

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., and
SAMSUNG ELECTRONICS, AMERICA, INC.,
Petitioners,

v.

FOUR BATONS WIRELESS, LLC,
Patent Owner.

Case IPR2025-00496
Patent 8,798,006

DECLARATION OF DR. KONSTANTINOS PSOUNIS



Signed: _____

Dr. Konstantinos Psounis

June 23, 2025

I. Introduction

1. My name is Konstantinos Psounis. I am over eighteen years of age, of sound mind, and qualified to make the statements set forth in this Declaration. With the exception of the legal principles counsel has supplied to me, all the facts and statements contained herein are within my personal knowledge and are in all respects true and correct.

2. I have been asked by Four Batons Wireless LLC (“Four Batons” or “Patent Owner”) to submit this declaration in response to a Petition in IPR2025-00496 from Samsung Electronics Co. Ltd., and Samsung Electronics, America, Inc., (“Samsung” or “Petitioner”) regarding U.S. Patent No. 8,798,006 (“the ’006 Patent”).

3. I am being compensated for my time at my current standard rate of \$850 per hour for the services that I provide in connection with this case. That compensation is not contingent upon my performance, the outcome of the case, or any issues involved in or related to this case.

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

II. Qualifications

5. I have summarized in this section my educational background, career history, publications, and other relevant qualifications. My full *curriculum vita* is attached as Exhibit 2014 to this declaration.

6. I am a Professor and prior Associate Chair of Electrical and Computer Engineering and Professor of Computer Science at the University of Southern California. I joined the University of Southern California in 2003, after completing my PhD at Stanford University as a Stanford Graduate Fellow.

7. My professional career spans more than 20 years. As set forth in Exhibit 2014, I have extensive experience in the field of networked distributed systems, including the Internet and the web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless systems, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems.

8. I have published more than 100 technical papers in these fields, which have been cited tens of thousands of times. I have also been awarded numerous grants and significant funding from the government and industry leaders to advance these fields. As a result, I have been named an Institute of Electrical and Electronics Engineers (IEEE) Fellow, the highest grade of membership, for “fundamental

contributions in the theory and practice of wireless networks,” and a Distinguished Member of the Association of Computing Machinery (ACM).

9. Throughout my career, I have analyzed, designed, and developed efficient networked distributed systems for the Internet and the Web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless networks, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems. As such, I have acquired extensive expertise in the analysis and development of those systems and associated products.

10. I have extensive experience with and made contributions specifically towards analyzing and designing efficient Wi-Fi, cellular and other wireless systems. In particular, I have received multiple funding awards from the National Science Foundation (NSF), the leading governmental agency for funding computer engineering and computer science research, to work on wireless systems, including Wi-Fi systems. I have also received multiple funding awards from the industry leaders in the area of networking and in particular wireless networking, to work on these systems. I have published several papers in the most selective academic journals and conferences on wireless systems. I have also been the faculty in charge of the entire networking curriculum at the Electrical and Computer Engineering

department at USC for more than a decade and teach networking classes and in particular the graduate wireless networking class yearly.

11. I also have extensive practical experience with networked distributed systems. For example, I was a co-founder of SpaceMUX, Inc. (whose IP was later acquired by Quantenna Communications, Inc.), where I designed and developed systems to increase the speed of wireless networked systems using modern wireless networking technologies and techniques. Also, I was the Technology Architect for Fineground Networks (later acquired by Cisco Systems, Inc.), where I designed and developed systems to accelerate the delivery of content over the World Wide Web. In addition, for over 20 years both at Stanford University and at the University of Southern California I have designed and implemented efficient algorithms, protocols, and systems for a variety of distributed networked systems, and I have consulted for industrial leaders, and produced prototype systems. I have also applied for and been granted numerous patents, which are owned by network industry leaders and prestigious academic institutions.

