth by Dr. Haas in paragraphs 86-87 of his Declaration, communications between the client device 100 and both an access point (*i.e.*, access point 160 of Cromer) and a peer-to peer device (*i.e.*, device 180

of Cromer) would need to occur via 802.11 ad-hoc mode communications.

77. Thus, a WLAN infrastructure-mode connection between the client device 100 and the access point 160 of Cromer, as set forth by Dr. Haas in the Cromer Modification, could not exist while simultaneously enabling the data relay functions of Ganu on which Dr. Haas relies for satisfaction of limitation [1pre].

78. The FN of Ganu is “an intermediate radio node without traffic of its own; the FN is only responsible for multi-hop routing of transit packets.” *See* Ex. 1005, pg. 881. In contrast, Cromer’s client 100 generates its own data. For example, as Dr. Haas explains, “when the client 100 is in ad-hoc mode, software in the client 100 can still generate data for the infrastructure network.” *Id.* at 49:17-18, 49:19-50:7; *see also id.* at 44:2-7, 51:18-23. To provide for such multi-hop routing, the Ganu FN operates in, specifically, *ad hoc mode* with all connections to and from the FN to achieve the objective of “introducing discovery *as a separate layer*” in the network such that “routing overhead is significantly reduced.” *See* Ex. 1005, pgs. 881-882; *see also* Ex. 2006 at 71:11-21. In my opinion, to assert a modification in which connections to and from a supposed “forwarding node” are conducted in infrastructure mode in one direction (*i.e.*, to/from an AP) and in ad hoc mode in the other direction (*i.e.*, to/from an MN) is to vitiate the purpose of the Ganu system configuration.

79. The essence of Ganu is in forming a scalable self-organizing ad hoc

network. *See* Ex. 1005, p. 881 (“Scalability issues for flat ad-hoc networks ... motivate our proposed hierarchical architecture with more than one tier of ad-hoc radio nodes in which the lower tiers aggregate the traffic up to the intermediate relay nodes, while continuing to use robust ad-hoc *self-organization and routing* protocols.”). Critical to this organization is the use of routing tables in FNs to map which MNs are *currently* “associated”—in essence connected with—with particular FNs and APs depending on current network conditions (in Ganu, these network conditions are measure transmit powers of various nodes in the network, because Ganu seeks to use self-organizing routing protocols to minimize aggregate transmit power and to maximize received signal strengths at any given time in the ad his network). *See* Ex. 1005 at p. 882. By requiring the Ganu-modified Cromer device 100 to use infrastructure mode Wi-Fi to connect with the AP 160, which always requires the device 100 to be connected to its associated AP *regardless of network (or any other) conditions*, the Ganu-modified Cromer device 100 cannot be part of Ganu’s self-organizing network that can dynamically reroute its connections based on current network conditions. Removing this critical functionality as apparently proposed by Dr. Haas would defeat Ganu’s ability to route packets to and from APs (whether actual 802.11 APs or Ganu’s ad hoc APs). *See* Ex. 1003 at paragraphs 85-89. In fact, Ganu’s architecture is incompatible with that of Cromer because Ganu teaches a pure scalable ad hoc network with ad

hoc APs that are essential to Ganu's hierarchical self-organizing ad hoc wireless network architecture. That is, Ganu's FN communicates upstream (with ad hoc APs and/or other FNs) and downstream (with MNs and/or other FNs) using a modified ad hoc protocol that the Cromer infrastructure AP would ignore and not respond to. This is because Ganu's FN and Cromer's AP operate in two mutually exclusive modes, ad hoc and infrastructure, respectively. Further, Dr. Haas admits that Ganu's ad hoc network could not successfully function without any ad hoc APs, stating that: "The communication between the mobile node through the Internet would not work[.]" Ex. 2006 at 102:18-103:7, 103:9-104:18. Ganu also does not teach operating its network using any other kind of AP, including an infrastructure AP. In other words, without any AP (ad hoc or infrastructure), Dr. Haas' proposed Cromer-Ganu architecture will not function as envisioned by Cromer—or even Ganu alone.

80. Dr. Haas apparently opines that a POSITA could cherry-pick particular details of Ganu and import them into Cromer, leaving out critical implementation details. For the above reasons, I disagree. In my opinion, a POSITA would understand that the components of Ganu's system are all required as detailed in Ganu in order for traffic to flow along the least costly (in terms of MN power usage) routes as MNs "associate" and "disassociate" from FNs (and APs) over time.

