

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

VASU HOLDINGS, LLC,
Patent Owner.

Case IPR2025-00448

Patent No. 10,368,281

**DECLARATION OF MARK LANNING IN SUPPORT
OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,368,281**

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I. INTRODUCTION

1. My name is Mark Lanning and I am currently the President of Telecom Architects, Inc., and Reticle Consulting, LLC. I have been retained on behalf of Samsung Electronics Co. Ltd. and Samsung Electronics America Inc. (“Samsung”), to provide my opinions on certain issues related to U.S. Patent No. 10,368,281 (“the ’281 patent”) in connection with the above-captioned *inter partes* review (“IPR”) proceeding. In particular, I have been asked to provide my insights, analysis, and opinions regarding whether claims 1, 12, 31, and 37 of the ’281 patent (“Challenged Claims”) are obvious over the prior art references identified below.

2. I understand that the ’281 patent is titled “Telephone With Automatic Switching Between Cellular and VoIP Networks,” names as an inventor Vasudevan Ganesan, and is currently owned by Vasu Holdings LLC. I have considered the ’281 patent. I understand that the ’281 patent has been provided as Ex. 1001.

3. I understand that the file history of the ’281 patent has been provided as Ex. 1002. I have considered this file history, and I will refer to it as “the ’281 File History.”

4. I understand that the ’281 patent is a continuation of U.S. Patent Application No. 14/806,482, which is a continuation of U.S. Patent Application No. 13/899,303, which is a continuation of U.S. Patent Application No. 13/168,585, which is a continuation of U.S. Patent Application No. 11/031,498 (“the ’498

Application”), which claims priority to U.S. Provisional Patent Application No. 60/534,466 (“the ’466 Provisional Application”).

5. I understand that the ’281 patent claims a priority date of January 6, 2004, the filing date of the ’466 Provisional Application. I have been asked to assume that the Challenged Claims are entitled to the January 6, 2005 filing date of the ’498 Application for the purposes of rendering my opinions in this declaration. I have not been asked to opine on whether the Challenged Claims of the ’281 patent are entitled to this priority date, and do not provide any opinion on that subject.

6. My analysis and conclusions set forth in this declaration are based on my educational background and experiences in the field (see Section II). I am qualified to opine concerning what a person of ordinary skill in the art would have known and understood during that time. Before January 6, 2004, my level of skill in the art was at least that of a person of ordinary skill. I am qualified to opine concerning what a person of ordinary skill in the art would have known and understood at the time of the ’281 patent’s purported invention. My analysis and conclusions herein are from the perspective of a person of ordinary skill in the art as of April 5, 2017, for claim 45. My analysis and conclusions herein are from the perspective of a person of ordinary skill in the art as of January 6, 2004, for all remaining claims.

7. As part of my independent analysis for this declaration, I have considered the following: the background knowledge/technologies that were commonly known to persons of ordinary skill in this art during the time before the earliest claimed priority date for the '281 patent; my own knowledge and experiences gained from my work experience in the field of the '281 patent and related disciplines; and my experience in working with others involved in this field and related disciplines.

8. I have considered the following non-exhaustive list of references in preparing my declaration. I have been instructed to assume that each of these references qualifies as prior art.

- **U.S. Patent Application Publication No. 2004/0137902 (“Chaskar”)** to Hemant M. Chaskar et al., titled “Smart Inter-Technology Handover Control” filed on November 13, 2003 and published on July 15, 2004. I understand that a copy of this reference has been designated as Exhibit 1004. Throughout my declaration, references to Chaskar are to Exhibit 1004.
- **U.S. Patent Application Publication No. 2005/0048977 (“Dorenbosch”)** to Jheroen Dorenbosch et al., titled “System and method to improve WLAN handover behavior and phone battery life when stationary in border cells,” filed on August 26, 2003 and published on March 3, 2005. I understand that a copy of this reference has been designated as Exhibit 1005. Throughout my declaration, references to Dorenbosch are to Exhibit 1005.
- **U.S. Patent No. 6,049,715 (“Willhoff”)** to Steven J. Willhoff et al., titled “Method and Apparatus for Evaluating a Received Signal in a Wireless Communication Utilizing Long and Short Term Values,” filed February 20, 1997 and published on April 11, 2000. I understand that a

copy of this reference has been designated as Exhibit 1006. Throughout my declaration, references to Willhoff are to Exhibit 1006.

- **U.S. Patent Application Publication No. 2005/0063348 (“Donovan”)** to Timothy Donovan, titled “Wireless local area network ad-hoc mode for reducing power consumption,” filed on September 19, 2003 and published on March 24, 2005. I understand that a copy of this reference has been designated as Exhibit 1007. Throughout my declaration, references to Donovan are to Exhibit 1007.
- **U.S. Patent Application Publication No. 2004/0246922 (“Ruan”)** to Jiandong Ruan et al., titled “Making Roaming Decisions Based on Association Qualities Between Wireless Devices and Wireless Access Points,” filed June 3, 2003 and published December 9, 2004. I understand that a copy of this reference has been designated as Exhibit 1008. Throughout my declaration, references to Ruan are to Exhibit 1008.
- **U.S. Patent Application Publication No. 2003/0084056 (“DeAnna”)** to Robert DeAnna et al., titled “System for development, management and operation of distributed clients and servers,” filed on October 11, 2002 and published on May 1, 2003. I understand that a copy of this reference has been designated as Exhibit 1009. Throughout my declaration, references to DeAnna are to Exhibit 1009.

9. I understand that there is a pending district court litigation between Petitioners and Vasu Holdings LLC (“Samsung Litigation”) involving the ’281 patent.

10. I am being compensated by Samsung at my standard hourly consulting rate of \$550 for my time on this matter. My compensation is not dependent on the outcome of this proceeding or any other proceeding between the parties.

11. In forming my opinions, I relied on the documents cited in this declaration and the documents identified in the attached Appendix B. These documents comprise patents, file histories, printed publications, and other related

documents. As discussed below, each document is a type that experts in my field would have reasonably relied upon when forming their opinions. Further, experts in my field would have had access to each document either through the applicable patent offices and/or well-known libraries, conferences, or publications in the field. My opinions are also based upon my personal and professional experience.

II. QUALIFICATIONS

12. I have extensive experience in the field of telecommunications including circuit-switched networks, multiple generations of cellular networks, and packet-switched networks.

13. I am currently the president of two consulting companies: Telecom Architects, Inc. and Reticle Consulting, LLC. Telecom Architects provides consulting services to fixed and wireless telecom service providers and their equipment suppliers. I have been President of Telecom Architects since 1999.

14. I have over 40 years of experience working in the telecommunications industry that began in the U.S. Army Signal Corp. My experience relevant to this case includes my work as an architect of various telecommunications systems and my work developing equipment used in telecommunications systems. This experience includes extensive design, implementation and testing work on the wireless interface functionality (between the base station and mobile phones) for multiple generations of cellular standards.

15. I received a B.S. in Computer Science from Southern Methodist University (SMU) in 1983.

16. DSC, now a part of Alcatel, hired me in 1983 where I was a software development manager on the team responsible for updating DSC's PSTN telephone switch into a Mobile Switching Center (MSC) for Motorola to sell as a part of their cellular product offering in the U.S. and many other countries.

17. In 1991, I began working as a consultant to Motorola for its "SuperCell" base station product and as a consultant to British Telecom to upgrade its current analog cellular network, and I was one of the network architects responsible for the design and rollout of its Global System for Mobile Communications (GSM) network known as Cellnet. Beginning in the early 1990s, I was responsible for implementation of the SMS service, including working with suppliers of the SMS Center (SMSC), Mobile Switching Centers (MSCs) and cellular phones to define and roll out the functionality that was to be provided.

18. I was personally involved with Nokia, Ericsson, Motorola and other equipment suppliers in this effort.

19. Since 1995, I have also provided second generation (2G) and third generation (3G) Code Division Multiple Access ("CDMA") network architecture and equipment design and implementation consulting services to companies such as Sprint, Nextel, Nokia, and Ericsson. While consulting to Nextel, which has since

become part of Sprint, as one of the network architects for its iDEN network, one of my responsibilities was to define the network and mobile phone functionality required to support MMS and advanced data communications capability.

20. In addition to my cellular experience listed above, for at least the past ten years, I have kept up to date my knowledge of the present-day 3G, 4G, and 5G cellular network and wireless standards and their associated equipment and protocols. I have done this through my study of each new release of these standards, technical books and trade publications as well as my expert work in legal cases, which has involved evaluating the functionality of many different types of network equipment, mobile devices, and baseband chipsets. I have also evaluated thousands of cellular technology patents, and most of these were for cellular phone and/or base station functionality.

21. I am a member of the Institute of Electrical and Electronics Engineers (IEEE), including the IEEE Standards Association. I am also a member of the Association for Computing Machinery (ACM). While employed at DSC, I was a member of the ANSI T1 and T1X1 standard groups responsible for the definition and standardization of the Advanced Intelligent Network (AIN) and Signaling System 7 (SS7) protocol.

22. A detailed record of my professional qualifications, including a list of publications, awards, and professional activities, is set forth in my curriculum vitae attached to this report as Appendix A.

III. LEGAL UNDERSTANDING

A. My Understanding of Priority Dates and Priority Claims

23. I have been informed that for a claim in a later-filed application to be entitled to the benefit of the filing date of a prior application, the specification of the prior application must contain a written description of the invention and the manner and process of making and using the claimed invention, in such full, clear, concise, and exact terms to enable an ordinarily skilled artisan to practice the invention claimed in the later patent application. Additionally, the priority application must describe the later claimed invention in sufficient detail that a person having ordinary skill in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought. I understand this analysis is performed on a claim-by-claim basis.

B. My Understanding of Claim Construction

24. I am not an attorney and offer no legal opinions, but in the course of my work, I have had experience studying and analyzing patents and patent claims from the perspective of a person skilled in the art.

25. I have been informed that patent claims are construed from the viewpoint of a person of ordinary skill in the art of the patent at the time of the

invention. I have been informed that patent claims generally should be interpreted consistent with their plain and ordinary meaning as understood by a person of ordinary skill in the art in the relevant time period (i.e., at the time of the purported invention, or the so called “effective filing date” of the patent application), after reviewing the patent claim language, the specification, and the prosecution history (i.e., the intrinsic record).

26. I have further been informed that a person of ordinary skill in the art must read the claim terms in the context of the claim itself, as well as in the context of the entire patent specification. I understand that in the specification and prosecution history, the patentee may specifically define a claim term in a way that differs from the plain and ordinary meaning. I understand that the prosecution history of the patent is a record of the proceedings before the U.S. Patent and Trademark Office and may contain explicit representations or definitions made during prosecution that affect the scope of the patent claims. I understand that an applicant may, during the course of prosecuting the patent application, limit the scope of the claims to overcome prior art or to overcome an examiner’s rejection, by clearly and unambiguously arguing to overcome or distinguish a prior art reference, or clearly and unambiguously disavowing claim coverage.

27. In interpreting the meaning of the claim language, I understand that a person of ordinary skill in the art may also consider “extrinsic” evidence, including

expert testimony, inventor testimony, dictionaries, technical treatises, other patents, and scholarly publications. I understand this evidence is considered to ensure that a claim is construed in a way that is consistent with the understanding of those of ordinary skill in the art at the time of the claimed invention. For example, this can be useful for a technical term whose meaning may differ from its ordinary English meaning. I understand that extrinsic evidence may not be relied on if it contradicts or varies the meaning of claim language provided by the intrinsic evidence, particularly if the applicant has explicitly defined a term in the intrinsic record.

C. My Understanding of Anticipation

28. I understand that a patent claim is invalid as “anticipated” if all the limitations of the claim are present, either expressly or inherently, in a single prior art publication or patent.

29. I also understand that a prior art reference can disclose a claimed feature because the feature is expressly described or because the feature is inherent in the disclosure. I understand that something is inherent in a prior art reference if the missing descriptive matter must necessarily be present, not merely probably or possibly present, and it would be so recognized by a person of ordinary skill in the art as of the priority date of the patent. I understand that it is acceptable to examine evidence outside of the prior art reference (i.e., extrinsic evidence) in determining whether a feature, while not expressly discussed in the reference, is necessarily

present in it.

30. I have further been informed that where a reference discloses multiple embodiments, the reference should not be limited to a preferred embodiment. Instead, each disclosed embodiment may anticipate.

31. Moreover, I have been informed that as part of an anticipation analysis, it is proper to take into account not only specific teachings of the reference, but also the inferences that one skilled in the art would reasonably be expected to draw therefrom. A reference can anticipate a claim even if it does not expressly spell out all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would at once envisage the claimed arrangement or combination.

D. My Understanding of Obviousness

32. I understand that a claim may be invalid if the subject matter described by the claim as a whole would have been obvious to a hypothetical person of ordinary skill in the art in view of a prior art reference or in view of a combination of references at the time the claimed invention was made. Therefore, I understand that obviousness is determined from the perspective of a hypothetical person of ordinary skill in the art and that the asserted claims of the patent should be read from the point of view of such a person at the time the claimed invention was made. I further understand that a hypothetical person of ordinary skill in the art is assumed

to know and to have all relevant prior art in the field of endeavor covered by the patent in suit.

33. I have been informed that there are two criteria for determining whether prior art is analogous and thus can be considered prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the patentee's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the patentee is involved. I have also been informed that the field of endeavor of a patent is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field. I have also been informed that a reference is reasonably pertinent if, even though it may be in a different field from that of the patentee's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to a patentee's attention in considering their problem.

34. I have also been advised that an analysis of whether a claimed invention would have been obvious should be considered in light of the scope and content of the prior art, the differences (if any) between the prior art and the claimed invention, and the level of ordinary skill in the pertinent art involved. I understand as well that a prior art reference should be viewed as a whole.

35. I have also been advised that in considering whether a claimed

invention would have been obvious over a combination of prior art references, I may assess whether there are apparent reasons to combine known elements in the prior art in the manner claimed in view of interrelated teachings of multiple prior art references, the effects of demands known to the design community or present in the marketplace, and/or the background knowledge possessed by a person of ordinary skill in the art. I understand that other principles may be relied on in evaluating whether a claimed invention would have been obvious, and that these principles include the following:

- A combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results;
- When a device or technology is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or in a different one, so that if a person of ordinary skill can implement a predictable variation, the variation is likely obvious;
- If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond their skill;
- An explicit or implicit teaching, suggestion, or motivation to combine two prior art references to form the claimed combination may demonstrate obviousness, but proof of obviousness does not depend on or require showing a teaching, suggestion, or motivation to combine;
- Market demand, rather than scientific literature, can drive design trends and may show obviousness;
- In determining whether the subject matter of a patent claim would have been obvious, neither the particular motivation nor the avowed purpose of the named inventor controls whether the claim is obvious;

- One of the ways in which a patent's subject can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims;
- Any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed;
- "Common sense" teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle;
- A person of ordinary skill in the art is also a person of ordinary creativity, and is not an automaton;
- A patent claim can be proved obvious by showing that the claimed combination of elements was "obvious to try," particularly when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a person of ordinary skill in the art would have had good reason to pursue the known options within his or her technical grasp; and
- One should be cautious of using hindsight in evaluating whether a claimed invention would have been obvious.