12. In sum, I have extensive experience in and familiarity with the fields of networked distributed systems and in particular with wireless networking systems including Wi-Fi and cellular wireless systems, and extensive experience and contributions towards the analysis, design, and implementation of such systems.

III. Materials Considered

13. Among the materials I have reviewed in forming my opinions are the '006 Patent, its prosecution history, as well as the patents, references, and other materials cited in this expert declaration.

14. I have also reviewed the Petition and its exhibits, including the declaration of Sumit Roy, Ph.D. (Exhibit 1002).

IV. Legal Principles

15. I am not a lawyer. In forming my opinions as set forth in this Declaration, I have relied upon legal principles supplied to me by attorneys for Atlas. In forming my opinions, I have not relied upon Patent Owner's attorneys for any purpose other than the following legal principles.

A. Claim Construction

16. I understand that determining whether a patent claim is valid requires a two-step analysis. First, the claim must be construed. Second, the properly construed claim must be compared to the prior art.

17. With respect to the first step, I understand that claims are construed from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the purported invention. I understand that, absent a disclaimer or express definition, claim terms are given their plain and ordinary meaning to a POSITA in view of the specification and file history and the knowledge of a POSITA. Unless

otherwise noted, I have applied what I consider to be the plain and ordinary meaning of all terms as understood by a POSITA at the time of the invention.

B. Anticipation

18. I understand that, although not expressly disclosed, subject matter may be inherently disclosed in a prior art reference where that subject matter is necessarily present in the subject matter disclosed and would be understood to be so by those of ordinary skill in the art. I understand that the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.

19. I understand that a claim is invalid if each and every element of the claim is disclosed in a single prior art reference with the elements arranged as specified in the claim, either expressly or inherently. I understand that invalidity based on the disclosure of a single prior art reference in this manner is called anticipation.

C. Obviousness

20. I understand that a claim would have been obvious under 35 U.S.C. § 103 if one or more prior art references disclose every claim limitation in such a way so as to render the claim, as a whole, obvious to a person of ordinary skill in the art at the time the purported invention was made.

21. In determining whether or not a patented invention would have been obvious, the following factors should be considered: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the art; and (d) whatever “secondary considerations” may be present.

22. I understand that certain “secondary considerations” may be relevant in determining whether or not an invention would have been obvious, and that these secondary considerations may include commercial success of a product using the invention, if that commercial success is due to the invention; long-felt but unsolved need for the invention; evidence of copying of the claimed invention by others; industry acceptance; initial skepticism of the invention; failure of others to solve the problem; praise of the invention by others; the taking of licenses under the patents by others; and simultaneous invention by others (which may be an indication that the claimed invention was the result of ordinary skill in the art).

23. I understand that a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. While multiple prior art references or elements may, in some circumstances, be combined to render a patent claim obvious, I understand that I should consider whether there is an apparent reason to combine the prior art references or elements in the way the patent claims. To determine whether such an

apparent reason exists to combine the prior art references or elements in the way a patent claims, it will often be necessary to look to the interrelated teaching of multiple patents, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a person having ordinary skill in the art.

24. I also understand that when the prior art teaches away from combining prior art references or certain known elements, discovery of a successful means of combining them is more likely to be non-obvious. A prior art reference may be said to teach away from a patent when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent or would be led in a direction divergent from the path that was taken by the patent.

25. I also understand that it is not permissible to use hindsight in assessing whether a claimed invention is obvious. Rather, I understand that, to assess obviousness, you must place yourself in the shoes of a person having ordinary skill in the relevant field of technology at the time the inventions were made who is trying to address the issues or solve the problems faced by the inventor and ignore the knowledge you currently now have of the inventions.

