

**UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

UNIFIED PATENTS, LLC
Petitioner,

v.

OZMO LICENSING LLC
Patent Owner.

IPR2022-00193

Patent No. 9,264,991
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Title: APPARATUS AND METHOD FOR INTEGRATING SHORT-RANGE
WIRELESS PERSONAL AREA NETWORKS FOR A WIRELESS LOCAL
AREA NETWORK INFRASTRUCTURE

RESPONSIVE DECLARATION OF DR. ZYGMUNT J. HAAS

TABLE OF CONTENTS

	Page
I. INTRODUCTION	3
II. CLAIM CONSTRUCTION	4
III. OZMO’S PATENTABILITY ARGUMENTS ARE INCORRECT.....	8
A. <i>Ganu</i> Modifies the 802.11 Ad-hoc Protocol ([1e-f], etc.)	9
B. The <i>Cromer-Ganu</i> Combination Is Obvious	11
1. Power Savings.....	11
2. Forwarding ([1pre], [1h]).....	14
3. The <i>Cromer-Ganu</i> Protocols Reduce Interference ([1f])	16
4. Reasonable Expectation of Successful Combination of <i>Cromer</i> and <i>Ganu</i>	18
a. Modification and Testing of Wireless Protocols	18
b. Obvious Software Modifications.....	20
C. The <i>Cromer-Ganu</i> Combination Is Consistent with the Teachings of <i>Ganu</i>	21
IV. CONCLUSION AND DECLARATION	27
APPENDIX A – MATERIALS RELIED UPON.....	29

I, Dr. Zygmunt Haas, declare as follows:

I. INTRODUCTION

1. I submit this declaration in response to the Board's Decision Granting Institution (Paper 10, "Board's Decision"), Ozmo's Patent Owner Response (Paper 21, "Response" or "Resp."), and the Declaration of its expert Dr. Jacob Sharony (Ex-2004, "Sharony Declaration"). I have considered these documents and the evidence cited therein, in light of the material I considered in my Declaration (Ex-1003, "First Declaration") and any additional documents cited herein. Nothing in the Board's Decision, Ozmo's Response, or the Sharony Declaration change my opinions regarding the obviousness of the Challenged Claims as set for in my First Declaration. Below, I discuss why the arguments and evidence provided by these documents does not change my opinion.

2. I expressly incorporate the contents on my First Declaration herein, including my qualifications, understanding of the relevant legal standards including claim construction, analysis of the '991 Patent, the state of the art, and my arguments demonstrating the obviousness of the Challenged claims.

3. Unless otherwise indicated, all emphasis, including coloring and bolding, in quoted material has been added.

II. CLAIM CONSTRUCTION

4. I have been informed by counsel that Ozmo and its expert have provided a new construction of the term “*partially consistent*” (Limitation [1F]). Specifically, I have been informed by counsel that Ozmo has stated that “[t]he court construed ‘*partially consistent*’ “to mean ‘conforms to a part, but not the entirety of,’” and that “[t]his construction inherently includes the notion of protocol ‘rule breaking’ or violation.” Resp. 15. I have been asked to opine on whether Ozmo’s newly proposed construction is supported by the ’991 Patent and its file history, which I understand form the “intrinsic record.” I have further been asked to, assuming that the construction is correct, opine whether the *Cromer-Ganu* combination would meet this construction. In summary, it is my opinion that Ozmo’s proposed construction is not supported by the intrinsic record, but nevertheless the *Cromer-Ganu* combination discloses “the notion of protocol ‘rule breaking’ or violation”

5. I have been informed by counsel that in the Board’s Decision, the Board encouraged the parties to address the scope of the claimed “*second network protocol*” ([1e.2]-[1g], claims 6-7). Paper 10, 6-8. I have been informed by counsel that the Board stated that the language of the claims themselves provides some clarity. Paper 10, 7. I have been informed by counsel that the Board noted that limitation [1f] “provides that 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 that claims 6 and 7 provide that the *second network protocol* “requires lower average power consumption over time relative to the first network protocol” and “is a modification of the 802.11x wireless protocol,” respectively. Paper 10, 7. I have been informed by counsel that the Board noted that the ’991 Patent’s exemplary second network protocol “is an overlay protocol that is partially compatible with the WLAN [(first network)] protocol, but not entirely, in terms of power, frame contents and sequences, timing, etc. The secondary network (WPAN) protocols might be 802.11x frames with new frame arrangements adapted for WPAN needs, such as reduced latency, power, etc.” Paper 10, 7-8 (citing Ex-1001 9:60–66).

6. I have been informed by counsel that, in the Board’s Decision, the Board also rejected Ozmo’s implicit claim construction arguments regarding the second network protocol. Paper 10, 13. I have been informed by counsel that the Board noted Ozmo’s arguments that *Ganu*’s modifications are not a *second network protocol* because they are not implemented at OSI Layer 2, with the Board further stating that Ozmo’s arguments “turn[ed] on an implicit interpretation of the second network protocol,” namely, that this term is restricted to certain layers of the OSI model that are not discussed in “the relevant portions of the intrinsic record.” Paper 10, 12-13.