36. I further understand that, in making a determination as to whether the claimed invention would have been obvious to a person of ordinary skill, the Board may consider certain objective factors if they are present, such as: commercial success of products practicing the claimed invention; long-felt but unsolved need; teaching away; unexpected results; copying; and praise by others in the field. These factors are generally referred to as "secondary considerations" or "objective indicia" of nonobviousness. I understand, however, that for such objective evidence to be relevant to the obviousness of a claim, there must be a causal relationship (called a

“nexus”) between the claim and the evidence, and that this nexus must be based on a novel element of the claim rather than something in the prior art. I also understand that even when they are present, secondary considerations may be unable to overcome primary evidence of obviousness (such as motivation to combine with predictable results) that is sufficiently strong.

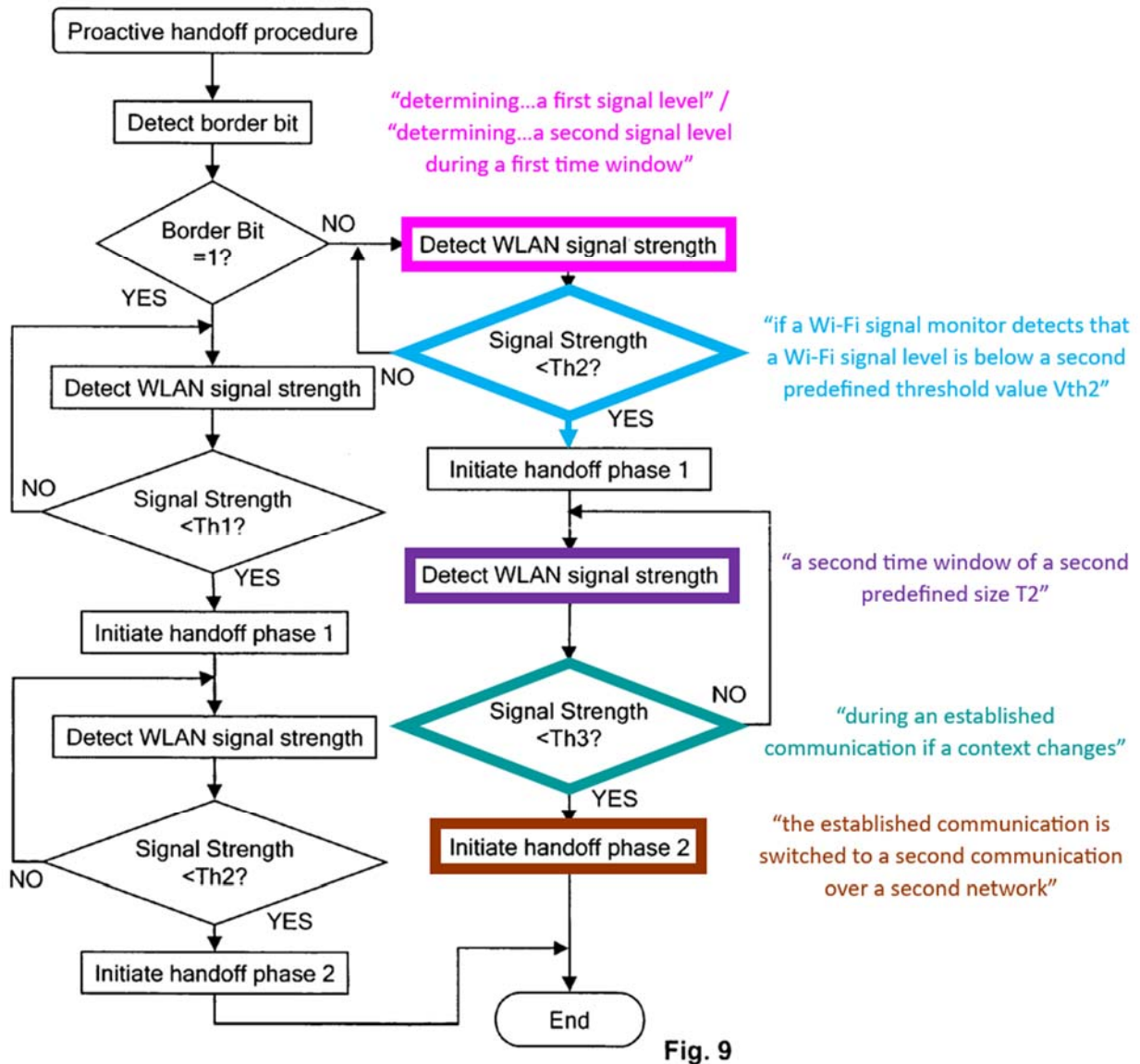
IV. BACKGROUND OF THE TECHNOLOGY

37. The '281 patent is generally directed to a mobile communication device that performs wireless handover between networks. '281 patent, 2:37-41. The device includes a cellular communication module and a Wi-Fi communication module and a network switch unit to automatically switch between them. '281 patent, 5:35-55, 6:20-27, 6:36-42.

38. The alleged inventive concept that led to allowance is the network switch unit's multi-step process for switching from the Wi-Fi communication module to the cellular communication module. See '281 File History, at 732. First, the Wi-Fi signal strength is measured during a window of time measured by a timer and compared against a threshold V_{th2} . '281 patent, claim 1. If the Wi-Fi signal strength falls below the level specified by the V_{th2} value, the Wi-Fi signal strength is again measured during a second time window measured by the timer, but compared against another, lower threshold level specified by the V_{th3} value. '281 patent, 6:59-67. If the Wi-Fi signal strength has fallen below the V_{th3} value, the network switch

unit switches to the cellular communication module. *Id.*

39. Based on my experience in the field, however, these concepts were already known in the art prior to the '281 patent's priority date. For example, Chaskar, discloses a method to control handover between a wireless local area network (WLAN) and a cellular networks. Chaskar, [0036]. In Chaskar's method, when a mobile communication device **detects a WLAN signal strength falls below a threshold (Th2)** during a signal strength averaging window, it initiates a first handoff phase, and thereafter, if the device **detects the WLAN signal strength falls below a threshold (Th3)** during a second signal strength averaging window, **the device switches communication networks**. Chaskar, [0072]-[0073].



40. Further, Willhoff discloses “a long term RSSI [(Received Signal Strength Indication)] average to determine when a handoff condition is to be checked,” which involves using a timer to establish time windows of “milliseconds” or “seconds” in length over which a signal strength is averaged. Willhoff, 2:33-37, 9:54-61. As I discuss in more detail below (Section IX.A.5), a person of ordinary skill in the art would have applied Willhoff’s implementation details for measuring

signal strength over a particular time window to Chaskar's signal strength averaging windows to advantageously ensure consistency of measurements.

41. As I discuss below, the claims of the '281 patent are obvious over the prior art. Further, there were no technological barriers to combining these teachings from the prior art and a person of ordinary skill in the art would have been motivated to combine these teachings and would have understood that the combination would have yielded predictable results.

V. THE '281 PATENT

A. '281 Patent Overview

42. The purported "invention" of the '281 patent relates to a "mobile communication device" for handover between networks. '281 patent, 2:36-41. As shown in Fig. 1, "mobile communication device 100" includes "**a first communication module** and **a second communication module**," such as "**a cellular communication module**" and "**a Wi-Fi communication module**." '281 patent, 5:35-45. Mobile communication device 100 further includes **network switch unit** to facilitate handover between the **cellular communication module** and the **Wi-Fi communication module**. '281 patent, 5:35-45, 6:20-27, 36-42.

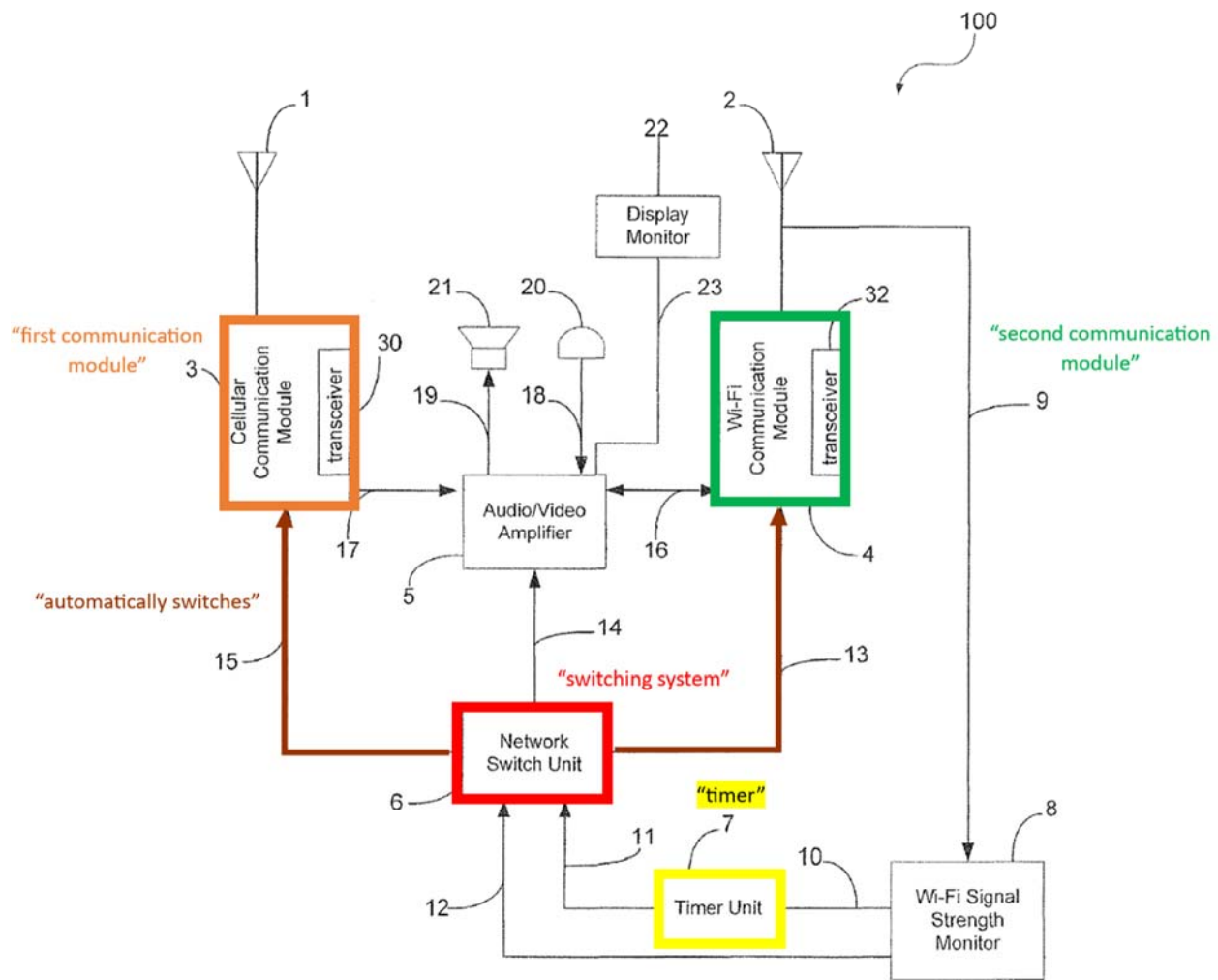


FIG. 1

1. Cellular to Wi-Fi Switching Scenario

43. While the mobile communication device is in an in-progress call via its **cellular communication module**, and the device detects a "Wi-Fi signal level [(strength)] is greater than V_{th1} , **timer unit 7** is activated to establish a first time window of a first predefined size T_1 ." '281 patent, 6:15-20; *see also* '281 patent, 4:43-49, 5:58-6:5. "If the Wi-Fi signal level detected during time window T_1 remains

equal to or greater than V_{th1} ,” a **switching circuit automatically switches** the in-progress call from the **cellular communication module** to the **Wi-Fi communication module**. ’281 patent, 4:49-56, 6:20-45. Further, when the timer is activated, the **Wi-Fi communication module** changes from a sleep mode to an active mode, before the communication is switched to the **Wi-Fi communication module**. ’281 patent, 4:4-10, 4:57-67, 5:33-36, 5:58-6:5.

2. Wi-Fi to Cellular Switching Scenario

44. While the mobile communication device is in a pre-established communication via its **Wi-Fi communication module**, and therefore “may be leaving the coverage area of the Wi-Fi access point,” and the device detects the level of the received Wi-Fi signal falls below a second predefined value V_{th2} , the **timer** is activated to establish a second time window of a second predefined size. ’281 patent, 6:46-60. The mobile communication device continues to monitor the signal strength during the second time window, and if the Wi-Fi signal level detected during the second time window is equal to or greater than a third predefined value V_{th3} , the pre-established communication via the **Wi-Fi communication module** is maintained without change. ’281 patent, 6:61-67. The third predetermined threshold value (V_{th3}) is less than the second predetermined threshold value (V_{th2}). ’281 patent, 6:63-67. If the detected Wi-Fi signal strength remains below V_{th3} , the **switching circuit** causes the in-progress communication to be switched from the **Wi-Fi**

communication module to the cellular communication module. '281 patent, 7:1-14.

B. The Prosecution History

45. U.S. Patent Application 15/480,293, which matured into the '281 patent, was filed on April 5, 2017. The Examiner issued a Non-Final Office Action on January 16, 2018 rejecting the as-filed claims under Sections 112, 103, and 102. '281 File History (Ex. 1002), 433-44. Claims 17-44 were additionally rejected on the ground of nonstatutory obviousness-type double patenting over claim 1 of U.S. Pat. No. 7,991,399, but the Examiner found that dependent claims 21-23 and 36 would be allowable if not dependent upon rejected independent claims 17 and 33. *Id.*, 433, 445. In response, Applicant amended the independent claims to recite, *inter alia*, “wherein switching is based on detecting a second context being preferred over the context within a set of known networks or from a newly discovered network.” *Id.*, 456.