26. I also understand that there are numerous ways in which to articulate the legal standard for obviousness, including: (1) combining prior art elements according to known methods to yield predictable results, (2) simple substitution of

one known element for another to obtain predictable results, (3) use of a known technique to improve similar devices (methods, or products) in the same way, (4) applying a known technique to a known device, method, or product ready for improvement to yield predictable results, (5) choosing from a finite number of identified, predictable solutions with a reasonable expectation of success, (6) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art, and (7) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

D. Person of Ordinary Skill in the Art

27. I understand that the meaning of claim terms and a patent's validity are to be determined from the vantage point of one of ordinary skill in the art at the time of the invention (a "POSITA"). In determining who would be one of such ordinary skill, I understand it is appropriate to consider criteria such as: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the rapidity with which innovations are made; (d) the sophistication of the technology; and (e) the education level of active workers in the field.

V. The Level of Ordinary Skill in the Art

28. For the purposes of this declaration supporting the Patent Owner's Preliminary Response, I have been asked to apply the same POSITA definition as Dr. Roy and assume that a POSITA "would have had at least a Bachelor's of Science Degree (or equivalent) in an academic area emphasizing electrical engineering, computer engineering, or a related technical field, coursework in statistics, applied math, or quantitative network analysis, and about two years of research or professional experience in mobile communications or a related field." EX1002 ¶ 19. I understand that if the Petition is instituted, I will have the opportunity to propose my own definition of a POSITA.

VI. Analysis

29. I have been asked to opine on a limited number of issues for the purpose of supporting the Patent Owner's Preliminary Response. I understand that if the Petition is instituted, then I will have the opportunity to submit additional analysis on these and other issues.

A. [Claims 1, 2, and 3] "comparing in substantially real-time the qualities of multiple interfaces...using path quality metrics that are independent of how the QoI is measured"

30. I have been asked to provide opinions on the Petition Grounds as applied to the '006 Patent Claims 1, 2, and 3 limitations "comparing in substantially

real-time the qualities of multiple interfaces...using path quality metrics that are independent of how the QoI is measured.”

31. The Petition and Dr. Roy rely on Guo’s “residual bandwidth” as disclosing the path quality metrics that are independent of how the QoI is measured. Pet. 23-26, 33, 37-38, EX1002 ¶¶111-117, 140-143, 160-163. I disagree with that interpretation of Guo.

32. The Petition and Dr. Roy conflate path quality metrics with single link QoS metrics, and as a result, point to a metric that does not and cannot provide information about the quality of a path.

33. The ’006 Patent distinguishes between metrics that provide path quality information and those that do not. For example, the ’006 Patent discuss well-know, prior art QoI information such as signal strength or signal to noise ratio. EX1001 at 5:1-12. But, as the ’006 Patent recognizes, these types of QoI are limited to comparisons of the radio network and cannot provide end-to-end path information. *Id.* The inventors of the ’006 Patent sought to improve upon these methods by using path quality metrics that can be used to compare the path a data packet may take between two interfaces. *Id.* at 11:20-26. Examples of these types of metrics include round-trip available bandwidth, end-to-end delay and delay jitter, unidirectional available bandwidth, delay and delay jitter along an end-to-end network path through each interface. *Id.* at 5:1-12.

34. The '006 Patent focuses specifically on methods to measure available bandwidth across a path. *See, e.g., id.* at 11:55-13:32. The '006 Patent first describes a method to calculate average available bandwidth A_i of a link i . *Id.* at 11:55-12:8. Average available bandwidth A_i allows a calculation of the available bandwidth of an H -hop network path by determining the minimum available bandwidth among the H links. *Id.* The '006 Patent then describes several approaches for estimating available path bandwidth, including self-induced congestion approaches, packet pair train dispersion methods, combined self-induced congestion and packet pair approaches, TCP bulk file transfer rate approaches, and methods that rely on knowledge of the path and recent link utilizations. *Id.* at 12:10-13:32. The '006 Patent then provides detailed examples of the implementation of a few of these approaches. *Id.* at 13:49-18:44.