7. In support of its proposed construction, Ozmo cites a single example from the '991 Patent, discussing a device(s) powering-down during “mutually agreeable inactivity periods.” The citation for this example does not reference “protocol” or “partially consistent.” Ex-1001 11:39-50; Resp. 15; Ex-2004 ¶52. This example similarly neither mentions, nor would a POSA understand it to require, OSI layers.

8. It is my opinion that the *Cromer-Ganu* combination meets Ozmo’s proposed construction under either the understanding of *Ganu* supported by me or relied upon by Ozmo. First, under the correct understanding, *Ganu* “mak[es] non-compliant 802.11 beacon frames,” and “add[s] association messages to the 802.11 ad-hoc protocol in a non-compliant discovery phase.” Ex-1005 001, 003; Ex-1003 ¶¶130-132, 139-144. *Ganu*’s modified beacon frame formats, ad-hoc association messages, and new ad-hoc discovery phase would “violate” or “break” the rules of 802.11 ad-hoc protocol used in *Cromer*’s infrastructure network (first network protocol) because they do not fully comply with that standard. Ex-1003 ¶¶50-55 (citing, *inter alia*, Ex-1029), 139-144; see also Resp. 3 (“There is no association process in ad hoc” networks.). These changes also result in ad-hoc devices performing actions that are not performed by 802.11 ad –hoc devices, as discussed below.

9. Second, the *Cromer-Ganu* combination still meets Ozmo's proposed construction under Ozmo's limited reading of *Ganu* (§III.A). Specifically, Ozmo's cited an example of powering down during a mutually agreeable inactivity period to support its proposed construction. Resp. 15. Ozmo states that this example demonstrates a violation because a "hub" (a supposed virtual AP) can go to sleep whereas an infrastructure AP cannot. Resp. 15. *Ganu* similarly describes ad-hoc STAs (MNs, FNs, APs) performing actions that 802.11 ad-hoc STAs do not perform, such as forming a hierarchy of ad-hoc nodes, performing discovery and association procedures, and modifying the MAC frame format. See, e.g., Ex-1003 ¶¶139-144. Thus, to the extent that the example cited by Ozmo meets this construction, so does the *Cromer-Ganu* combination under any reading of *Ganu*.

10. As stated above, Ozmo's proposed construction is incorrect, because it is not supported by the intrinsic record. First, neither the '991 Patent nor its file history use the terms "rule breaking" or "violations," either generally or specifically in Ozmo's example. See, generally, Ex-1001, Ex-1002. Second, the description cited by Ozmo does not use the term "partially consistent," or even "protocol." Instead, this example merely describes various characteristic of the networks absent mentioning those terms. This example also does not describe achieving those characteristics within OSI Layer 1 or 2 functionality, nor would a POSA have understood that they are achievable only within those layers. I also note that the

'991 Patent claims the mutually-agreeable inactivity period example in "logic." Ex-1001 15:65-16:9 (claims 11-12). "Logic," generally or as stated in the claim, is not required to be part of any claimed protocol nor any specific component of the claimed "hub." *Id.*; *cf.* Ex-1001 15:39-48 (claim 8). Thus, the intrinsic record does not support that the inactivity period is restricted to OSI Layers 1 and 2.

III. OZMO'S PATENTABILITY ARGUMENTS ARE INCORRECT

11. As set for in my First Declaration, the *Cromer-Ganu* combination is supported by several facts. For example, *Cromer* teaches client 100 "communicating concurrently" in a WLAN and with peer-to-peer devices in a WPAN using the 802.11 infrastructure and ad-hoc protocols, respectively. *See, e.g.*, Ex-1004 1:8-10; Ex-1003 ¶¶59-63, 81-89, 41-47, 116-127, 147-152; Resp. 7-8 ("*Cromer* teaches a client device 100 that uses a single Wi-Fi subsystem to operate concurrently in both infrastructure mode and ad hoc mode."). *Ganu* disclosed a "self-organizing hierarchical ad-hoc wireless network (SOHAN)" that "help[ed] to scale network throughput, reduce delay and lower power consumption at end-user devices" compared to 802.11 ad-hoc networks. Ex-1005 001; Ex-1003 ¶¶79-89 (*Ganu* Overview and [1pre]), 116-144 ([1e-f]), 147-152 ([1h]); Resp. 9 ("*Ganu* teaches a self-organizing hierarchical ad-hoc WLAN to provide improvements in system capacity and performance relative to 'flat' ad-hoc WLANs."), 20.

12. My First Declaration also demonstrates that a POSA would have been motivated to incorporate features from *Ganu* into *Cromer*. Specifically, a POSA would have been motivated to modify *Cromer*'s client 100 to (1) forward traffic between its peer-to-peer devices and AP and (2) incorporate changes to the 802.11 ad-hoc protocol as discussed by *Ganu*. Ex-1003 ¶¶ 81-89 ([1pre]), 116-144 ([1e-f]), 147-152 ([1h]). In response, Ozmo argues that (A) *Ganu* does not modify the 802.11 ad-hoc protocol (Resp. 36-39), (B) there is no reason to combine *Cromer* and *Ganu* (Resp. 15-25) and (C) the combination could not be made successfully without violating *Ganu* (Resp. 25-36). As demonstrated below, I disagree with Ozmo's arguments.