46. The Examiner then maintained the same rejections against the newly amended claims in a Final Office Action. *Id.*, 492-501. In response, Applicant amended the independent claims to recite, *inter alia*, “wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to an active mode, wherein the timer is activated to establish a time window of a predefined size.” *Id.*, 542. The Examiner issued an advisory

action, and the Applicant filed a request for continued examination with minor claim amendments. *Id.*, 560, 567.

47. The Examiner issue another Non-Final Office Action, maintaining only the double patenting and Section 103 rejections, but finding claims 33, 37, 39-40, 56-58, 60-61, and 64 allowable if the double patenting rejection is resolved and certain amendments made. *Id.*, 598-605. In particular, the Examiner stated that the prior art does not teach “establishing a second time window of a second predefined size T, if the third detected context falls below a second predefined threshold value...detecting a fourth context during the second time window...and continuing a Wi-Fi communication without change if the fourth detected context is equal to or greater than a third predefined threshold value....” *Id.*, 604. The Examiner also found that the prior art does not teach “a timer...activated to establish a second time window of a second predefined size, wherein a third predefined threshold value is smaller than second predefined threshold value....” *Id.*, 605. Applicant duly amended the independent claims to include these limitations, but the Examiner issue another Final Rejection maintaining the unresolved Section 103 grounds. *Id.*, 674. In response, Applicant added “wherein a third predefined threshold value V_{th3} is smaller than V_{th2} ” to independent claim 45. *Id.*, 713.

48. Thereafter, the Examiner issued a notice of allowance on March 15, 2019, finding that the prior art does not teach the newly added limitation. *Id.*, 732.

In the notice of allowance, the Examiner determined that, for issued claims 1, and 37, the prior art does not teach “wherein if a Wi-Fi signal monitor [detects] that a Wi-Fi signal level is below a second predefined threshold value V_{th2} ; the timer is activated to establish a second time window of the second predefined size T_2 , wherein a third predefined threshold value V_{th3} is smaller than V_{th2} .” *Id.*, 732. The Examiner further determined that, for issued claim 12, the prior art does not teach “establishing a second time window of a second predefined size T , if the third detected context falls below a second predefined threshold value V_{th2} ; detecting a fourth context during the second time window; and continuing a Wi-Fi communication without change if the fourth detected context is equal to or greater than a third predefined threshold value V_{th3} ; wherein V_{th3} is smaller than V_{th2} .” *Id.*, 732. And the Examiner also determined that, for issued claim 31, the prior art does not teach “a timer is activated to establish a second time window of a second predefined size, wherein a third predefined threshold value is smaller than a second predefined threshold value.” *Id.*, 732.

VI. LEVEL OF ORDINARY SKILL IN THE ART

49. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art at the time of the alleged invention. I understand that the factors considered in determining the ordinary level of skill in a field of art include the level

of education and experience of persons working in the field; the types of problems encountered in the field, the teachings of the prior art, and the sophistication of the technology at the time of the alleged invention. I understand that a person of ordinary skill in the art is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a person of ordinary skill in the art would also have knowledge from the teachings of the prior art, including the art cited below.

50. I have been asked to assume that Claims 1, 12, 31, and 37 are entitled to the benefit of the January 6, 2004, filing date of the '466 Provisional Application filing date.

51. Upon consideration of these factors, and based on my knowledge and experience in the field and my review of the '281 patent and file history, I believe that a person having ordinary skill in the art in this matter would have had at least a Bachelor's degree in electrical engineering, computer engineering, computer science, or the equivalent thereof, and approximately two years of professional experience working with networking and wireless communications systems. Additional education could substitute for professional experience, or vice-versa.

52. Based on my experiences, I have at least the skills of a person having ordinary skill in the art as well as a good understanding of the capabilities of a person having ordinary skill in the art. To be clear, all of my opinions in this declaration are

from the perspective of one of ordinary skill in the art as I have defined it here during the relevant timeframe.

VII. CLAIM CONSTRUCTION

53. I have been instructed that the Challenged Claims of the '281 patent are to be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the alleged invention in light of the specification and the prosecution history pertaining to the patent. I have followed these principles in my analysis set forth in this document.

54. I understand that the parties have not proposed constructions for the '281 patent in the Samsung Litigation.

VIII. GROUNDS OF UNPATENTABILITY

55. As I explain above in Section IV above, a mobile communication device that performs wireless handover between networks was well-known in the art.

56. In this section, I will explain why the teachings or combinations of teachings from the following references render obvious each of the Challenged Claims:

Name	Exhibit	Publication	Filed	Published/ Issued
Chaskar	1004	US2004/0137902	11/13/2003	7/15/2004
Dorenbosch	1005	US2005/0048977	8/26/2003	3/3/2005

Willhoff	1006	US6049715	2/20/1997	4/11/2000
Donovan	1007	US2005/0063348	9/19/2003	3/24/2005
Ruan	1008	US2004/0246922	6/3/2003	12/9/2004
DeAnna	1009	US2003/0084056	10/11/2002	5/1/2003

57. I have been instructed to assume that each of these references qualifies as prior art.

58. As I explain below, the Challenged Claims are invalid based upon the following prior art grounds:

- **Ground 1:** Challenged Claims 1, 12, and 37 of the '281 patent are rendered obvious by Chaskar in view of Dorenbosch and Willhoff.
- **Ground 2:** Challenged Claims 1, 12, and 37 of the '281 patent are rendered obvious by Chaskar in view of Dorenbosch, Willhoff, and Donovan.
- **Ground 3:** Challenged Claim 31 of the '281 patent is rendered obvious by Chaskar in view of Willhoff and Ruan.
- **Ground 4:** Challenged Claim 31 of the '281 patent is rendered obvious by DeAnna in view of Chaskar, Willhoff, and Ruan.

59. It is my opinion that Challenged Claims of the '281 patent are unpatentable as I explain below. I note that in this discussion, I may focus on the particular language in the specific claims, but it should be understood that my analysis applies to the corresponding elements of all Challenged Claims containing identical or substantially identical language.

IX. SPECIFIC GROUNDS FOR CHALLENGE

60. As I explain above in Section IV above, although the '281 patent

purports to have invented a mobile communication device that performs wireless handover between networks, such devices were well-known in the art. As described below, the cited prior art provides these teachings.

61. In this section, I explain why claims 1, 12, 31, and 37 of the '281 patent are rendered obvious by the teachings of Chaskar, Dorenbosch, Willhoff, Donovan, and DeAnna. I note that, in this discussion, I may focus on the particular language in specific claims, but it should be understood that my analysis applies to the corresponding limitations of all claims containing identical or substantially identical language.

A. Ground 1: Chaskar in view of Dorenbosch and Willhoff (Claims 1, 12, and 37)

1. Overview of Chaskar (Ex. 1004, U.S. Patent App. Pub. No. 2004/0137902)

62. Chaskar discloses a method to control handover between first (wireless local area network (WLAN)) and second (cellular) technology networks by “detecting information about regions of an area of the first technology network,” and “initiating a handover procedure between the first and second technology networks based on the detected region information.” Chaskar, [0036]. Chaskar’s method allows detection of “whether a user of a mobile node is well within a WLAN footprint, roaming near the boundary of it or has left hot spot premises, [so that] smart handoff decision policies can be implemented.” Chaskar, [0016]. Chaskar’s

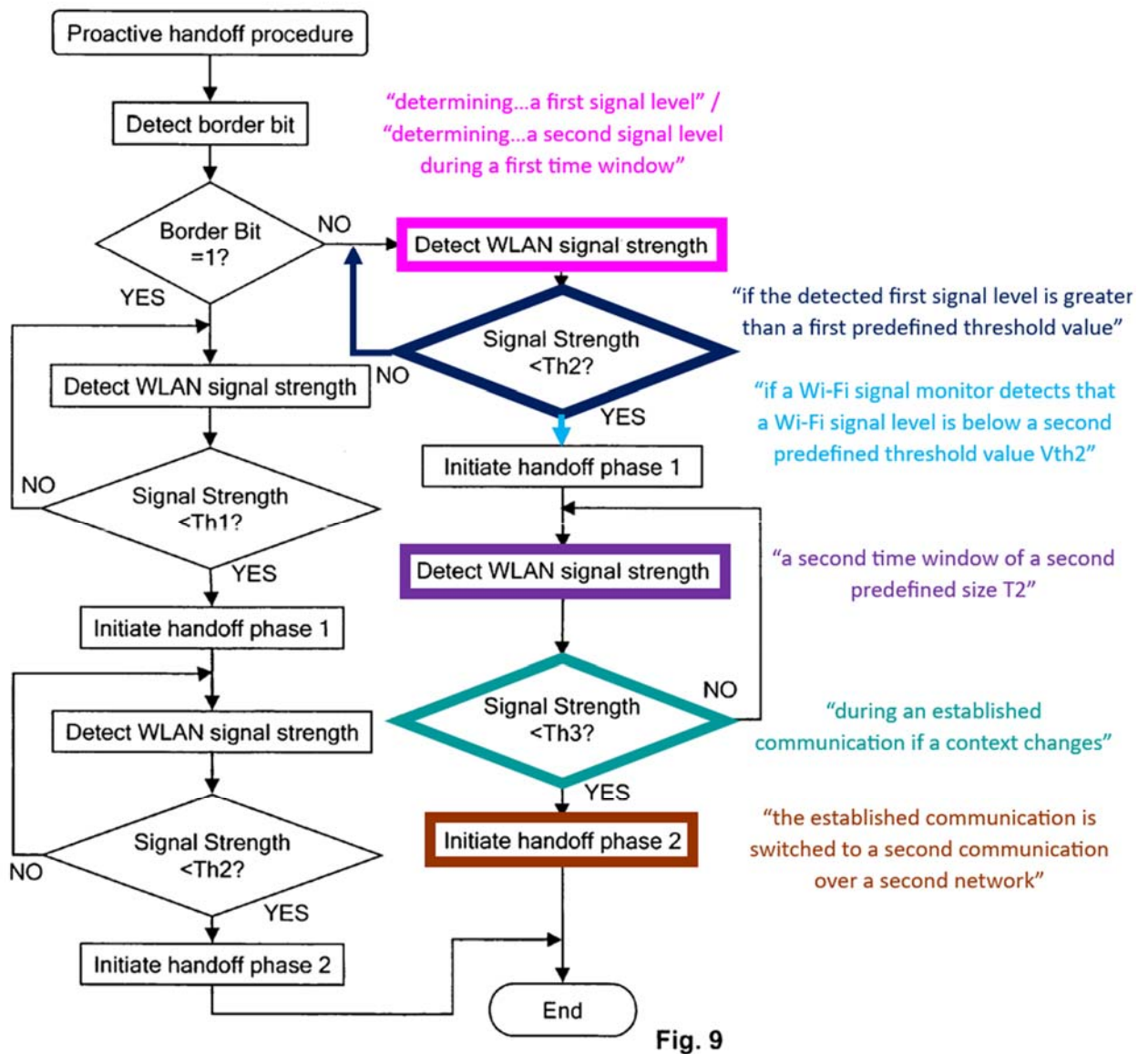
method “improve[s] inter-technology handover control so that spurious handoff triggers can be avoided and the need for handoff can be anticipated with enough margin for the execution of proactive handoff steps.” Chaskar [0013].

63. Chaskar’s method involves detecting whether the device is in a border region of a WLAN region by detecting whether “a border bit in beacons of those access nodes to the first technology network, e.g. those WLAN access points APs” is 1 or 0, and then proceeds to determine whether to transfer to a cellular network accordingly. Chaskar, [0044], [0070]-[0073].

64. When the mobile node detects a border bit=0 (indicating “a non-border region of the WLAN”), **the device “detect[s the] WLAN signal strength” over a “signal strength averaging window”¹ of a particular “width,” and if the WLAN signal strength is larger than Th2, it repeats the measurement for comparison against Th2.** Chaskar, [0072], [0076]-[0077]. **If the signal strength falls below Th2,** the mobile node initiates “handoff phase 1,” “in which handover is prepared.” Chaskar, [0037], [0072]. After initiation of phase 1, **the mobile node again**

¹ To the extent it is argued that the handoff procedures in Chaskar relied on in my declaration do not use “signal strength averaging windows,” it would have been obvious to do so because Chaskar teaches that this method provides a “robust measurement of received signal strength.” Chaskar, [0076].

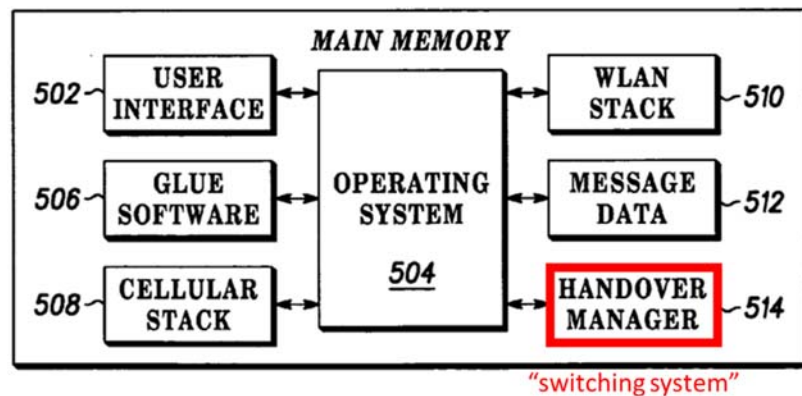
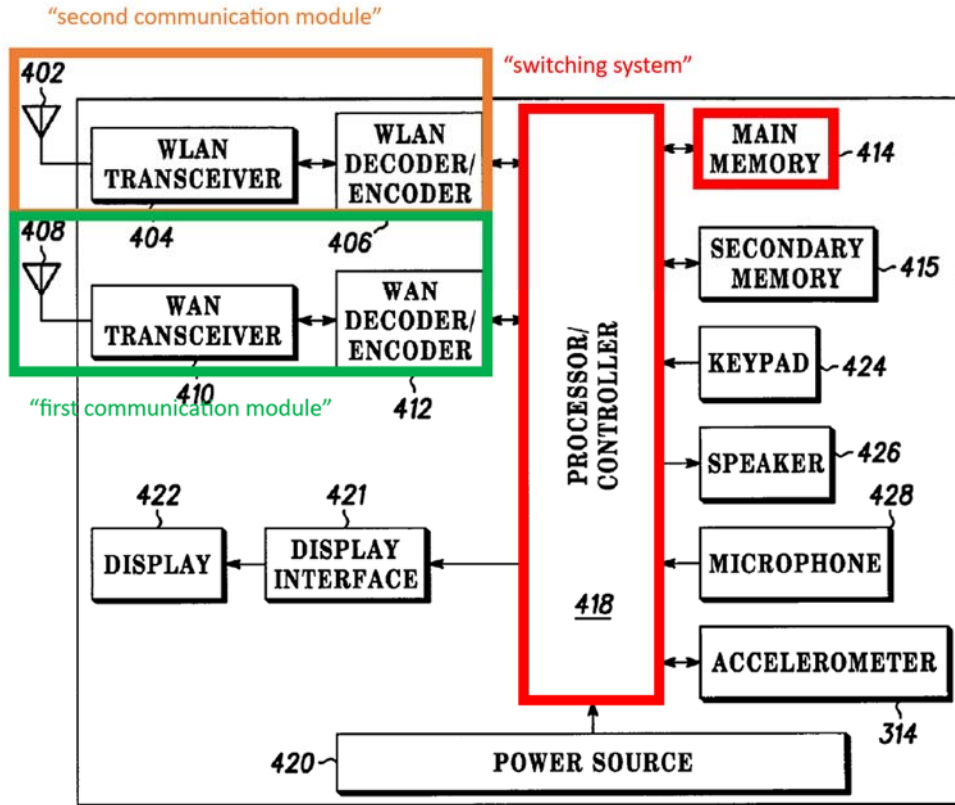
“detect[s the] WLAN signal strength” over a second signal strength averaging window of a particular width, and if the signal strength falls below Th3, “handoff phase 2” is initiated and a handover to cellular is performed. Chaskar, [0037], [0073], [0076]-[0077]. Chaskar discloses that “multiple thresholds can be used, for example $Th1 > Th2 > Th3$.” Chaskar, [0069].