2. The Cromer Modification As Described By Dr. Haas for Limitation [1e.2] also cannot satisfy limitation [1h].

81. In my opinion, the Cromer Modification also fails to satisfy limitation [1h]. Limitation [1h] recites “implement[ing] data forwarding logic, implemented in a network-enabled hub using hardware and/or software, that forwards data between an originating node and a destination node, wherein the originating node is a node in one of the first and second networks and the destination node is a node in the other of the first and second networks.”

82. Dr. Haas states that “the data handling structures of *Cromer*’s client device 100 would have logic for carrying out *Ganu*’s data relaying, which includes data forwarding (*implement data forwarding logic*).” *See* Ex. 1003, ¶ 148. However, as explained below, this is not achievable given the details disclosed about the [1e.2] Cromer Modification in paragraphs 128-134 of Dr. Haas’ Declaration. *See* Ex. 1003 at ¶¶ 128-134.

83. *Ganu*’s data forwarding logic is set forth at Sections III.B and III.C of the reference. *See* Ex. 1005 at pgs. 881-882. *Ganu* teaches a “discovery metric” in which transmission power and received signal strength are included in its beacons, such that a node with a minimum transmit power (and, if there are two such nodes, a higher received signal strength) is chosen as a next hop neighbor. *See id.* at pg. 882. *Ganu* further teaches the formation and periodic updating of a Local

Neighbor Table to enable routing functions of the FN. *See id.* In particular, “FNs and APs build their local neighbor tables based on the beacons and the association messages exchanged during the discovery phase.” *See id.* These beacons and “association” messages (as mentioned above, not to be confused with Wi-Fi infrastructure mode association messages, which are entirely different) are sent using the Wi-Fi ad hoc protocol, which calls for frequent discovery messages and beacons to be exchanged, unlike in the Wi-Fi infrastructure mode protocol. *See id.* Ganu further teaches that “[a]fter the table exchanges, each FN computes a path that it can use to route data to the AP” and that the “FN maintains a latest best cost path towards the AP at every instant and whenever it receives data packets...it consults the neighbor table to forward the data.” *Id.*

84. The data forwarding logic of Ganu thus relies upon the formation of Local Neighbor Tables for FNs to effect data routing between MNs and APs, which in turn relies in the frequent exchange of Wi-Fi ad-hoc mode discovery messages. *See Ex. 2006 at 74:7-10.* The consequences of not engaging in such message exchange, and therefore not populating Local Neighbor Table entries from neighboring nodes are stark in Ganu—Ganu itself states that “[i]f an FN is disconnected from the network (there is no entry for an AP that exists in its neighbor table), it discards the packet and indicates a routing failure.” *See Ex. 1005 at pg. 882.* Likewise, Dr. Haas admits that if no APs are present in Ganu’s ad

hoc network, “[t]he communication between the mobile node through the Internet would not work[.]” Ex. 2006 at 102:18-103:7, 103:9-104:18.

85. Thus, if only the WPAN connection (*i.e.*, the purported “second network connection”) of Cromer is modified “using Ganu’s modified-802.11 ad-hoc protocol,” as purported by Dr. Haas in an effort to satisfy claim limitation [1e.2], there could be no data exchange with APs (and other FNs) over an ad-hoc Wi-Fi protocol as required by Ganu, because there would be an infrastructure Wi-Fi protocol implemented upstream to higher routing tier devices (*i.e.*, APs) by the FN. In turn, this means there would be no data forwarding logic to implement as the WLAN connection would remain as taught by Cromer and, therefore, Local Neighbor Tables could not be generated and routing functions based on such Local Neighbor Tables could not occur. This is because the discovery and routing mechanism in Ganu is based on ad-hoc connections (between the FN and AP). *See* Ex. 1005, p. 880. Furthermore, Cromer’s client 100 cannot transmit data on Cromer’s infrastructure network 170 and ad-hoc network 190 at the same time—which Dr. Haas admits. *See, e.g.*, Ex. 2006 at 46:15-18, 46:20-47:23 (“This is not how Cromer operates”), 50:8-10, 50:12-18 (“One of ordinary skill in the art would have understood that when Cromer talks about [client 100’s] infrastructure driver 120 being in an inactive mode, meaning that infrastructure driver 120 does not communicate data to the [Cromer single Wi-Fi] adapter.”), 51:24-52:2, 52:4-12.