A. *Ganu* Modifies the 802.11 Ad-hoc Protocol ([1e-f], etc.)

13. *Ganu* unequivocally modifies the 802.11 ad-hoc protocol, contrary to Ozmo's argument that *Ganu*'s teachings are implemented at only the application layer. Resp. 36-39. As set forth in my First Declaration, *Ganu* taught "modifying the 802.11 ad-hoc protocol by (1) having FNs 'append transmit power to each outgoing beacon' and MNs 'append' 'the received signal strength for each incoming beacon' and (2) adding 802.11-like association to organize MNs into cells with power-efficient selections of FNs" based on MNs, "listen[ing] to the beacons and send[ing] an association message"—modifications to message types delineated by 802.11. See, e.g., Ex-1003 ¶¶ 50-55 (802.11 Standard), 116-144 ([1e-f]) (citing, e.g.,

Ex-1005; Ex-1001; Ex-1029; Ex-1028; Ex-1025). *Ganu* also stated that it “use[d] augmented 802.11 MAC beacons and associations” in its SOHAN. Ex-1005 003. It further noted “that for ease of implementation, the beacons used in [its] prototype are application-level packets.” Ex-1003 003. While *Ganu* stated that its application-level, proof-of-concept prototype experienced issues under “higher loads,” *Ganu* stated that such issues should be addressed by modifying 802.11 firmware: “using firmware-generated beacons should solve this problem” and “implementing the discovery protocol in firmware will result in better network performance.” Ex-1005 001-002, 004-005; Ex-2006 90:1-94:7. As Ozmo acknowledges, *Ganu* also states that “802.11 beacons are generated by” “firmware.” Ex-1005 003; Resp. 37-39. Thus, *Ganu* taught modifying the 802.11 ad-hoc protocol, provided a proof-of-concept prototype implemented at the application layer, and noted that implementing *Ganu*’s 802.11 modifications in firmware would cure the limited deficiencies of that prototype. Thus, *Ganu* modifies the 802.11 protocol.

14. In response, Ozmo argues that *Ganu*’s “prototype [uses] application-level packets” and that the “the preferred modification” taught by *Ganu* “should be in the application layer.” Resp. 36-39. These arguments fail for multiple reasons. First, Ozmo’s application-layer arguments, like others, focus on only the actual proof-of-concept prototype described in *Ganu* and ignore *Ganu*’s full teachings. As I discussed above, *Ganu* taught modifying the 802.11 ad-hoc network protocol,

expressly stating that prototyping work is at the application layer for ease of implementation and that the shortcomings of its application-layer “proof-of-concept” prototype would be addressed by implementing its modifications in “firmware.” Ex-1005 003, 005; Ex-2006 90:1-94:7. Also, I have been informed by counsel that Ozmo admits that *Ganu* discloses that 802.11 beacons are generated in 802.11 firmware. Ex-1005 003; Resp. 37-39 (“theoretically the modified beacons and association messages in *Ganu* can be implemented in the 802.11 firmware (layer 2)”). Thus, *Ganu* expressly taught modifying the 802.11 firmware.

15. Second, *Ganu*’s expressly taught implementing its modifications in firmware—“using firmware-generated beacons” and “implementing the discovery protocol in firmware”—to overcome the limited issues with application-level implementations. Ex-1005 005. Thus, *Ganu* expressly preferred implementing its 802.11 protocol modifications in firmware.

B. The *Cromer-Ganu* Combination Is Obvious

16. As further detailed below, nothing in Ozmo’s Response refutes my opinion that a POSA would have found the *Cromer-Ganu* combination as obvious.

1. Power Savings

17. My First Declaration demonstrates that the *Cromer-Ganu* combination would have been motivated to achieve, *inter alia*, power savings over conventional 802.11 ad-hoc networks, as expressly taught by *Ganu*. See, e.g., Ex-1003 ¶¶131-

134; *see also* Ex-1003 ¶161. While Ozmo states that *Ganu*'s power savings are "questionable," (Resp. 23) I can find no technical analysis or reason from Ozmo or its expert why *Ganu* would not provide improved power savings over conventional 802.11. Rather, Ozmo (1) suggests that power savings is not an "issue", (2) ignores that *Ganu* expressly taught the same objective, and (3) argues that *Ganu*'s power-savings are negated by complexity and limited detriments that *Ganu* both attributed to its prototype implementation and addressed by proposing that the modification be implemented in 802.11 firmware.

18. I have been informed by counsel that Ozmo states that power savings is not a motivation for combining *Cromer* and *Ganu* because "the challenged independent claim does not address power issues." Resp. 22. However, Ozmo describes that the '991 Patent "provided a technical solution to" "unsolved technological problems", including a "need to enable power save modes that were better optimized to meet the needs of WPAN devices," a "stringent requirement[] of battery-operated devices." Resp. 5, Ex-1001 3:15-24. Also, I note that Challenged claim 6 expressly requires "*lower average power consumption*" Specifically, power savings are expressly claimed. *See, e.g.*, Challenged Claim 6. Therefore, contrary to Ozmo's implications, it is my opinion that power savings are entirely pertinent to the Challenged Claims. Further, such power savings, achieved by modifying 802.11 ad-hoc protocols, was previously disclosed at least by *Ganu*.