Chaskar, Fig. 9.

2. Overview of Dorenbosch (Ex. 1005, U.S. Patent App. Pub. No. 2005/0048977)

65. Dorenbosch discloses a “mobile subscriber unit 306 also includes one or more **processors 418**,” and “a **main memory 414**.” Dorenbosch, [0027]. Dorenbosch’s **main memory 414** includes “**handover manager 514**,” “cellular stack 508,” and “WLAN stack 510.” Dorenbosch, [0027]. **Dorenbosch’s** mobile subscriber unit also contains “two sets of transceivers—one for the **WLAN system** and one for the **WAN system**, each transceiver containing an antenna **402**, **408**, an RF front end **404**, **410**, and a decoder/encoder **406**, **412** respectively, designed to transmit, receive, encode and decode wireless signals for the frequencies and characteristics of its corresponding system.” Dorenbosch, [0026].



a. Switching From WLAN to WAN/Cellular

66. Dorenbosch discloses maintaining a call while switching from a WLAN to a wide area network (WAN or cellular network), **the mobile subscriber**

unit “attempt[ing] to detect the presence of a border cell 210 or degradation in signal quality of the WLAN coverage.” Dorenbosch, [0038], Fig. 8. If either condition is detected, the mobile subscriber unit “initiates the registration sequence with the WAN system” and begins to monitor the movement of the mobile subscriber unit and detect the signal strength of the WAN. Dorenbosch, [0038]. Dorenbosch discloses that “the process of initiating the registration sequence with a communications system, be it a cellular (WAN) system or a local area (WLAN) system, includes the steps necessary to bring up the corresponding hardware and software for that system.” Dorenbosch, [0038]. If the “speed and/or displacement of the device 306 [exceeds] the first predetermined threshold and the signal strength of the WAN signal is still good,” then the device checks to see if the registration sequence is complete, at which point the unit conducts present/subsequent calls via the WAN system, and “terminat[es]” the “WLAN stack 510 and hardware.” Dorenbosch, [0038].

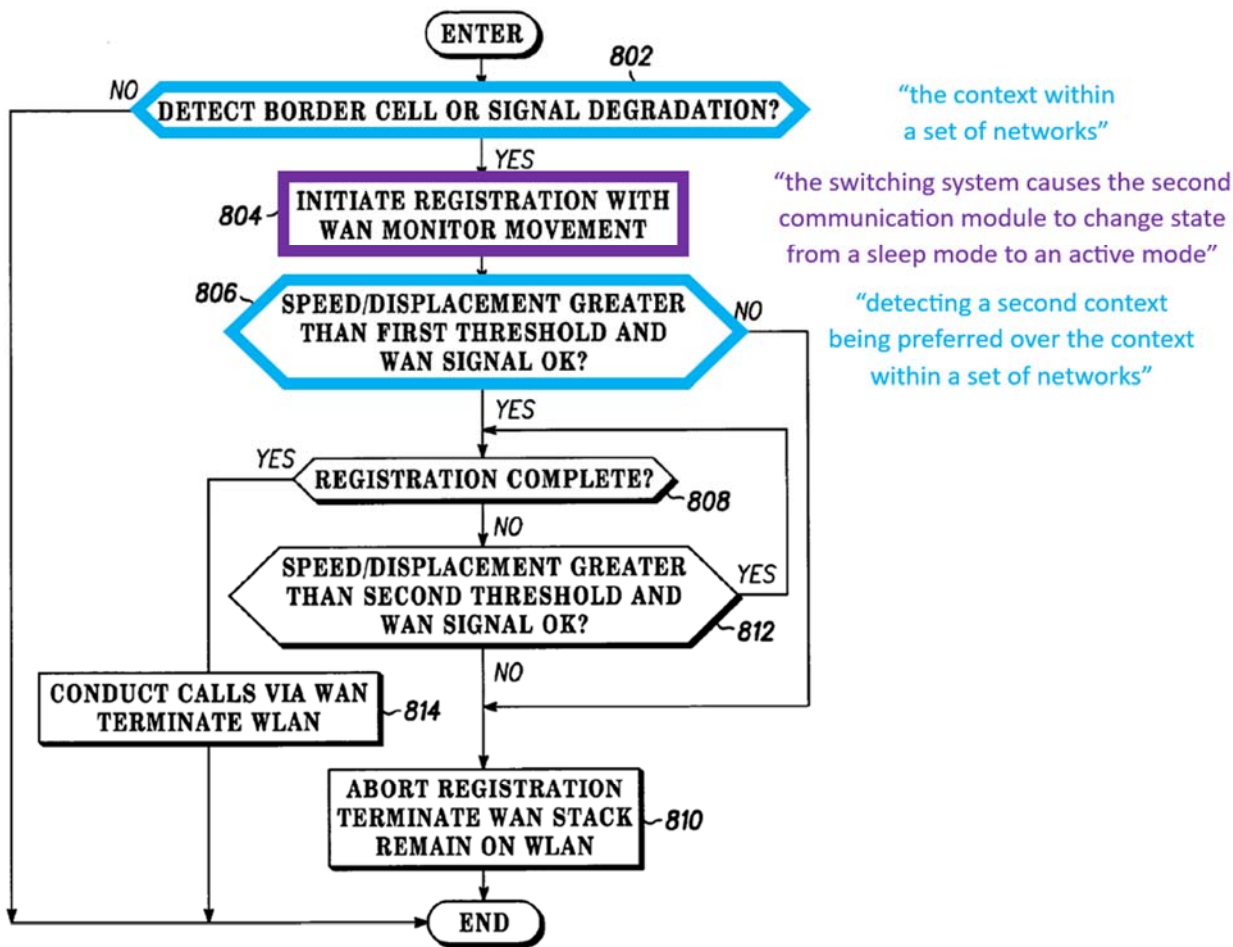


FIG. 8 800

b. Switching From WAN/Cellular to WLAN

67. Dorenbosch also discloses the reverse process of switching from WAN or Cellular to WLAN coverage. Dorenbosch, [0045]; Fig. 10. Upon entering the method, the mobile subscriber unit “begins running the **WLAN stack 510 and associated hardware 404, 406**” and “attempts to receive signals from WLAN cells.” Dorenbosch, [0045]. If the mobile subscriber unit “**detects a WLAN border cell**...then [it] registers with the WLAN and begins to monitor its movement,” and

“if the speed and/or displacement [of the mobile subscriber unit] exceed predetermined thresholds” (e.g., not relatively stationary) the unit “**check[s] the signal strength of the WLAN signal.**” Dorenbosch, [0045]. If the WLAN signal strength is sufficient to warrant a handover, the mobile subscriber unit “**terminat[es] running the WAN stack...and hardware**” and **conducts the present call via the WLAN.** Dorenbosch, [0045].

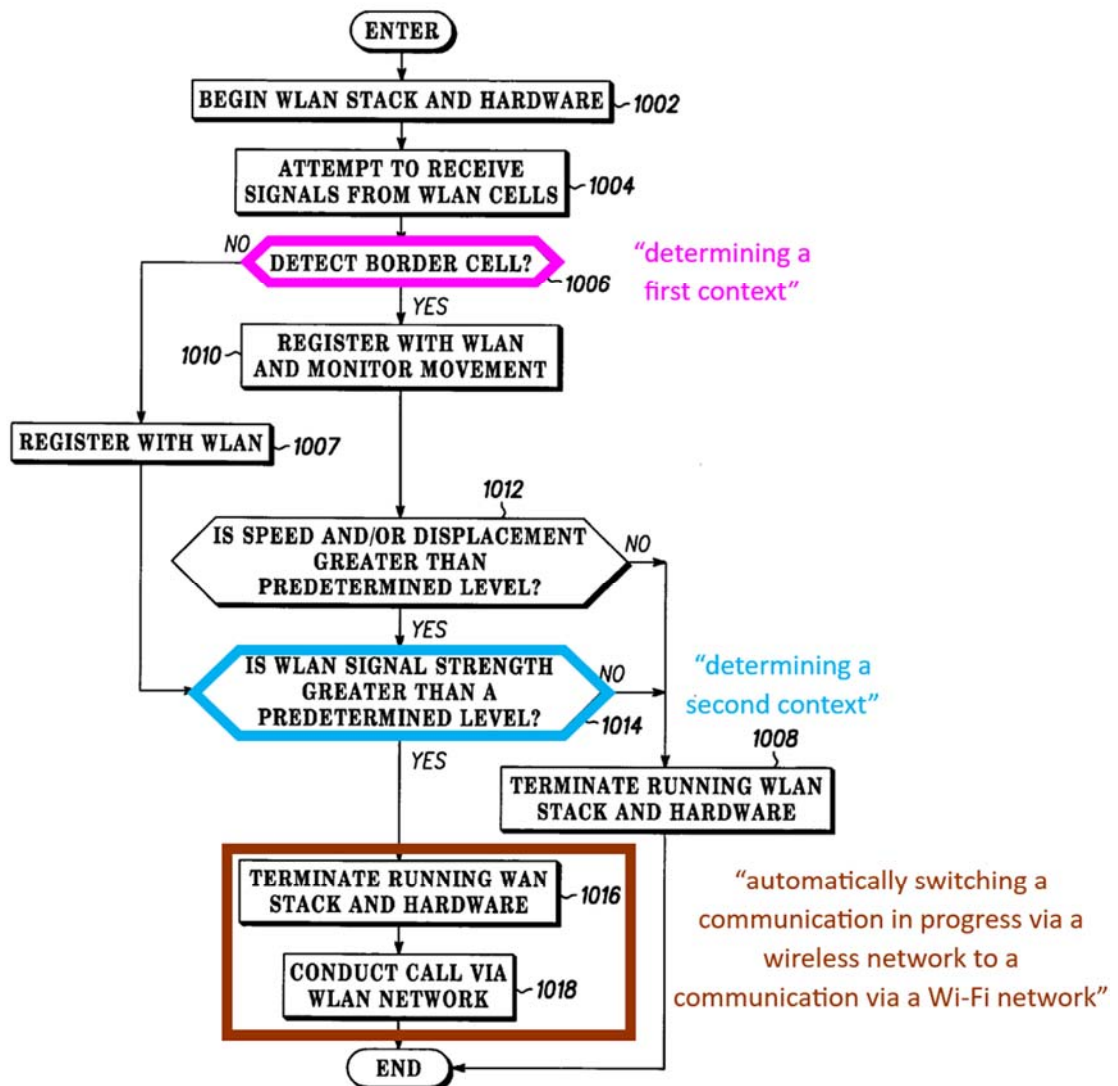


FIG. 10 1000

3. Motivation to Apply Dorenbosch's Teachings to Chaskar

68. Chaskar and Dorenbosch are in the same field as the '281 patent and are reasonably pertinent to the problems purportedly addressed by the '281 patent. For example, the '281 patent field includes wireless communications, and is pertinent to the problems of switching between wireless communication networks. *See e.g.*, '281 patent, Abstract ("A mobile communication device includes, in part, a cellular communication module, a first antenna adapted to receive and transmit data between the mobile communication module and a cellular network, a Wireless Fidelity (Wi-Fi) communication module, a second antenna adapted to receive and transmit data between the Wi-Fi communication module and a VoIP network, a signal monitoring circuit, and a switching circuit adapted to switch an existing communication from the cellular communication module to the Wi-Fi communication module or vice versa."), 2:36-41 ("In accordance with the present invention, a mobile communication device is configured so as to automatically switch a communication that is already in progress using a wireless cellular network (hereinafter alternatively referred to as cellular network) to a wireless Voice over IP (VoIP) network or vice versa.").

69. Chaskar's field includes wireless communications as well, and Chaskar is pertinent to the problems of switching between wireless communication networks. Chaskar, Abstract ("A method and apparatus for controlling handover between a

first technology network and a second technology network by detecting information about regions of an area of the first technology network, and deciding whether to initiate a handover procedure between the first and second technology networks based on the detected region information.”), [0036] (“The idea of the present invention is to control handover between a first technology network and a second technology network by detecting information about regions of an area of the first technology network, and deciding initiating a handover procedure between the first and second technology networks based on the detected region information.”).