86. Thus, in my opinion, a WLAN infrastructure-mode connection between the client device 100 and the access point 160 of Cromer, as set forth by Dr. Haas for limitation [1e.2], could not exist while simultaneously implementing the data forwarding logic of Ganu on which Dr. Haas relies for satisfaction of limitation [1h].¹

3. Dr. Haas has not made a showing that all of Limitations [1pre], [1e.2], and [1h] are met by the combination.

87. Ganu's data relaying functions and data forwarding logic rely upon application of its modified beacons in FN communications. Ganu specifically teaches that, if there is no entry for an AP that exists in an FN's neighbor table, packets are discarded and a routing failure occurs. *See* Ex. 1005, pg. 882. Thus, a combination in which an infrastructure-mode WLAN connection is maintained between a client device 100 and an access point, as taught by Cromer, and the purported Ganu-modified ad-hoc-mode WPAN connection is adopted only between the client device 100 and a peer-to-peer device 180, as purported by Dr.

¹ The beacon frames for BSS (infrastructure) and IBSS (ad hoc) are different. For example, the Capability Information field is used to determine whether stations support all the features in the BSS/IBSS network. Stations that do not implement all the features in the capability advertisement are not allowed to join the network. Of particular interest are the ESS/IBSS subfields. These two bits are **mutually exclusive**. Access points set the ESS field to 1 and the IBSS field to 0 to indicate that the access point is part of an infrastructure network. Stations in an IBSS set the ESS field to 0 and the IBSS field to 1. *See* Ex. 1029, p. 51. Thus, the infrastructure AP 160 of Cromer will ignore the FN ad hoc beacons.

Haas for limitation [1e.2], is entirely inconsistent and incompatible with the positions adopted by Dr. Haas for limitations [1pre] and [1h].

88. In my opinion, it is not possible that an implementation in which data forwarding tables could not be generated and in which routing failures would occur, as would be the case with Dr. Haas' purported combination at limitation [1e.2], could satisfy either of the limitations of [1pre] and [1h], where the client device would be required to provide data relay functions and implement data forwarding logic.

4. Ganu's Ad-Hoc Hierarchical Network Does Not Modify Any 802.11 Protocols

89. In paragraph 131 of his Declaration, Dr. Haas opines that Ganu taught a modified 802.11 ad-hoc protocol. I disagree.

90. Ganu's system did not modify any 802.11 protocol. Ganu plainly states that "the beacons used in the prototype are application-level packets, since actual 802.11 beacons are generated by the firmware in most of the [then] existing 802.11b network adapters and are not customizable." *See* Ex. 1005, pg. 882.

Furthermore, Dr. Haas agrees that Ganu's system did not involve any firmware modification. *See* Ex. 2006 at 92:6-9; *see also id.* at 90:5-6, 93:14-17, 93:19-21.

91. The 802.11 ad-hoc protocol actually used in Ganu's system was a conventional unmodified 802.11 ad-hoc protocol. This is further apparent from the

beacon format shown in Fig. 4 of Ganu.

92. Ganu teaches that the beacons are “generated by [the] application layer,” and are not of the layer at which 802.11 beacons are generated (*i.e.*, the MAC Layer; See Ex. 1029, pp. 34-36, 46). *See* Ex. 1005, p. 863. Thus, being an application-layer implementation, the beacon format of Ganu is not a modification of a conventional 802.11 beacon frame.²

93. In addition to those fields “generated by the application layer,” the Ganu beacon format includes “Tx Power” and “Rx Power” fields. *See* Ex. 1005 at p. 882. In particular, Ganu teaches a “discovery metric” in which transmission power and received signal strength are included in its beacons, which are only processed by the routing function of the FNs and APs that occurs in Layer 3. *See* Ex. 1005 at pgs. 882-883. These fields are not modifications to a conventional 802.11 beacon frame—they are choices of payload traffic to be carried by such a frame, much like video payload traffic, web page payload traffic, Internet Protocol (IP) payload traffic or Transmission Control Protocol (TCP) payload traffic.

94. Also, in my opinion, adding an application that provides commands to the Wi-Fi network protocol stack without modifying it in any way does not amount to

² The 802.11 protocol defines only layer 1 (physical layer or PHY) and layer 2 (medium access control or MAC). It does not define layer 3 (that deals with routing).

any inconsistency between the second network protocol and the first network protocol.

95. While theoretically the modified beacons and association messages in Ganu can be implemented in the 802.11 firmware (layer 2), a POSITA would understand from Ganu that the preferred modification should be in the application layer and not in the 802.11 firmware. This is because the MN protocol also needs to be modified which limits the applicability of the solution (even though the MNs do not participate in the routing decisions). In this case, the firmware in every 802.11 user-device would have to be modified, whereas, downloading an application to the user-device would be a much simpler implementation.

96. Accordingly, in my opinion Ganu, as actually implemented and taught, does not teach a second network protocol that is a modification of a first network protocol.