35. Guo uses an entirely different approach. Guo's techniques focus only on the quality of the radio network and aims to "provide[] a system and method for improved vertical handoff between different types of wireless network[s]." EX1005 ¶[0010]. Guo's method relies on "[e]nabling the measurement of wireless network quality of service parameters at a mobile computing device [which] enables the mobile computing device to make vertical handoff decisions...." *Id.*

36. There are two types of vertical handoff decisions envisioned by Guo, "automatically deciding when to enter a potentially higher quality of service wireless

network (e.g., WLAN) from a lower quality of service wireless network (e.g., WWAN), and automatically deciding when to exit a potentially higher quality of service network to a lower quality of service network.” *Id.* ¶[0055].

37. In going from WWAN to WLAN, Gou states that the only objective is to achieve a higher quality of service (presumably on the assumption that WLAN will almost always provide higher bandwidth and lower latency than WWAN). *Id.* The preference for WLAN is evident in Guo’s preferred embodiment. There, a “Multi-Network Manager component 1006 periodically (e.g., every 10 seconds) sends a Network Available notification....notifying [the Policy Manger component 1010] that the WLAN is available, as well as the [WLAN’s] current quality of service statistics.” EX1005 ¶[0104]. Guo explains that the device will switch from WWAN to WLAN when “the estimated residual bandwidth in the WLAN is higher than the communications bandwidth currently being experienced in the WWAN....” *Id.* In other words, in the WWAN to WLAN context, the decision to switch networks is based on a simple identification of which radio interface has better performance.

38. When deciding to switch from WLAN to WWAN, Guo describes a different technique. This handoff must account for two competing goals: “to handoff before the higher quality of service wireless network is no longer able to provide service, but also to remain in the potentially higher quality of service wireless network while that wireless network is actually able to provide a higher quality of

service.” *Id.* ¶[0056]. To accomplish both goals, Guo uses techniques that combine a Fourier transform based method, to determine whether signal strength is decreasing, *id.* ¶¶[0076]-[0080], combined with an adaptive signal strength threshold, to determine when a signal has weakened enough to justify switching networks, *id.* ¶[0085]. Guo states that this combination results in “an order of magnitude reduction in the unnecessary vertical handoff rate compared to the prior art...” *Id.* But, as with the WWAN to WLAN method, this decision only looks at quality of service metrics of the radio interfaces.

39. As I noted above, Petitioner and Dr. Roy rely on Guo’s discussion of residual bandwidth in making these decisions. Guo describes two methods to determine residual bandwidth, both in the context of a WLAN network. The first uses the network allocation vector (“NAV”) of the IEEE 802.11b standard. *Id.* ¶¶[0061]-[0062]. NAV is part of the collision avoidance scheme in the medium access control (“MAC”) layer of 802.11. *Id.* ¶[0061]. Based on the NAV, a mobile device can calculate a network allocation vector occupation (“NAVO”) that represents a “ratio of cumulative advertised transmission time during an observation period to the total observation time.” *Id.* ¶[0062]. There are several ways to map NAVO to network quality of service measures, such as residual bandwidth. *Id.* ¶¶[0063]-[0067]. However, because NAVO is a measure of the MAC layer, see *id.*

paragraph [0061], it is limited to providing QoS measurements of the wireless network link, not of a transmission path.

40. Since some networks cannot provide a NAV, Guo proposes determining data packet collision probability (“PCP”), which “may serve as a wireless network quality of service measure even in wireless networks that do provide for senders to advertise transmission time.” *Id.* ¶¶[0069]-[0072]. PCP is calculated by transmitting probing IP packets directly to an access point and determining the number of unacknowledged packets. *Id.* ¶[0070]. Since these packets are transmitted to an access point in the 802.11b context, PCP can only provide information about the wireless 802.11b network. *Id.*

41. For WWAN networks, “quality of service characteristics, such as bandwidth and transmission delay, are generally predictable in advance and relatively constant during use.” *Id.* ¶[0059]. Neither the petition nor Dr. Roy point to any specific technique in the WWAN networks to obtain QoS information.