70. Likewise, Dorenbosch’s field includes wireless communications as well, and Dorenbosch is pertinent to the problems of switching between wireless communication networks. Dorenbosch, Abstract (“A system, computer readable medium, mobile subscriber device and method determine that the device (306), operating on a first communications system is detecting a triggering event, which may be the detection of a wireless local area network border cell (210) or a degradation in signal quality. The device (306) then initiates a registration sequence with a second wireless communication system if the device (306) has detected the triggering event, determines the speed and/or displacement of the device (306), and conducts any present and subsequent calls via the second wireless communication system if the speed and/or displacement of the device exceeds a predetermined threshold.”), [0002] (“The present invention generally relates to the field of wireless

communications, and more particularly relates to a system and method to improve handover and registration behavior between WLANs and WANs and battery life of a mobile device when a user is stationary in border cells.”), [0038] (“[T]he subscriber unit 306 attempts to detect the presence of a border cell 210 or degradation in signal quality of the WLAN coverage at step 802. If the border cell 210 or WLAN signal degradation is detected, then the unit 306 initiates the registration sequence with the WAN system and begins to monitor the movement of the device 306, at step 804....[I]f the speed and/or displacement of the device 306 do exceed the first predetermined threshold and the signal strength of the WAN signal is still good, at step 806, then the device checks to see if the registration sequence has been completed, at step 808. If the registration sequence has not completed, the unit will continue to monitor the speed and/or displacement of the device and the strength of the WAN signal while checking whether the registration is completed....When the registration sequence is completed, the unit will conduct any present call and subsequent calls via the WAN system, at step 814, and will terminate running the WLAN stack 510 and hardware 404, 406. This method saves battery life by both aborting the handover to the WAN when unnecessary, and terminating the WLAN stack and hardware when the call is transferred to the WAN system.”), [0045] (“FIG. 10 illustrates a procedure used by the subscriber device 306 when moving from WAN coverage to WLAN coverage....The unit 306 enters the method, at step 1002

where it begins running the WLAN stack 510 and its associated hardware 404, 406. The unit then attempts to receive signals from WLAN cells at step 1004. If the unit detects a WLAN border cell, at step 1006, then the unit 306 registers with the WLAN and begins to monitor its movement, at step 1010....For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the unit will check the signal strength of the WLAN signal, at step 1014. Otherwise, the unit 306 again terminates running the WLAN stack 510 and hardware 404, 406, at step 1008, if either the movement information or the WLAN signal strength is insufficient to warrant a handover. If all the conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then the unit 306 will terminate running the WAN stack 508 and hardware 410, 412, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.”).

71. Like the '281 patent, Chaskar and Dorenbosch each contemplate methods of switching between WAN and WLAN networks according to signal strengths detected by a mobile device. *See, e.g.,* '281 patent, 2:54-67 (“If the mobile communication device is in an in-progress (i.e., pre-established) communication via its cellular communication module and through a cellular network, and the Wi-Fi antenna system detects a Wi-Fi signal having a first predefined level (strength), a timer disposed in the mobile communication device is activated to establish a first

time window of a first predefined size. If the Wi-Fi signal level detected during the first time window remains equal to or greater than the first predefined level, at the expiration of the first time window, the switching circuit causes the in-progress communication to be switched from its cellular communication module to its Wi-Fi communication module and through a VoIP network without losing the in-progress communication.”); Chaskar, [0070] (“In a first step in FIG. 9, a border bit is detected by the mobile node from a beacon of the WLAN AP with which the mobile node is connected. In case the border bit is equal to 1, i.e. the mobile node is in a border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a high possibility, the mobile node waits while a detected WLAN signal strength is larger than a predetermined threshold Th1. After the signal strength has declined below Th1, in order to be proactive, handoff phase 1 is initiated.”), [0071] (“After initiation of phase 1, the mobile node again detects WLAN signal strength from the AP, and while the detected WLAN signal strength is larger than a predetermined threshold Th2, the mobile node remains in a waiting state. After the signal strength has fallen below Th2, handoff phase 2 is initiated.”), [0072] (“In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, while a detected WLAN signal strength is larger than Th2, the mobile node waits. After the signal strength has fallen below Th2, in order to be

proactive, handoff phase 1 is initiated.”), [0073] (“After initiation of phase 1, WLAN signal strength is detected again and while the detected WLAN signal strength is larger than a predetermined threshold Th3, the mobile node waits. After the signal strength has fallen below Th3, handoff phase 2 is initiated.”); Dorenbosch, [0038] (“[T]he subscriber unit 306 attempts to detect the presence of a border cell 210 or degradation in signal quality of the WLAN coverage at step 802. If the border cell 210 or WLAN signal degradation is detected, then the unit 306 initiates the registration sequence with the WAN system and begins to monitor the movement of the device 306, at step 804....[I]f the speed and/or displacement of the device 306 do exceed the first predetermined threshold and the signal strength of the WAN signal is still good, at step 806, then the device checks to see if the registration sequence has been completed, at step 808. If the registration sequence has not completed, the unit will continue to monitor the speed and/or displacement of the device and the strength of the WAN signal while checking whether the registration is completed....When the registration sequence is completed, the unit will conduct any present call and subsequent calls via the WAN system, at step 814, and will terminate running the WLAN stack 510 and hardware 404, 406. This method saves battery life by both aborting the handover to the WAN when unnecessary, and terminating the WLAN stack and hardware when the call is transferred to the WAN system.”), [0045] (“FIG. 10 illustrates a procedure used by the subscriber device 306

when moving from WAN coverage to WLAN coverage....The unit 306 enters the method, at step 1002 where it begins running the WLAN stack 510 and its associated hardware 404, 406. The unit then attempts to receive signals from WLAN cells at step 1004. If the unit detects a WLAN border cell, at step 1006, then the unit 306 registers with the WLAN and begins to monitor its movement, at step 1010....For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the unit will check the signal strength of the WLAN signal, at step 1014. Otherwise, the unit 306 again terminates running the WLAN stack 510 and hardware 404, 406, at step 1008, if either the movement information or the WLAN signal strength is insufficient to warrant a handover. If all the conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then the unit 306 will terminate running the WAN stack 508 and hardware 410, 412, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.”).

72. A person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of WLAN and WAN transceiver in implementing Chaskar’s mobile node, as **Dorenbosch** provides implementation details for the mobile node to carry out the communication on the WLAN and WAN. As I discussed above, both Chaskar and Dorenbosch each contemplate methods of switching between WAN and WLAN networks. Chaskar, [0070]-[0073]; Dorenbosch, [0038], [0045].

Chaskar provides that a generic “mobile node” performs the steps of the switching process. *See, e.g.*, Chaskar [0070] (“a border bit is detected by the mobile node”), [0071] (“the mobile node again detects WLAN signal strength from the AP”). A person of ordinary skill in the art would have understood that Chaskar’s generic mobile node would include specific hardware in order to perform wireless communication and its handover procedure. Thus, a person of ordinary skill in the art would have looked to Dorenbosch, which discloses such hardware in the form of “two sets of transceivers—one for the WLAN system and one for the WAN system, each transceiver containing an antenna 402, 408, an RF front end 404, 410, and a decoder/ encoder 406, 412 respectively, designed to transmit, receive, encode and decode wireless signals for the frequencies and characteristics of its corresponding system.” Dorenbosch, [0026].

73. A person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of detecting both the context of a WLAN network and WAN network to Chaskar’s handover method from a WLAN to a WAN to advantageously increase efficiency of the system. A person of ordinary skill in the art would have understood that in a WLAN to WAN handover during an established call, detecting the WAN context prior to any handover would ensure that communication over the WAN is not performed unless the WAN signal strength is strong enough to support the call. *See* Enzmann [0007] (“In order for handoffs to occur automatically and

seamlessly, signal strength detection circuitry in the wireless device detects the strength of a cellular signal being transmitted by a cellular network and of an 802.1x signal being transmitted from an access point of an 802.1x network.”). This furthers Chaskar’s goal of avoiding “spurious handoff.” See Chaskar, [0013] (“It is therefore an object of the present invention to improve inter-technology handover control so that spurious handoff triggers can be avoided and the need for handoff can be anticipated with enough margin for the execution of proactive handoff steps.”). However, Chaskar teaches a handoff procedure for switching an in-progress call from a WLAN to a WAN based only on a detected border bit and WLAN signal strength, and does not take into consideration whether the WAN signal strength is sufficient to support a call. See Chaskar, [0071] (“[T]he mobile node again detects WLAN signal strength from the AP....”), [0072] (“In case the detected border bit is equal to 0....”), [0073] (“WLAN signal strength is detected again”). Thus, a person of ordinary skill in the art would have looked to Dorenbosch’s teaching of further checking the WAN signal strength before making a switch from WLAN to WAN to avoid connecting to a WAN that cannot maintain a call, thereby improving Chaskar’s handoff procedure. Dorenbosch, [0038] (“[I]f...the strength of the WAN signal is unacceptable...then the registration sequence is aborted...However, if the speed and/or displacement of the device 306 do exceed the first predetermined threshold and the signal strength of the WAN signal is still good...then the device

checks to see if the registration sequence has been completed.”). As I described above, a person of ordinary skill in the art would have been motivated to use Dorenbosch’s teachings of WLAN and WAN transceivers in Chaskar’s mobile node, and therefore would have recognized that when measuring WAN signal strength, Chaskar’s mobile node would use the WAN transceiver.

74. A person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teaching of transitioning from a WAN to a WLAN to Chaskar’s device to advantageously switch a call to WLAN instead of continuing the call on cellular. It was well known in the art that a connection via a cellular network: has higher service fees as compared to a WLAN connection, increases power consumption of the mobile device, and provides slower service than WLAN. See Chaskar [0004] (“[I]t is supposed that the user has chosen WLAN as the preferred access to the IP network...because WLAN access [is] typically cheaper and faster than cellular access.”); Dorenbosch, [0003] (“[C]ertain factors do affect performance on different networks. Battery life may be degraded on one system in comparison to another as the hardware required to operate in that particular mode may consume more energy than in another mode. Also, cost may be significantly different from one system to another and the subscriber may pay a premium to be able to use a particular network.”), [0006] (“[T]here may be a cost savings for calls made on the WLAN system....”), [0008] (“[T]he handover decision must not be

made prematurely to avoid the service cost associated with handing over a subscriber to the macro network 102 when the SU 106 does not actually leave the WLAN coverage area....”), [0049] (“The novel system and related methods for improving WLAN handover behavior and phone battery life provide significant advantages for dual-mode cellular communication systems (WLAN/WAN systems), such as improving the reliability of the handover, thereby allowing for significant cost savings by allowing more calls to be made over the WLAN.”). When applying these teachings to Chaskar, a person of ordinary skill in the art would have understood that the WAN signal strength would be measured using a signal strength averaging window of a particular width. Chaskar, [0076] (“It should be noted that, in practice, mobile nodes may use some method for robust measurement of received signal strength. Examples are use of signal strength averaging windows....”).

75. Further, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of the WAN transceiver changing state from sleep mode to active mode in Chaskar’s handover method to advantageously reduce power consumption. A person of ordinary skill in the art would have understood that mobile device users value mobile devices with longer battery lives. As Dorenbosch explains, employing a “brute force” handover method would require simultaneously maintaining both WLAN and WAN transceivers in an active, power consuming mode while on a network, and that such a method has “significant detrimental effect

on battery life because the device must operate both sets of hardware simultaneously.” Dorenbosch, [0006]. A person of ordinary skill in the art would have recognized that in order to minimize any disruptions to in-progress communications, changing state from sleep mode to active mode would predictably be performed at initial stages of handover. For example, Dorenbosch explains that at the beginning of its WLAN to WAN handover, “the subscriber unit 306 attempts to detect the presence of a border cell 210 or degradation in signal quality of the WLAN coverage,” and only if one of these conditions is true is the WAN communication module activated. Dorenbosch, [0038] (“If the border cell 210 or WLAN signal degradation is detected, then the unit 306 initiates the registration sequence with the WAN system and begins to monitor the movement of the device 306, at step 804.”).

76. A person of ordinary skill in the art would have had a reasonable expectation of success in applying Dorenbosch’s teachings in implementing Chaskar’s WLAN to WAN handoff procedure. Chaskar, [0070]-[0073]; Dorenbosch, [0038]. Both references teach communicating over WANs and WLANs, and Dorenbosch’s teachings would add functionalities to the use of these communication modes that are not described in Chaskar. This would have been a straightforward application of Dorenbosch’s teachings in a manner that advantageously improves Chaskar’s mobile device.

77. Accordingly, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Dorenbosch's teachings to Chaskar's mobile device, and would have known such a combination (yielding the claimed limitations) would predictably work and provide the expected functionality.

4. Overview of Willhoff (Ex. 1006, U.S. Patent No. 6,049,715)

78. Willhoff discloses a "dual stage method and apparatus for accurately evaluating a received signal by providing a mobile station with a concise and consistent measure of a received signal strength." Willhoff, 2:56-62; *see also* Willhoff, Abstract. Willhoff discloses using "a long term RSSI [(Received Signal Strength Indication)] average to determine when a handoff condition is to be checked" followed by a "short term average" before handoff is performed. Willhoff, 2:33-37, 9:54-10:7. The long term RSSI average is computed by averaging samples representing the strength of the received signal contained in a particular window of time over "several seconds," while the short-term average is averaged over a smaller window of time of "tens to hundreds of milliseconds." Willhoff, 9:56-61. A person of ordinary skill in the art would have understood that, because Willhoff's averaging windows measure signal strength **over time**, these windows would be determined using a timer that is activated at the beginning of the time window. At the very least it would have been obvious for a person of ordinary skill in the art to use a timer to determine Willhoff's averaging windows, as time windows require a mechanism for

establishing their parameters and the purpose of a timer is to measure when a certain amount of time has passed. *See* The IEEE Standard Dictionary of Electrical and Electronics Terms (6th ed. 1996) (which I understand has been identified as Ex. 1023, and would have been accessible to a person of ordinary skill in the art, e.g., through a library or a college bookstore) at 1116 (defining “timer” to be “An object that can notify a process when the time as measured by a particular clock has reached or passed a specified value, or when a specified amount of time, as measured by a particular clock, has passed.”).

79. Willhoff explains that the use of the long-term measurement windows avoids premature triggers due to “fluctuating signals,” as the “the signal strength measurements are not over reactive to fluctuating signals.” Willhoff, 4:13-14. The use of short-term measurement windows avoids “historical bias,” which “may trigger action based on events that occurred not only in the past, but also in different geographic locations.” Willhoff, 4:15-18, 2:6-8.

5. Motivation to Apply Willhoff’s Teachings to Chaskar (as Optionally Modified by Dorenbosch)

80. Like Chaskar and Dorenbosch, Willhoff is analogous art, in the same field as the ’281 patent which includes wireless communications, and reasonably pertinent to alleged problems addressed by the ’281 patent of switching between wireless communication networks. *See e.g.*, Willhoff, 1:15-20 (“The invention relates generally to a method and apparatus for determining and executing correct

handoff decisions in a wireless communications system. Specifically, the invention involves determining the correct handoff time (decisions) based on both a long term and short term measurement of the signal level.”).