C. Dr. Haas fails to establish that Cromer and Ganu teach all recited claim limitations of any dependent claim.

97. Dependent Claims 3-4, 6-7, 14, and 16-17 depend from and include all limitations of independent Claim 1. Dr. Haas relies entirely on the arguments presented for Claim 1 in substantiating his position as to the unpatentability of dependent Claims 3-4, 6-7, 14, and 16-17. Thus, for at least the reasons described above with respect to Claim 1, in my opinion, Dr. Haas has failed to meet the

burden of proof in demonstrating that any of Claims 3-4, 6-7, 14, and 16-17 are rendered unpatentable based on the teachings of Cromer and Ganu.

V. Ground 2 fails to establish a reasonable likelihood that Cromer, Ganu, and Sinivaara render Claims 1, 3-4, 6-7, 14, and 16-17 unpatentable.

A. Dr. Haas' Ground 2 argument does not rely on Sinivaara to remedy the deficiencies in the Ground 1 argument.

98. With respect to independent Claim 1, Dr. Haas relies entirely on the arguments presented for Ground 1, except for limitations [1e] and [1f]. *See* Ex. 1003 at 177-186. Dr. Haas does not rely on Sinivaara in support for his opinions as to any of limitations [1pre], [1e.2], and [1h]. Claims 3-4, 6-7, 14, and 16-17 depend from and include all limitations of independent Claim 1. Moreover, Sinivaara does not disclose an overlay protocol as taught and claimed in the '991 Patent. In fact, Sinivaara's protocol is fully consistent with 802.11, so it also does not satisfy limitation [1f]. This is because Sinivaara's terminal can go back to the first infrastructure network without affecting the ad hoc network, whereas in the '991 Patent, the hub, which functions as a virtual AP in the WPAN, needs to notify the WPAN devices on agreeable inactivity periods. *See* Ex. 1006 at 3:14-5:6; Ex. 1001 at 11:39-13:8.

99. Thus, for at least the reasons described above with respect to Ground 1, in my opinion, Dr. Haas has failed to show that any of Claims 1, 3-4, 6-7, 14, and 16-17 are rendered unpatentable based on the teachings of Cromer, Ganu, and

Sinivaara.

VI. Ground 3 fails to establish a reasonable likelihood that Cromer, Ganu, and Judd render Claims 15 and 18 unpatentable.

A. Ground 3 does not rely on Judd to remedy the above-noted deficiencies of Ground 1.

100. Claims 15 and 18 depend from and include all limitations of independent Claim 1. Dr. Haas does not rely on Judd in support for his opinions as to any limitations of Claim 1 and relies on Judd solely for his opinions as to features of dependent Claims 15 and 18. In particular, Dr. Haas relies on Judd as purportedly disclosing “an integrated wall plug.” *See* Ex. 1003, ¶ 192. Accordingly, in my opinion, Dr. Haas has not provided proof that the combination of Cromer, Ganu, and Judd render claims 15 and 18 unpatentable.

VII. Ground 4 fails to establish a reasonable likelihood that Cromer, Ganu, Sinivaara, and Judd render Claims 15 and 18 unpatentable.

A. Ground 4 does not rely on Judd to remedy the above-noted deficiencies of Ground 2.

101. Claims 15 and 18 depend from and include all limitations of independent Claim 1. Dr. Haas does not rely on Judd in support for his opinions as to any limitations of Claim 1 and relies on Judd solely for his opinion as to features of dependent Claims 15 and 18. In particular, Dr. Haas relies on Judd as purportedly disclosing “an integrated wall plug.” *See* Ex. 1003, ¶ 198.

102. Thus, for at least the reasons described above with respect to Ground 2, in

my opinion, Dr. Haas has failed to show that Claims 15 and 18 are rendered unpatentable based on the teachings of Cromer, Ganu, Sinivaara, and Judd.

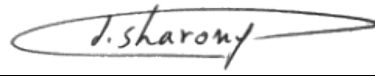
VIII. CONCLUSION

103. My opinions and factual findings set forth in this Declaration are based on my own work to date. I may supplement my opinions in view of additional evidence that comes forward during trial. I reserve all right to add to, alter, or delete my opinions and my Declaration upon discovery of additional information as trial is ongoing.

104. I understand that this Declaration will be filed as evidence in this IPR. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for such within the United States during the time allotted for cross examination.

105. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and 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.

Executed this 27 day of September 2023,

A handwritten signature in cursive script, appearing to read "J. Sharony", is enclosed within a horizontal oval. The signature is written in dark ink on a white background.

Dr. Jacob Sharony