19. I have reviewed Ozmo's Response and the Sharony Declaration and I can find no technical argument demonstrating that the *Cromer-Ganu* combination would not result in power savings, even under Ozmo's incorrect reading of *Ganu* (§III.A).

20. I also note that, *Ganu* expressly recognized the 802.11 standard and stated that improved power-savings for "battery-operated end-user device[s]" was achievable over that 802.11 by modifying it. Ex-1005 001-003; Ex-1004 3:49-51; Ex-1001 9:40-47. *Ganu* disclosed that such devices included "personal digital assistant[s]," like the PDA disclosed by *Cromer*. *Id.* *Ganu* also stated that "the objective" of its teachings was "energy conservation" for these devices (Ex-1005 0003). I can find no argument in which Ozmo counters that choosing the most energy-efficient topology by minimizing MN transmit power would conserve energy as stated in my First Declaration. *See, e.g.*, Ex-1003 ¶¶79-80 (*Ganu* Overview), 131-134, 160-161 (claim 6); Ex-1005 003. Further, *Ganu*'s reduced overhead likewise saves power. *Id.*

21. Finally, Ozmo argues that any benefit of power savings would be outweighed by "increased overhead and complexity." Resp. 23-25. Again, Ozmo relies on *Ganu*'s prototype for this deficiency while ignoring that *Ganu* showed reduced overhead, even in its prototype, and that *Ganu*'s solution to those issues was to modify the 802.11 firmware. Ex-1005 003, 005; §III.A. Further, there is no

legitimate argument that modifying the 802.11 protocol, as taught by *Ganu*, is unduly burdensome or complex, as *Ganu* itself demonstrates how to do so in a system that is similar to *Cromer*. It is not but, rather, within a POSA's routine skill. See §III.B.4, *infra*.

2. Forwarding ([1pre], [1h])

22. Ozmo argues that a POSA would have not been motivated to implement *Ganu*'s teaching of forwarding between peripherals and an AP into *Cromer*'s WLAN/infrastructure and WPAN/ad-hoc networks. Resp. 16-18, 20. Ozmo's states that techniques for forwarding between infrastructure and ad-hoc networks were widely known. Resp. 16-17. However, such extensive knowledge and use of such a feature, as stated by Ozmo, demonstrates why a POSA would have found the *Cromer-Ganu* combination obvious and speaks to the well-developed nature of the prior art. Further, this well-known forwarding¹ speaks directly to the reasonable likelihood of successfully modifying *Cromer*'s client 100 to forward traffic between *Cromer*'s peer-to-peer devices 180 and *Cromer*'s AP 160—just as *Ganu*'s FN forwards traffic between MNs and APs. Ex-1003 ¶¶81-89 ([1pre]), 147-152 ([1h]). Additionally, Ozmo admits that forwarding from a WPAN to a WLAN requires only

¹ As demonstrated by the First Declaration (*e.g.*, Ex-1003 ¶¶81-89 ([1pre]), 147-152 ([1h]) and Ozmo's additional evidence (Resp. 18 (citing Ex-2008)).

“simple techniques” that were “well within the ability of a POSITA.” Resp. 16-17. I agree. Thus, combining *Ganu*’s forwarding with *Cromer* would have been obvious.

23. Ozmo’s arguments also appear to fundamentally misunderstand the *Cromer-Ganu* combination.² As stated in my First Declaration “a POSA would have been motivated to incorporate *Ganu*’s teaching of FNs using data forwarding techniques to relay” traffic. Ex-1003 ¶86. The *Cromer-Ganu* combination is not premised on bodily incorporating all features and components of *Ganu*, including those used to route traffic through *Ganu*’s hierarchical ad-hoc network. Rather, the combination proposes data forwarding occurring between *Cromer*’s ad-hoc network (as modified by *Ganu*) to WLAN network, as was known (Ex-1003 ¶¶81-89 ([1pre])) and that, as admitted by Ozmo, only required “simple techniques” that were “well within the ability of a POSITA” (Resp. 16-17). Further, even if *Ganu*’s routing tables were required in the *Cromer-Ganu* combination, Ozmo’s argument ignores the POSA’s routine skill that would enable the POSA to adapt *Ganu*’s teachings. It would have been within the POSA’s skills to adapt *Ganu*’s routing tables to account for an infrastructure connection between client 100 and *Cromer*’s AP. §III.C.

² Ozmo’s arguments also conflate *forwarding* and *routing* operations.

24. Thus, the incorporation of *Ganu*'s teaching of forwarding is obvious, motivated, a POSA would have had a reasonable expectation of success.