81. A person of ordinary skill in the art would have been motivated to apply Willhoff’s teaching of using a timer to measure signal strength in implementing Chaskar’s (as optionally modified by Dorenbosch) signal strength averaging windows of a set width to advantageously provide the implementation details for using such a measurement mechanism. While Chaskar discloses that signal strength measurements are performed using “signal strength averaging windows” “having different...widths,” it does not provide the implementation details for such measurement. See Chaskar, [0076] (“It should be noted that, in practice, mobile nodes may use some method for robust measurement of received signal strength. Examples are use of signal strength averaging windows, exponential averaging of samples of received signal strength, dwell timers, etc.”), [0077] (“It is to be noted that it is also possible to build in aggressiveness and conservativeness into handoff logic in a different manner. For example, having different values for the widths of averaging windows or dwell timers, having different values for the coefficient of the exponential averager, etc.”). A person of ordinary skill in the art would have looked to Willhoff for implementation details for Chaskar’s signal strength averaging windows. For example, Willhoff explains that the “width of the window” is selected

as a particular amount of time based on how many samples the device should sample, and the sample rate of the signal strength measurement and as discussed above a person of ordinary skill in the art would have understood and at least found obvious that the windows are measured with a timer. Willhoff, 10:47-55 (“The Voice Channel parameters can vary among systems and from cell to cell. The RSSI Sample Rate gives the long term averaging time, i.e. the width of the window. Typical values of the window are in the range of 2.5 to 3.5 seconds. Wider ranges for the long term averaging window are also possible. For instance, in one particular configuration, the range can vary from 0.32 Seconds to 5.12 Seconds. Optimum ranges will vary according to the system (i.e. the specific hardware and software) and the environment in which the System is utilized.”). Moreover, timers were commonly used in communication modules to determine time lengths, and would have predictably been implemented in Chaskar’s device to determine the time averaging window width. *See, e.g.*, Ex. 1018 (U.S. Application Publication No. 2003/0017842 published January 23, 2003), [0034] (using timer to measure “3 seconds” in wireless device); Ex. 1019 (U.S. Application Publication No. 2002/0037715, published March 28, 2002), [0151] (using “timer” to measure “time window”).

82. Further, a person of ordinary skill in the art would have been motivated to apply Willhoff’s teaching of using a longer time window, for example on the order of seconds, to Chaskar’s first signal strength measurement for comparison against

Th2. Willhoff teaches that “short term measurements are subject to error due to the highly fluctuating nature of the signal,” thus making long term measurements more accurate depending on the situation in which they are used. Willhoff, 1:51-53. Similarly, a person of ordinary skill in the art would have been motivated to apply Willhoff’s teaching of using a shorter time window, for example on the order of milliseconds, to Chaskar’s second signal strength measurement for comparison against Th3. A person of ordinary skill in the art would have understood that measured signal strengths are prone to brief changes due to a mobile device user’s change in position. For example, as Willhoff explains, by using a longer window for the first measurement, the device would not prematurely start a handoff procedure based on such momentary fluctuations in detected signal strength. Willhoff, 1:41-43 (“The land station must react appropriately to changes in the signal, without overreacting to signal fluctuations prevalent in radio signals due to fading conditions.”), 1:51-65 (“Methods that rely exclusively on short term measurements are subject to error due to the highly fluctuating nature of the signal. These methods rely on periodic sampling of the signal at intervals of several milliseconds or seconds. This practice often contributes to poor decisions due to the long latencies that may exist between measurements and the effects of short fades on the signal. Methods that utilize continual measurements at relatively frequent intervals and then average them over a long period of time provide a more even view of the received

signal. This averaging approach or long term method, smooths out the affects of short term fades in the signal. Thus, 'long' term methods are less over reactive to fluctuating signals. However, averaging methods are flawed since they may build in a historical bias to the signal strength average.”), 3:31-34 (“The averaging process removes the effects of short term fades in the signal that may cause a premature reselect decision due to these short term signal fluctuations. This initial trigger is then qualified by examining the short term current value of the signal.”), Abstract (“A long term average and a short term value of the strength of a received signal is used to determine a trigger condition in a mobile communications system to perform such functions as control channel or traffic channel reselect. The long term average removes the effects of short term fades in the short term signal that otherwise may cause a premature trigger decision. The short term value offsets historical bias that may be built into long term average. The actual trigger is only realized when both the long term average and the short term value exceed predetermined thresholds in a positive or negative direction.”).

83. Further, a person of ordinary skill in the art would have understood that it is common for a mobile device user to leave a WLAN coverage area within a matter of seconds (for example, if the user’s device loses sight of the WLAN by turning a corner such that there is a intervening obstacle), and that if the mobile device does not make a handover to a different communication network fast enough,

the mobile device user may experience interruptions in any in-progress calls. For example, in a March 1996 article for the well-known and readily accessible IEEE Communications Magazine (that would have been accessible to a person of ordinary skill in the art, e.g., through the IEEE website or a library) titled “Trends in Handover Design,” Gregory P. Pollini explains that, in some circumstances, handover “must be done as quickly as possible due to the sudden signal drop as a mobile turns a corner.” Ex. 1017, 85. Thus, a person of ordinary skill in the art would have understood that by using a shorter window for the second measurement, the device would be able to perform the measurement quickly enough to complete handoff before the WLAN connection is lost in situations when the device is leaving a WLAN coverage area. Willhoff, 2:31-33 (“Not reacting quickly enough to changing signal conditions can result in server interruptions and expensive processing to re-acquire service”).

84. A person of ordinary skill in the art would have understood that the use of different signal strength measuring window widths as taught by Willhoff for the Th2 and Th3 comparisons in Chaskar would be predictable. Chaskar already contemplates using measurement windows of different widths according to how the handoff logic is programmed, and thus specifically using the relative time window size teachings of Willhoff would have been predictably implemented in Chaskar’s device. Chaskar, [0077] (“It is to be noted that it is also possible to build in

aggressiveness and conservativeness into handoff logic in a different manner. For example, having different values for the widths of averaging windows or dwell timers, having different values for the coefficient of the exponential averager, etc.”).

85. Accordingly, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Willhoff’s teachings of using a timer for measuring signal strength and using measurement windows of different sizes in implementing Chaskar’s handoff procedure (as optionally modified by Dorenbosch), and would have known such a combination (yielding the claimed limitations) would predictably work and provide the expected functionality.

6. Invalidity of Claims 1, 12, and 37 Over Chaskar in view of Dorenbosch and Willhoff

86. As I discuss below, Claims 1, 12, and 37 are rendered obvious by Chaskar in view of Dorenbosch and Willhoff. In addition to my discussion in Section IX.A.1-5, the following discussion identifies example disclosures followed by bulleted excerpts that each disclose Claims 1, 12, and 37.

87. As I explain below, this ground involves the use of Chaskar’s multi-threshold comparison process for switching from Wi-Fi to cellular (see Section IX.A.1), to which is applied Dorenbosch’s procedure for switching from cellular to Wi-Fi (see Section IX.A.2) to improve performance. Willhoff’s teaching of using a timer for measuring signal strength (see Section IX.A.4) is applied to each signal strength measurement involved in these switching processes.

a. Element [1.pre]

88. Element [1.pre] recites “A device comprising.” This element is met by Chaskar.

89. To the extent the preamble is limiting, Chaskar discloses a device (e.g., “mobile node”). See, e.g., Chaskar:

- [0070]: “In a first step in FIG. 9, a border bit is detected by the **mobile node** from a beacon of the WLAN AP with which the **mobile node** is connected. In case the border bit is equal to 1, i.e. the **mobile node** is in a border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a high possibility, the mobile node waits while a **detected WLAN signal strength** is larger than a predetermined threshold Th1.”
- [0071]: “After initiation of phase 1, the **mobile node** again **detects WLAN signal strength** from the AP, and while the **detected WLAN signal strength** is larger than a predetermined threshold Th2, the **mobile node** remains in a waiting state.”
- [0072]: “In case the detected border bit is equal to 0, i.e. the **mobile node** is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, while a **detected WLAN signal strength** is larger than Th2, the **mobile node** waits.”
- [0073]: “After initiation of phase 1, **WLAN signal strength is detected** again and while the detected WLAN signal strength is larger than a predetermined threshold Th3, the **mobile node** waits.”
- [0074]: “As can be seen from the description of the above embodiments, in case the detected border bit indicates a border region, handoff phases 1 and 2 are initiated more aggressively, and in case the border bit indicates a non-border region, the handoff phases are initiated more conservatively.”
- [0075]: “It is to be noted that the handoff schemes in FIGS. 6 and 7 are used for the sake of illustration only of how the embodiments of the invention can be used in handoff schemes relying on proactive procedures. There are many other handoff schemes in addition to these that also rely

on proactive procedures. (Some of these other schemes may be built around the core of Fast Mobile IP, but are tailored to specific environments.) The handoff schemes in FIGS. 6 and 7 have only moderate amount of proactive procedures, but many others include extensive proactive procedures, e.g., for candidate access router discovery, for establishment on on-demand security associations, for establishment of access network bearers, for service negotiation with target access network, etc., depending upon the environment they operate in. The invention applies to all those as well.”

90. Chaskar discloses a “mobile node” that “detect[s] WLAN signal strength” to determine whether a handoff to a cellular network is required. Chaska, [0070]-[0075].

b. Element [1.a]

91. **Element [1.a] recites “a switching system to switch operation between a first communication module and a second communication module.”**

This element is met by Chaskar in view of Dorenbosch.

92. Chaskar discloses a switching system (e.g., “handoff decision logic”) to switch operation (e.g., “handoff” to “cellular”) between a first communication module (“WLAN” module) and a second communication module (“cellular” module). See, e.g., Chaskar:

- [0036]: ***“The idea of the present invention is to control handover between a first technology network and a second technology network*** by detecting information about regions of an area of the first technology network, and deciding initiating a handover procedure between the first and second technology networks based on the detected region information. The first technology network may be a WLAN and ***the second technology network may be a cellular network.***”

- [0070]: “In a first step in FIG. 9, a border bit is detected by the **mobile node** from a beacon of the WLAN AP with which the **mobile node** is connected. In case the border bit is equal to 1, i.e. the **mobile node** is in a border region of the WLAN area and the need of an inter-technology **handoff** in the middle of session is a high possibility, the **mobile node** waits while a detected WLAN signal strength is larger than a predetermined threshold Th1.”
- [0071]: “After initiation of phase 1, the **mobile node** again detects WLAN signal strength from the AP, and while the detected WLAN signal strength is larger than a predetermined threshold Th2, the **mobile node** remains in a waiting state.”
- [0072]: “In case the detected border bit is equal to 0, i.e. the **mobile node** is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, while a detected WLAN signal strength is larger than Th2, the **mobile node** waits.”
- [0073]: “After initiation of phase 1, WLAN signal strength is detected again and while the detected WLAN signal strength is larger than a predetermined threshold Th3, the **mobile node** waits.”
- [0074]: “As can be seen from the description of the above embodiments, in case the detected border bit indicates a border region, **handoff phases 1 and 2** are initiated more aggressively, and in case the border bit indicates a non-border region, the handoff phases are initiated more conservatively.”
- [0075]: “It is to be noted that the **handoff schemes** in FIGS. 6 and 7 are used for the sake of illustration only of how the embodiments of the invention can be used in **handoff schemes** relying on proactive procedures. There are many other **handoff schemes** in addition to these that also rely on proactive procedures. (Some of these other schemes may be built around the core of Fast Mobile IP, but are tailored to specific environments.) The **handoff schemes** in FIGS. 6 and 7 have only moderate amount of proactive procedures, but many others include extensive proactive procedures, e.g., for candidate access router discovery, for establishment on on-demand security associations, for establishment of access network bearers, for service negotiation with target access network, etc., depending upon the environment they operate in. The invention applies to all those as well.”
- [0078]: “It should be noted that, even though the received signal strength is the parameter used in the illustrations of possible embodiments, **mobile**

nodes may also use other parameters such as SIR (Signal to Interference Ratio) or SNR (Signal to Noise Ratio) in the **handoff decision logic.**”

93. Chaskar discloses a “mobile node” connected to a WLAN and detects the WLAN signal strength to determine whether a handoff to a cellular network is required to maintain communication. Chaskar, [0036], [0070]-[0075]. A person of ordinary skill in the art would have understood that, while Chaskar discloses a generic “mobile node,” because the device communicates with WLAN and cellular networks, Chaskar’s mobile node includes WLAN and cellular modules, as this was the general mechanism for implementing WLAN and cellular communications. See *e.g.*, Ex. 1020 (U.S. Patent No. 7,826,868 filed December 9, 2002), 13:32-34, 47-49 (“The dual mode subscriber device 130 has a WLAN front end module 400 that receives and transmits wireless link signals over the WLAN 132....The cellular front end module 402 provides the functionality of a cellular subscriber device or cellphone for transmitting and receiving over a cellular telephone network.”); Ex. 1021 (U.S. Patent Application No. 2004/0008645 filed December 20, 2002), [0038] (“[A] mobile terminal 18 is illustrated as having a control system 36 associated with a user interface 38, a wireless interface 40, and a WLAN interface 42....[T]he wireless interface 40 facilitates wireless communications with the base station 26 via the antenna 28 and the WLAN interface 42 provides for wireless communications with the Access Point 32. As noted, the control system 36 will cooperate with the wireless interface 40 and the WLAN interface 42 to provide the

RTSS 44, which is capable of sensing the presence of cellular and WLAN signals, to decide when a handoff should occur and initiate a handoff as described above.”); Ex. 1022 (U.S. Patent No. 7,414,992 filed June 30, 2003), 3:23-33, 43-51 (“Radio signals that are transmitted from a WLAN, such as, for example, one of the access points 15 (or LAN transceiver) coupled to the enterprise server 14 are absorbed by the first antenna and coupled to a WLAN receiver (or receiving device) 203....The communication unit 10 also includes a WAN receiver 204 that the absorbed signals from the cellular BTS 16 are coupled to a WAN transmitter 208 that amplifies and provides the signals for transmission or radiation by the antenna 202 to a cellular network such as the cellular BTS 16 as is known.”). The mobile node further includes “handoff decision logic” to perform the determination. Chaskar, [0078].