42. When these techniques from Guo are compared to the claimed methods of the ’006 Patent discussed above, a POSITA would not understand Gou to teach the “path quality metrics that are independent of how the QoI is measured.” None of this QoS information described by Guo—NAVO, PCP, or WWAN service characteristics—can provide path quality metrics. They are only QoS measurements that are limited to the single link of their respective wireless networks.

B. A POSITA would not combine Guo with Neave

43. I have been asked to provide opinions on whether a POSITA would combine Guo with Neave as applied to Claim 1, 2, and 3 limitations related to specific method of comparing path quality. Specifically, Claim 1 requires that the use of either “a quickest change detection problem for observations from a new interface or... sequential two sample tests.” Claim 2 requires “a one-sample change point detection method or [] a non-parametric and on-line two-sample method.” Claim 3 requires “comparing path qualities based on sequential two sample tests.”

44. The Petition and Dr. Roy rely on several statistical tests describe in Neave as rendering these limitations obvious. Pet. 28-31, 34-36, 38, EX1002 ¶¶121-131, 146-151, 164-166. The Petition and Dr. Roy’s analysis is premised on their shared misunderstanding that “Guo does not explicitly state how [Guo’s] policy manager 1010 compares the QoS data for the WWAN and WLAN to determine whether ‘the estimated residual bandwidth in the WLAN is higher than the communication bandwidth currently being experienced in the WWAN.’” Pet. 28; EX1002 ¶ 123. This reading of Guo ignores its express discussion about how to compare the QoS data, much of which I discussed above, *supra* VI.A.

45. As I noted above, Guo provides specific algorithms to select between two networks. When going from WWAN to WLAN, Guo explains that the device will switch from WWAN to WLAN when “the estimated residual bandwidth in the

WLAN is higher than the communications bandwidth currently being experienced in the WWAN.” *Id.*; EX1005 ¶[0104]. In other words, the decision to switch networks is based on a simple identification of which radio interface has better performance. *Supra* VI.A.

46. In the WLAN to WWAN comparison, Guo uses techniques that combine a Fourier transform based method, to determine whether signal strength is decreasing, EX1005 paragraphs [0076]-[0080], with an adaptive signal strength threshold, to determine when a signal has weakened enough to justify switching networks, *id.* paragraph [0085]. *Supra* VI.A. The details of both steps are discussed in great detail in Guo. *See* EX1005 Figs. 12-14, ¶¶[0076]-[0123].

47. The Petition and Dr. Roy contend that “POSITAs would have been motivated to look to statistical tests that do not require any detailed assumptions about the distribution underlying the data.” Pet. 29; EX1002 ¶122. But, Guo’s system already teaches techniques to analyze and compare QoS metrics between two networks, and its methods are based around those techniques. As I discussed above, Guo’s teachings use specific measurements of the quality of service interface and use the Fourier and threshold techniques to generate “an order of magnitude reduction in the unnecessary vertical handoff rate.” EX1005 ¶[0085].

48. Contrary to the Petition and Dr. Roy’s assertions, there is no way to implement the teachings of Neave without fundamentally changing the principles of

operation of Guo. Combining Guo with Neave would require re-designing Guo's system to use entirely different data collection and decision making methods, a change that is not suggested in either Guo or Neave. For example, instead of maintaining a single threshold value, and periodically gathering signal samples, Guo would need to be modified to collect ranges of data for each network, such as described by Neave in reference to Rosenbaum's test. *See* EX1006, 165. Nothing in Guo suggests such a modification. Indeed, nothing in Guo suggests modifying its teachings to use *any* techniques discussed in Neave, much less specific ones that Petitioner relies on.

49. The argument put forth in the Petition and by Dr. Roy appears to be entirely based on hindsight. Neither Guo nor Neave would lead a POSITA to completely change the operation of Guo simply to implement Neave's tests, especially when doing so may eliminate the benefits that Guo claims to achieve. It is my opinion that a POSITA would not have looked to Neave to modify Guo.