3. The *Cromer-Ganu* Protocols Reduce Interference ([1f])

25. *Ganu*'s modified-802.11 ad-hoc protocol, when combined with *Cromer*'s unmodified-802.11 infrastructure protocol, is an *overlay protocol* ([1f]) that satisfies the court's construction of "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." Ex-1010 23-26; Ex-1003 ¶¶ 139-144 ([1f]). Specifically, "the WLAN and WPAN protocols of *Cromer-Ganu* share common aspects of 802.11." *Id.* Included among these aspects are "physical layer formatting" and "MAC frame formatting," such as "the non-appended portions of *Ganu*'s beacon frames." *Id.* Further, "a POSA understood [these shared aspects] reduced interference and allowed" the "co-existence" of the *Cromer-Ganu* networks, consistent with *Cromer*'s teaching of concurrent communications and connections. *Id.*; Ex-1029 1 ("This [802.11] standard ... Permits the operation of an IEEE 802.11 conformant device within a wireless local area network (LAN) that may coexist with multiple overlapping IEEE 802.11 wireless LANs)).

26. In response, Ozmo argues that no modification of *Cromer* is "necessary or even prudent" to incorporate a *second network protocol* "to reduce interference

such that the second and first networks can co-exist.” Resp. 19-22. Ozmo admits that 802.11 already contained “many ways of reducing interference between two 802.11 networks.” Resp. 19. These aspects of 802.11 included “operating on different channels” and “CSMA-CA techniques.” Resp. 19-20. *Cromer’s* infrastructure and ad-hoc networks utilized “common aspects” of 802.11 to reduce interference between these different networks. Ex-1003 ¶¶139-144. *Ganu* likewise expressly disclosed using well-known techniques to reduce interference within its hierarchical network. For example, *Ganu* stated that “[o]ptionally, an FN may have two radio cards” for carrying traffic “on [] different frequnc[ies]” or “channels ... so as to minimize interference” between concurrent FN-MN and FN-AP communications. Ex-1005 002. Thus, reducing interference, including between different networks (such as *Cromer’s* infrastructure and ad-hoc networks), is fundamental to the operation of both *Cromer* and *Ganu* and is achieved in the *Cromer-Ganu* combination ¶¶139-144, 185-186 (further reductions in interference achieved in combination with *Sinivaara*). My First Declaration expressly relies on, *inter alia*, such “common aspects of 802.11” shared by “the WLAN and WPAN protocols of *Cromer-Ganu*” to “reduce[] interference and allow[] their co-existence.” ¶¶139-144, 185-186. Thus, the *Cromer-Ganu* combination is an *overlay protocol*.

4. Reasonable Expectation of Successful Combination of *Cromer* and *Ganu*

27. Ozmo argues “due consideration” has not been given to what is required to modify the 802.11 ad-hoc protocol as disclosed by *Ganu* and used in the *Cromer-Ganu* combination. Resp. 24-25. Specifically, Ozmo argues that “[e]stablished wireless protocols” are rigorously tested and that “modifying existing wireless protocols [also] requires a great deal of testing.” Resp. 25. Ozmo also notes “MAC ‘deployability problems,’” but neither Ozmo nor its expert provide further explanation regarding the impact of those problems. Resp. 25; Ex. 2004 ¶70. Ozmo also states that required software modifications have not been considered in the combination. Resp. 34-35. For the reasons discussed below, Ozmo is incorrect.

a. Modification and Testing of Wireless Protocols

28. Ozmo’s arguments regarding the testing and modification of wireless protocols (Resp. 24-25) fail for multiple reasons. First, Ozmo’s arguments are divorced from the POSA’s skill as demonstrated by, *e.g.*, *Ganu*’s 802.11 modifications and 802.11’s extensive history of revisions—prior to the ’991 Patent. A POSA would have recognized that no more than routine experimentation would have been required to implement *Ganu*’s teachings, as they are straightforward.

29. Ozmo’s arguments regarding MAC deployability “problems” are likewise unexplained. These “deployability problems” are referenced immediately following a note about the administrative process of “obtaining the approval of the

IEEE and FCC organizations for any modifications to 802.11.” Ex-2006, 1. Also, *Ganu* discloses modifying 802.11.

30. In any case, the ’991 Patent’s disclosure regarding modifying the 802.11 protocol demonstrates that “testing” and “MAC deployability” “problems” were within the routine skill of a POSA. Specifically, the ’991 Patent descriptions of these modifications are provided at only a high level of generality, *e.g.*:

- “[D]river[s] or firmware” may or may not “require[] modifications to accommodate the PS-STA.” Ex-1001 5:29-40, 5:41-57;
- “[T]he 802.11x device driver may also require slight modification to accommodate [PS-STA power savings].” Ex-1001 7:9-20; and
- “The secondary network (WPAN) protocols might be 802.11x frames with new frame arrangements adapted for WPAN needs, such as reduced latency, power etc.” Ex-1001 9:64-66.

31. Further, the ’991 Patent provides only limited references to MAC, such as the transmittal of MAC addresses and contention for the wireless medium—features that were part of 802.11. *See, e.g.*, Ex-1001 13:10-11, 12:13-52, FIG. 11; Ex-1029. Given these limited descriptions, it is unclear from the ’991 Patent how it solves these supposed testing or MAC deployability problems. Rather, these modifications were already within a POSA’s routine skill.