94. To the extent it is argued further disclosure of a module is required, Dorenbosch discloses a first communication module (*e.g.*, “WLAN” “transceiver”) and a second communication module (*e.g.*, “WAN” “transceiver”). *See, e.g.*, Dorenbosch:

- Fig. 4:

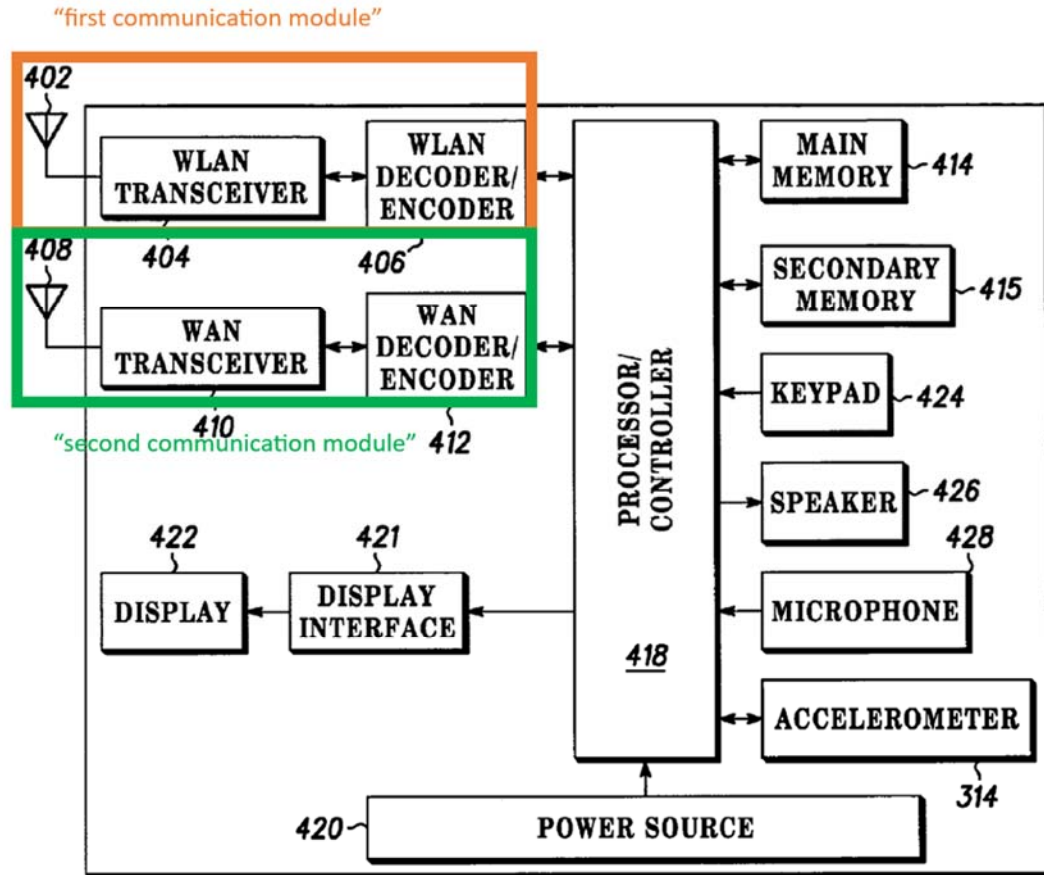


FIG. 4 306

- [0025]: “The WLAN cells 104 may be any of a number of different wireless protocols such as *IEEE Standard 802.11* or Bluetooth.”
- [0026]: “A block diagram of an exemplary mobile subscriber device (SU) 306 is shown in FIG. 4. The SU 306 contains **two sets of transceivers—one for the WLAN system and one for the WAN system**, each transceiver containing an antenna 402, 408, an RF front end 404, 410, and a decoder/encoder 406, 412 respectively, designed to transmit, receive, encode and decode wireless signals for the frequencies and characteristics of its corresponding system.”

95. Dorenbosch discloses a mobile subscriber unit 306 that “contains two sets of transceivers—one for the WLAN system” (e.g., for “IEEE Standard 802.11” communications) and “one for the WAN system, each transceiver containing an

antenna 402, 408, an RF front end 404, 410, and a decoder/encoder 406, 412 respectively, designed to transmit, receive, encode and decode wireless signals.” Dorenbosch, [0025], [0026], Fig. 4.

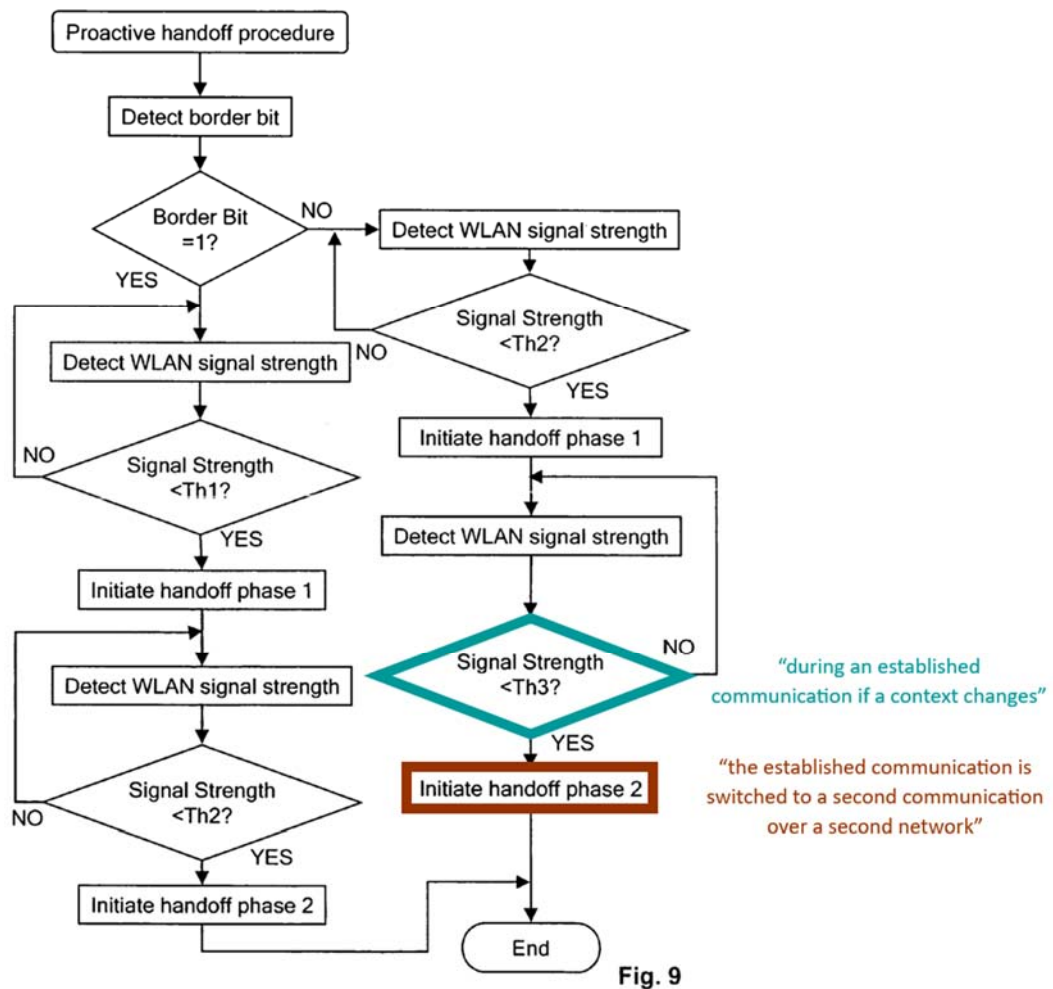
96. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of WLAN and WAN transceiver in implementing Chaskar’s mobile node.

c. Element [1.b]

97. **Element [1.b] recites “wherein during an established communication if a context changes, the established communication is switched to a second communication over a second network, wherein switching is based on detecting a second context being preferred over the context within a set of networks.”** This element is met by Chaskar in view of Dorenbosch.

98. Chaskar discloses that during an established communication (e.g., established “voice call[]”) if a context changes (e.g., “WLAN signal strength...fall[s] below Th3”), the established communication is switched to a second communication over a second network (e.g., “handoff” to “cellular”). See, e.g., Chaskar:

- Fig. 9:



- [0043]: “The handoff policies as described above can be simultaneously applied to different applications. For example, policy 1 for **voice calls** and policy 2 for entertainment applications such as games.”
- [0072]: “In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, while a **detected WLAN signal strength** is larger than Th2, the mobile node waits.”
- [0073]: “After initiation of phase 1, **WLAN signal strength is detected** again and while the **detected WLAN signal strength** is larger than a predetermined threshold Th3, the mobile node waits. **After the signal strength has fallen below Th3**, handoff phase 2 is initiated.”

99. See my discussion of element [1.a] above (Section IX.A.6.b).

100. Chaskar further discloses a handover procedure “for voice calls” that detects the “WLAN signal strength” and performs a handoff to the cellular network “[a]fter the signal strength has fallen below Th3.” Chaskar, [0043], [0072]-[0073], Fig. 9.

101. Dorenbosch discloses detecting a second context (e.g., “signal strength of the WAN signal is” “good”) being preferred over the context within a set of networks (e.g., preferred over “[i]f...WLAN signal degradation is detected”). See, e.g., Dorenbosch:

- Fig. 8:

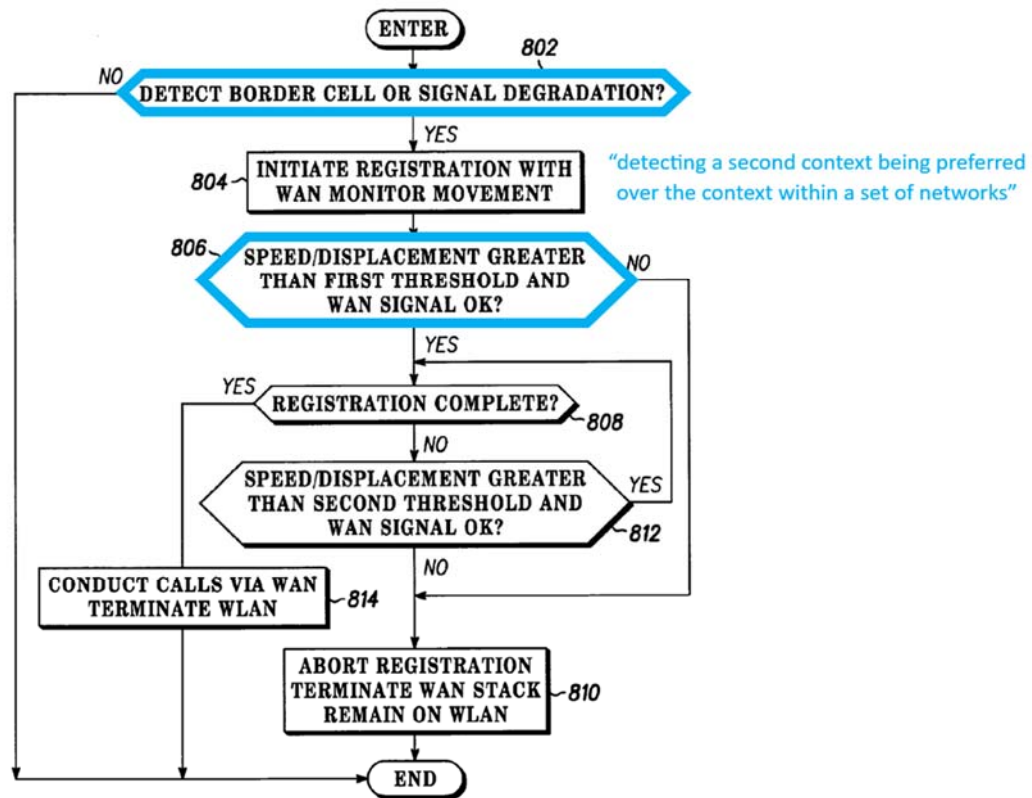


FIG. 8 800

- [0038]: “The process illustrated in FIG. 8 further expands upon the method of the handover manager 514 presented in FIG. 7. Again, the subscriber unit 306 attempts to ***detect the presence of a border cell 210 or degradation in signal quality of the WLAN coverage*** at step 802. ***If the border cell 210 or WLAN signal degradation is detected***, then the unit 306 initiates the registration sequence with the WAN system and begins to monitor the movement of the device 306, at step 804.... In this example, if either the speed and/or displacement of the device 306 do not exceed a first predetermined threshold ***or the strength of the WAN signal is unacceptable***, at step 806, then the registration sequence is aborted (the unit stops running the WAN stack 510 and hardware 410, 412) at step 810 and the process is exited, resulting in a current and/or future calls continuing to be placed via the WLAN system. However, if the speed and/or displacement of the device 306 do exceed the first predetermined threshold and ***the signal strength of the WAN signal is still good***, at step 806, then the device checks to see if the registration sequence has been completed, at step 808.”
- ***See also Figs. 7, 9; [0037], [0039].***

102. Dorenbosch discloses a handover procedure that decides to perform a handover from a WLAN to a WAN because “degradation in signal quality of the WLAN coverage” has occurred and “signal strength of the WAN signal is still good.” Dorenbosch, [0038], Fig. 8; *see also* Dorenbosch, [0037], [0039], Figs. 7, 9.

103. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of detecting both the context of a WLAN network and WAN networks to Chaskar’s handover method.

104. In implementing Dorenbosch’s teachings in Chaskar’s method, the handover would occur only if both the signal strength of the WAN is sufficient and

the signal strength of the WLAN is insufficient, as explained by Dorenbosch. Dorenbosch, [0038]. Because the device makes this transition to maintain a continuous connection, a sufficient WAN signal is preferred over an insufficient WLAN signal. Dorenbosch, [0038] (“When the registration sequence is completed, the unit will conduct any present call and subsequent calls via the WAN system, at step 814, and will terminate running the WLAN stack 510 and hardware 404, 406.”), [0005] (“It is critical to be able to transfer a call in progress on one system over to a different system without a noticeable consequence to the end user, such as a lost call, an unnecessary charge, significant reduction in battery life, etc.”).

d. Element [1.c]

105. **Element [1.c] recites “wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to an active mode, wherein the timer is activated to establish a time window of a predefined size.”** This element is met by Chaskar in view of Dorenbosch and Willhoff.