32. Additionally, *Ganu* expressly teaches the modification of the 802.11 protocol with a similar, if not more detailed, disclosure. §III.A; Ex-1005 (*generally*). For example, *Ganu*’s protocol similarly uses “802.11x frames with new frame

arrangements adapted for WPAN needs, such as reduced latency, power etc.” E.g., Ex-1003 ¶¶ 130-132; §III.A. *Ganu*’s level of disclosure regarding its 802.11 modification further demonstrates modifying wireless protocols was well within a POSA’s routine skill.

b. Obvious Software Modifications

33. Ozmo’s implication that I did not fully consider necessary software modifications (Resp. 34-35) is in error. I provided an analysis of the operation of both the hardware and software of *Cromer*, the modifications to *Cromer* required to implement the features of *Ganu* into *Cromer*, and the reasons why a POSA would have found the combination predictable and reasonably likely to succeed. *See, generally*, Ex-1003 §VII. My comments that I did not discuss what “changes need to be made to [*Cromer*’s] code” (Ex-2006 99:4-11) is merely an acknowledgement that *Cromer* does not provide examples of code to modify (Ex-2006 99:15-19). I testified—in this same section cited by Ozmo—that changes would be required to *Cromer*’s software (Ex-2006 96:20-97:1), and my complete testimony demonstrates why those modifications are obvious and reasonably likely to succeed. *See, e.g.*, Ex-1003 §VII; Ex-2006 90:1-99:19. And, again, *Ganu*’s disclosures regarding the modification of the 802.11 ad-hoc protocol are at least as detailed as the ’991 Patent. *See*, §III.B.4.a. For example, the ’991 Patent does not neither details how to make specific software changes to the 802.11 protocol, nor does it provide any code for its

second network protocols. Ex-1001 (generally). By the time of the '991 Patent, such software modifications were within the routine skill of a POSA.

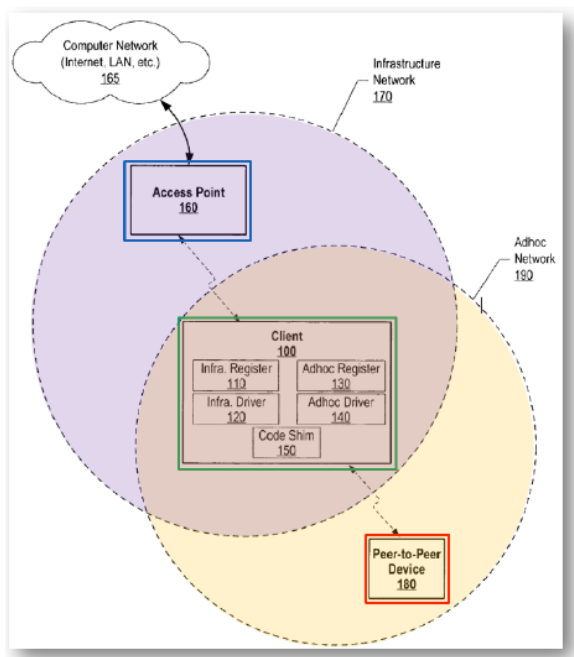
C. The *Cromer-Ganu* Combination Is Consistent with the Teachings of *Ganu*

34. Ozmo argues that the *Cromer-Ganu* combination could not be successful without violating the teachings of *Ganu*. Resp. 25-36. I disagree. Ozmo argues that *Ganu* teaches that data forwarding requires ad-hoc network connections, *Ganu*'s routing tables, and, seemingly, continuous, uninterrupted, and absolutely reliable ad-hoc communications. *Id.* According to Ozmo, the absence of such features "vitiate[s] the purpose" of *Ganu*. Resp. 28. However, Ozmo's arguments mischaracterize, or misunderstand, both the *Cromer-Ganu* combination and *Ganu*'s teachings.

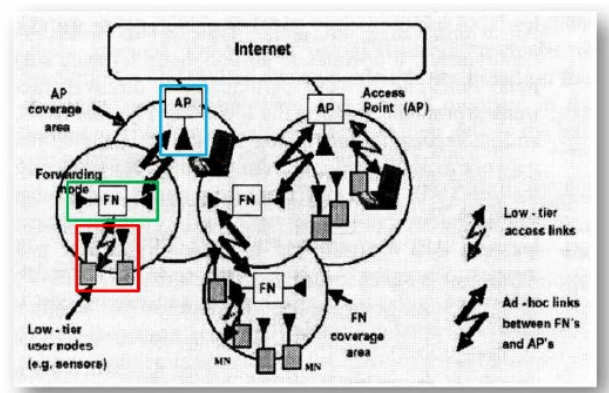
35. My First Declaration details a straightforward combination of *Cromer* and *Ganu*. For example, *Cromer* taught a device that concurrently communicated over a WLAN infrastructure network and a WPAN ad-hoc network using 802.11. *E.g.*, Ex-1003 ¶¶59-63 (*Cromer*), 81-89 ([1pre]), 147-152 ([1h]). *Ganu* taught modifications to ad-hoc networks and data forwarding between battery-operated devices (MNs) and APs using a device (FN) located between the two. Ex-1003 ¶¶80-89 (*Ganu* Overview, [1pre]), 139-144([1f]), 147-152 ([1h]). *Ganu* stated that these features achieved, *e.g.*, power savings and reduced overhead. *Id.* *Ganu* also taught multi-hop routing through multiple layers of a self-organizing hierarchical

ad-hoc network (SOHAN). My First Declaration demonstrates that a POSA would have found it obvious to modify *Cromer*'s 802.11 ad-hoc protocol with teachings of *Ganu*. *Id.* My First Declaration further demonstrates that a POSA would have found it obvious for *Cromer*'s client to forward data between peer-to-peer devices and an AP as taught by *Ganu*'s teachings of forwarding by a similarly located device (FN):

Cromer



Ganu



Id.; Ex-1004 Fig. 1 (annotated); Ex-1005 Fig. 1 (annotated); Ex-1003 ¶¶81-89 ([1pre])).

36. Contrary to Ozmo's claims (Resp. 25-36) *Ganu*'s teaching of data forwarding is not predicated on all devices using the same protocol or on implementing *Ganu*'s routing tables. For example, *Ganu* repeatedly mentioned that

its forwarding nodes (FN) relayed data, often placing a single FN as the only device between the MN and AP, as shown in the annotated *Ganu*'s Fig. 1 above. Ex-1005. While such data relaying could also be accomplished through a particular routing procedure (Ex-1005 001), *Ganu*'s relaying disclosed a forwarding procedure to the POSA. *Ganu* also disclosed that its AP forwarded data outside of the ad-hoc network—like the forwarding in the *Cromer-Ganu* combination. Ex-1003 ¶¶139-144([1f]), 147-152 ([1h]). Such data forwarding would involve *Ganu*'s modified 802.11 protocol within the network and another protocol outside the network. Thus, *Ganu*'s teachings of data forwarding are not limited to its routing tables and involve more than one protocol.

37. *Ganu* also disclosed routing tables as part of a specific routing method. Ex-1005 001. *Ganu*'s routing tables were built based on MN association messages sent following periodic, modified-802.11 beacons. Ex-1005 003; Ex-1003 ¶¶116-144 ([1e-f]). The routing tables' population occurred during a discovery phase in which SOHAN FNs and APs sent beacons. Ex-1005 003. *Ganu* updated the table using a variable "refresh timer" that was set based on whether beacons were or were not received. Ex-1005 003.

38. Ozmo argues that *Cromer-Ganu* combination won't work, but mischaracterizes *Ganu*. For example, Ozmo argues that "*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” and that *Ganu* could not “successfully function without any ad hoc APs.”³ Resp. 30, 33-34. Ozmo’s conclusions are incorrect and unsupported by *Ganu*. While *Ganu* states that the most scenarios involve internet traffic (Ex-1005 001), it does not state that this is the only scenario to which its teachings apply. Further, *Ganu*’s SOHAN only required two-tiers. Ex-1005 002 (disclosing a “proposed hierarchical architecture with more than one tier.”). The fact that APs, and the tier at which *Ganu* typically placed them, is not required by *Ganu* is consistent with a POSA’s knowledge that ad-hoc networks do not require an AP but, rather, only two stations. Ex-1029 23-24; Ex-1028 398. Additionally, *Ganu* does not state that it requires APs. Thus, *Ganu*’s teachings are

³ Ozmo also mischaracterizes my testimony regarding the necessity of APs in *Ganu*. Resp. 30. My testimony merely states that, without an AP, the “communication between the mobile node [and] the Internet would not work” (Ex-2006 104:15-17), not that *Ganu*’s routing would fail or that an “ad hoc” AP was necessary.

broadly applicable to ad-hoc networks—such as that disclosed in *Cromer*—regardless of the express placement an AP in that network.^{4,5}

39. Ozmo also states that “[c]ritical to [*Ganu*’s SOHAN] organization is the use of routing tables in FNs to map which MNs are currently ‘associated’” (Resp. 29) and that these associations require periodic updating and listening to ad-hoc beacons (Resp. 32-33). Ozmo appears to argue that, if client 100 missed a beacon, such tables governing the ad-hoc network routing would not be populated and, hence, traffic would be dropped. Resp. 28-29, 32-33. However, *Cromer* provided concurrent communications in both infrastructure and ad-hoc networks (WPAN). Ex-1003 ¶¶59-63 (*Cromer*), 81-89 ([1pre]), 116-144 ([1e-f]), 147-152 ([1h]). Also, the 802.11 standard described beacons synchronizing ad-hoc and infrastructure networks. Ex-1003 ¶¶50-55 (802.11 WiFi Standard). Thus, *Cromer* receives the beacons necessary to maintain its network connections. *Ganu*’s beacons are sent according to its 802.11-modified protocol. Ex-1005. *Ganu* did not disclose changes

⁴ Moreover, APs were known to be part of both infrastructure and ad-hoc networks. Ex-1004; Ex-1005; Ex-1029. Thus, a POSA would have understood that *Cromer*’s ad-hoc networks could also contain other APs.

⁵ As stated above, ad-hoc network connections, including with APs, were not required to implement *Ganu*’s teaching of forwarding.

to beacon frequency, and Ozmo does not explain that *Ganu*'s modified-802.11 beacons are sent more frequently in 802.11 networks.

40. Also, routing tables are not required in the *Ganu-Cromer* combination to enable forwarding. §III.B.2. Even if they were, Ozmo's arguments ignore the POSA's skill to make routine adaptations to the combination. For example, *Ganu* disclosed a variable "refresh timer" used to update tables based on whether beacons (such as FN beacons) were or were not received. Ex-1005 003. *Cromer* similarly disclosed a "watchdog timer" controlling the frequency with which client 100 returned to the ad-hoc network. *E.g.*, Ex-1004 2:14-15. Thus, a POSA would have found it obvious to change client 100's watchdog timer, as necessary, to cause client 100 to return the *Cromer-Ganu* ad-hoc network to both send and receive these beacons, or other messages, as network conditions changed and to maintain any required tables (to the extent they were necessary), as taught by *Ganu*. Further, missing transmissions, dropping packets, dealing with changing network conditions, and devices entering and leaving a network are rudimentary considerations that are routinely addressed by design choices in wireless networks, especially ad-hoc networks. A POSA would have been well aware of these considerations and had the skills to address them as needed, particularly to ensure that a network provided effective communications.

41. The *Cromer-Ganu* combination does not violate *Ganu*'s teachings.

IV. CONCLUSION AND DECLARATION

199. My findings and opinions set forth in this Declaration are based on my work and examination to date. I may continue my examinations in view of additional documents or other factual evidence over the course of this proceeding that may necessitate supplementing and/or refining my opinions. I reserve the right to add to, alter, or delete my opinions and my Declaration upon discovery of additional information. I reserve the right to make such changes as necessary.

200. In signing this Declaration, I understand 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 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 cross-examination within the United States during the time allotted for cross-examination.

201. 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 at Richardson, TX on January 10, 2024:

By: Zygmunt J. Haas 01/10/2024
Dr. Zygmunt J. Haas

APPENDIX A – MATERIALS RELIED UPON

<i>Exhibit #</i>	<i>Description</i>
1001	U.S. Patent 9,264,991 (“the ’991 Patent”)
1002	Prosecution history of the ’991 Patent (“File History”)
1003	Declaration of Dr. Zygmunt J. Hass (“First Declaration”)
1004	U.S. Patent 7,389,352 to <i>Cromer</i> et al. (“ <i>Cromer</i> ”)
1005	S. <i>Ganu</i> et al., <i>Architecture and Prototyping of an 802.11-Based Self-Organizing Hierarchical Ad-Hoc Wireless Network (SOHAN)</i> (“ <i>Ganu</i> ”)
1006	WO 2006/000617 to Sinivaara et al. (“ <i>Sinivaara</i> ”)
1007	P. Manzoni et al., <i>Providing Interoperability Between IEEE 802.11 and Bluetooth Protocols for Home Area Networks</i> (“ <i>Manzoni</i> ”)
1008	U.S. Patent 7,643,463 to Linsky et al. (“ <i>Linsky</i> ”)
1009	Declaration of Petitioner’s Expert Dr. Ingrid Hsieh-Yee (“Librarian Declaration”)
1010	Claim Construction Order and Memorandum from <i>Ozmo Licensing LLC v. Acer Inc.</i> , Dkt. 36, Case No. 6:21-cv-01225 (W.D. Tex Sep. 20, 2022) (“ <i>Markman Order</i> ”)
1015	IEEE Xplore Digital Library copy of <i>Ganu</i> , obtained on September 29, 2002
1017	Compilation of archived IEEE webpages, available at: https://web.archive.org/web/20040710111848/http://www.ieee.org:80/portal/index.jsp , archived July 10, 2004; https://web.archive.org/web/20040718051206/http://webapps1.ieee.org/conferenceSearch/details.do?tagNo=9573 , archived July 18, 2004; https://web.archive.org/web/20010207003457/http://ieeexplore.ieee.org/lpdocs/epic03 , archived February 7, 2001; and https://web.archive.org/web/20040823035644/http://shop.ieee.org/store/search.asp?mscssid=SQWFCQGUPSG59LETBWMTGL9713B63BEE&CID_LDAP=&PROMO_SRC_CODE=&BUYER_TYPE=&account_type=&member_grade=&hftype=&AUTH= , archived August 23, 2004.
1018	PIMRC 2004 Conference Website, and Conference Program Schedule downloaded from the same website, available at: https://web.archive.org/web/20040721000953/http://www.pimrc2004.org/ , archived July 21, 2004.

<i>Exhibit #</i>	<i>Description</i>
1019	WO 01/52447 to Judd et al. (“ <i>Judd</i> ”)
1020	“WPAN Applications” IEEE submission dated 1998, available at: https://www.ieee802.org/11/Documents/DocumentArchives/1998_docs/82957S-Shell-WAPAN-Applications.pdf .
1021	U.S. Patent Application Publication 2006/0194538 to Palin et al. (“ <i>Palin</i> ”)
1022	U.S. Patent 7,194,642
1023	U.S. Patent 8,208,449
1024	U.S. Patent Application Publication 2004/0048577
1025	Excerpts from Newton’s Telecom Dictionary (20 th ed. 2004)
1027	U.S. Patent Application Publication 2002/0028655
1028	Excerpts from Eric Cole, Network Security Bible (2005)
1029	IEEE Std 802.11, 1999 Edition (Reaffirmed 2003)
1030	U.S. Patent No. 8,599,814 (“the ’814 Patent”)—parent (by continuation) to the ’991 Patent