106. Chaskar discloses the switching system (*see* [1.a]), the second communication module (*see* [1.a]), and establishing a time window of a predefined size (e.g., establishing “signal strength averaging window[]” having a “width[]” to determine if “WLAN signal strength...has fallen below Th2”). *See, e.g.*, Chaskar:

- [0076]: “It should be noted that, in practice, mobile nodes may use some method for robust measurement of received signal strength. Examples are

- use *of signal strength averaging windows*, exponential averaging of samples of received signal strength, dwell timers, etc.”
- [0077]: “It is to be noted that *it is also possible to build in aggressiveness and conservativeness into handoff logic in a different manner. For example, having different values for the widths of averaging windows* or dwell timers, having different values for the coefficient of the exponential averager, etc.”
 - [0063]: “In particular, with respect to the low latency handoff scheme shown in FIG. 6, with the beginning of handoff phase 1, *a mobile node sends a proxy router solicitation message ProxyRtSol to an old foreign agent still serving the mobile node, e.g. to an agent of the first technology network such as WLAN.*”
 - [0072]: “In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, *while a detected WLAN signal strength is larger than Th2, the mobile node waits. After the signal strength has fallen below Th2, in order to be proactive, handoff phase 1 is initiated.*”

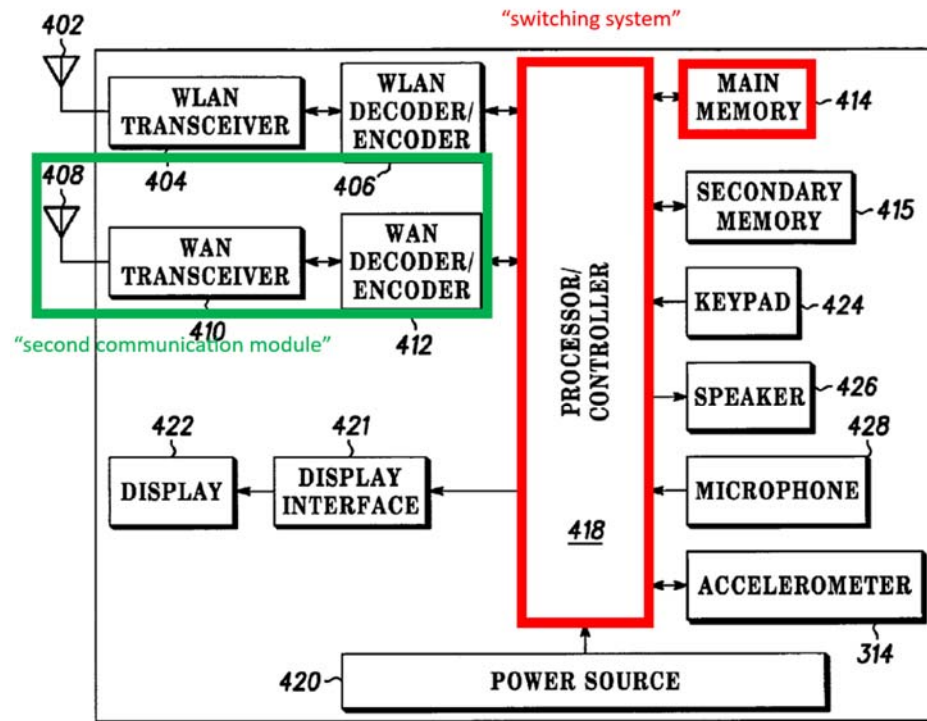
107. See my discussion of element [1.a] above (Section IX.A.6.b).

108. Chaskar further discloses the mobile terminal measures signal strength using “signal strength averaging windows.” Chaskar, [0076]. The averaging window has a “width[.]” Chaskar, [0076]. Handoff phase 1 is initiated when the WLAN signal strength “has fallen below Th2.” [0063], [0072], Fig. 9.

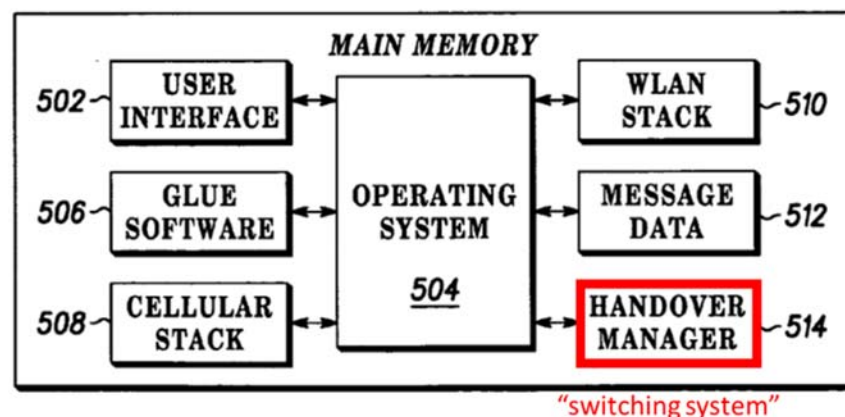
109. Dorenbosch discloses the switching system (*e.g.*, “processor[] 418” and “main memory 414” having “handover manager 514”) causes the second communication module (*e.g.*, “WAN” “transceiver”) to change state from a sleep mode (*e.g.*, “hardware 410, 412” is “terminate[d]”) to an active mode (*e.g.*, receiver circuitry of “WAN” “transceiver” is activated and used to determine whether

“strength of the WAN signal is unacceptable” or “good”). See, e.g., Dorenbosch:

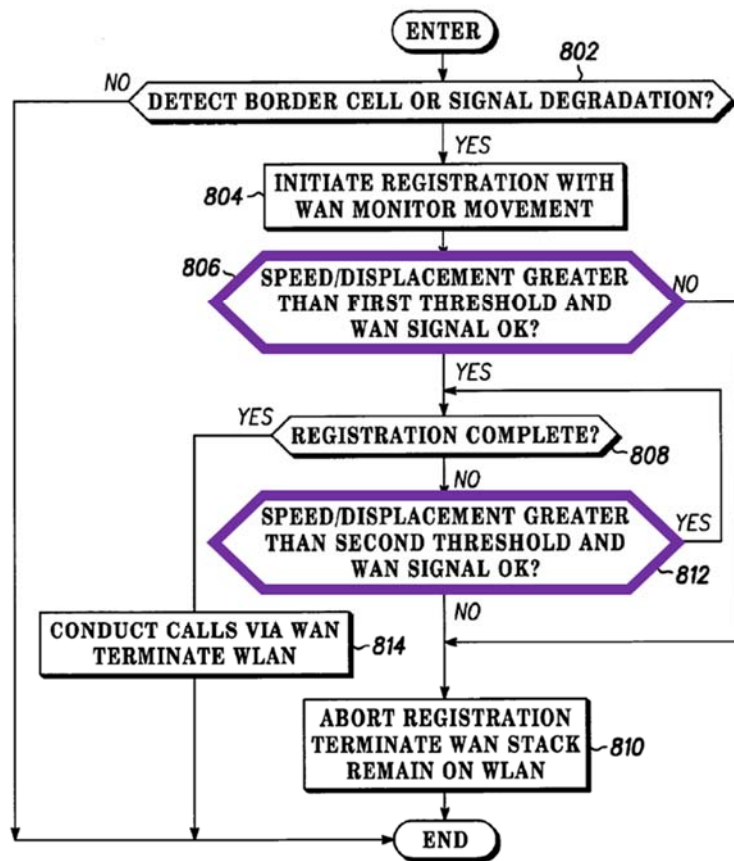
- Fig. 4:



- Fig. 5:



- Fig. 8:



"the switching system causes the second communication module to change state from a sleep mode to an active mode"

FIG. 8 800

- [0021]: "FIGS. 7, 8, 9, 10 and 11 are operational flow diagrams illustrating portions of a **handover process between a WLAN and a WAN** according to a preferred embodiment of the present invention."
- [0027]: "The mobile subscriber unit 306 also includes **one or more processors 418 which processes instructions, performs calculations, and manages the flow of information through the SU 306. The SU 306 also includes a main memory 414** containing a program memory and a data memory, preferably random access memory (RAM), and may also include a secondary memory 415. Additionally, the processor 418 is communicatively coupled with the main memory 414. **Included within the main memory 414**, shown in more detail in FIG. 5, are a user interface 502, **a handover manager 514** (to be discussed in more detail later), operating system platform 504, a cellular stack 508, a WLAN stack 510 and glue software 506."

- [0038]: “**Note that hereafter, the process of initiating the registration sequence with a communications system, be it a cellular (WAN) system or a local area (WLAN) system, includes the steps necessary to bring up the corresponding hardware and software for that system.** In this example, if either the speed and/or displacement of the device 306 do not exceed a first predetermined threshold or **the strength of the WAN signal is unacceptable**, at step 806, then the registration sequence is aborted (the unit stops running the WAN stack 510 and hardware 410, 412) at step 810 and the process is exited, resulting in a current and/or future calls continuing to be placed via the WLAN system. However, if the speed and/or displacement of the device 306 do exceed the first predetermined threshold and **the signal strength of the WAN signal is still good**, at step 806, then the device checks to see if the registration sequence has been completed, at step 808.”
- [0041]: “This presents further benefits to the phone battery life and the WAN system demands in that **the unit 306 does not even start the WAN stack 510 and hardware 410, 412, or burden the WAN system unnecessarily until sufficient movement has been detected.**”
- [0045]: “If all the conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then **the unit 306 will terminate running the WAN stack 508 and hardware 410, 412**, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.”

110. See my discussion of element [1.a] above (Section IX.A.6.b).

111. Dorenbosch further discloses “one or more processors 418 which processes instructions” and “main memory 414” that includes a “handover manager 514” for triggering a handover between the WLAN and WAN transceivers. Dorenbosch, [0021], [0027], Figs. 4, 5.

112. Dorenbosch further discloses that the “WAN stack 508 and hardware 410, 412” is “terminate[d],” such that, when a call is serviced by the WLAN, the

transceiver for the WAN system is in a sleep mode. Dorenbosch, [0041], [0045]. Then, the software and hardware of the transceiver are activated, and then, as I explained above in [1.b], Dorenbosch discloses measuring whether the WAN signal strength is “unacceptable” or “good.” Dorenbosch, [0038], Fig. 8.

113. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teachings of the WAN transceiver changing state from sleep mode to active mode and of measuring the signal strength of the WAN signal in Chaskar’s handover method.

114. Willhoff discloses activation of a timer (*e.g.*, starting timer measuring “window of time”), wherein the timer is activated to establish a time window of a predefined size (*e.g.*, “window of time” of long “width”). *See, e.g.*, Willhoff:

- Abstract: “A long term average and a short term value of the strength of a received signal is used to determine a trigger condition in a mobile communications system to perform such functions as control channel or traffic channel reselect. The long term average removes the effects of short term fades in the short term signal that otherwise may cause a premature trigger decision. The short term value offsets historical bias that may be built into long term average. The actual trigger is only realized when both the long term average and the short term value exceed predetermined thresholds in a positive or negative direction.”
- 3:31-34: “The averaging process ***removes the effects of short term fades in the signal that may cause a premature reselect decision due to these short term signal fluctuations.*** This initial trigger is then qualified by examining the short term current value of the signal.”
- 9:53-56: “A simplified overview of the method of the present invention is presented in FIG.8. The Voice Channel (VCH) in the base station will use

a long term **RSSI average to determine when a handoff condition is to be checked.**"

- 9:56-62: "The long term **RSSI average** is computed by **averaging samples representing the strength of the received signal, contained in a particular window of time**, e.g. **several seconds**. The short term average is a the average over a smaller window of time, e.g. typically tens to hundreds of milliseconds. The long and short term averages are calculated in step 150."
- 10:46-11:3: "The Voice Channel parameters can vary among systems and from cell to cell. **The RSSI Sample Rate gives the long term averaging time, i.e. the width of the window. Typical values of the window are in the range of 2.5 to 3.5 seconds. Wider ranges for the long term averaging widow are also possible. For instance, in one particular configuration, the range can vary from 0.32 seconds to 5.12 seconds.** Optimum ranges will vary according to the system (i.e. the specific hardware and software) and the environment in which the system is utilized. The short term sample rate, i.e. the SSSR or short term averaging time, should be correlated as closely as possible to the sample rate (i.e. averaging time) of the locate receivers (LCRs) in adjacent cells. The correlation with the LCRs sample rate means that the signal strength value provided as the mobile station's signal strength for comparisons to the signal strength measured on the adjacent cells at handoff time will provide the best comparison with the measurements made on the adjacent cells. Optimum performance of the second stage sample rates is therefore a function of the LCR sample rates. The SSSR should optimally be within 100 ms of the averaging time for the LCRs. By way of example, in one particular embodiment, the **SSSR can range from 20-300 ms with 120 ms being preferred**, based on characteristics of the system and environment."

115. Willhoff discloses using an "RSSI average to determine when a handoff condition is to be checked" in a cellular system. Willhoff, Abstract, 9:53-56. The "RSSI average" is computed by "averaging samples representing the strength of the received signal, contained in a particular window of time." Willhoff, 9:56-59. The measurement is performed over "several seconds" for a window of longer "width."

Willhoff, 9:56-62, 10:46-47. A person of ordinary skill in the art would have understood, or at least found it obvious, that a timer is used to measure the “window” because the measurements are precisely measured according to “seconds” or “milliseconds,” and a timing mechanism would be used to set these parameters. Willhoff, 10:46-11:3. *See, also*, Ex. 1018 (U.S. Application Publication No. 2003/0017842 published January 23, 2003), [0034] (using timer to measure “3 seconds” in wireless device); Ex. 1019 (U.S. Application Publication No. 2002/0037715, published March 28, 2002), [0151] (using “timer” to measure “time window”).

116. As I explained above in Section IX.A.5, a person of ordinary skill in the art would have been motivated to apply this teaching in implementing Chaskar’s (as modified by Dorenbosch) signal strength averaging windows.

117. A person of ordinary skill in the art would have understood (or at least found it obvious), when applying Willhoff’s teaching of using a timer to measure signal strength to Chaskar’s mobile device (as modified by Dorenbosch), the signal strength measurement (and thus the transition from a sleep state to an active state) would be upon activation of the timer for measuring the signal strength. A person of ordinary skill in the art would have recognized that the timer would coincide with the start of the signal strength measurement in order to start the time window. Further, Dorenbosch teaches that after “WLAN signal degradation is detected, then

the unit 306 initiates the registration sequence with the WAN system,” which includes the steps necessary to bring up the WAN hardware and software, thus a person of ordinary skill in the art would have understood that the change of the second communication module from sleep to active mode would coincide with activation of the timer. Dorenbosch, [0038].

e. Element [1.d]

118. **Element [1.d] recites “wherein if a Wi-Fi signal monitor detects that a Wi-Fi signal level is below a second predefined threshold value V_{th2} , the timer is activated to establish a second time window of a second predefined size $T2$.”** This element is met by Chaskar in view of Willhoff.

119. Chaskar discloses wherein if a Wi-Fi signal monitor (*e.g.*, monitor for detecting “802.11” “WLAN signal strength”) detects that a Wi-Fi signal level is below a second predefined threshold value V_{th2} (*e.g.*, “WLAN signal strength...has fallen below $Th2$ ”), establishing a second time window of a second predefined size $T2$ (*e.g.*, “signal strength averaging window[]” having a “width[]” to determine if “the signal strength has fallen below $Th3$ ”). *See, e.g.*, Chaskar:

- Fig. 9:

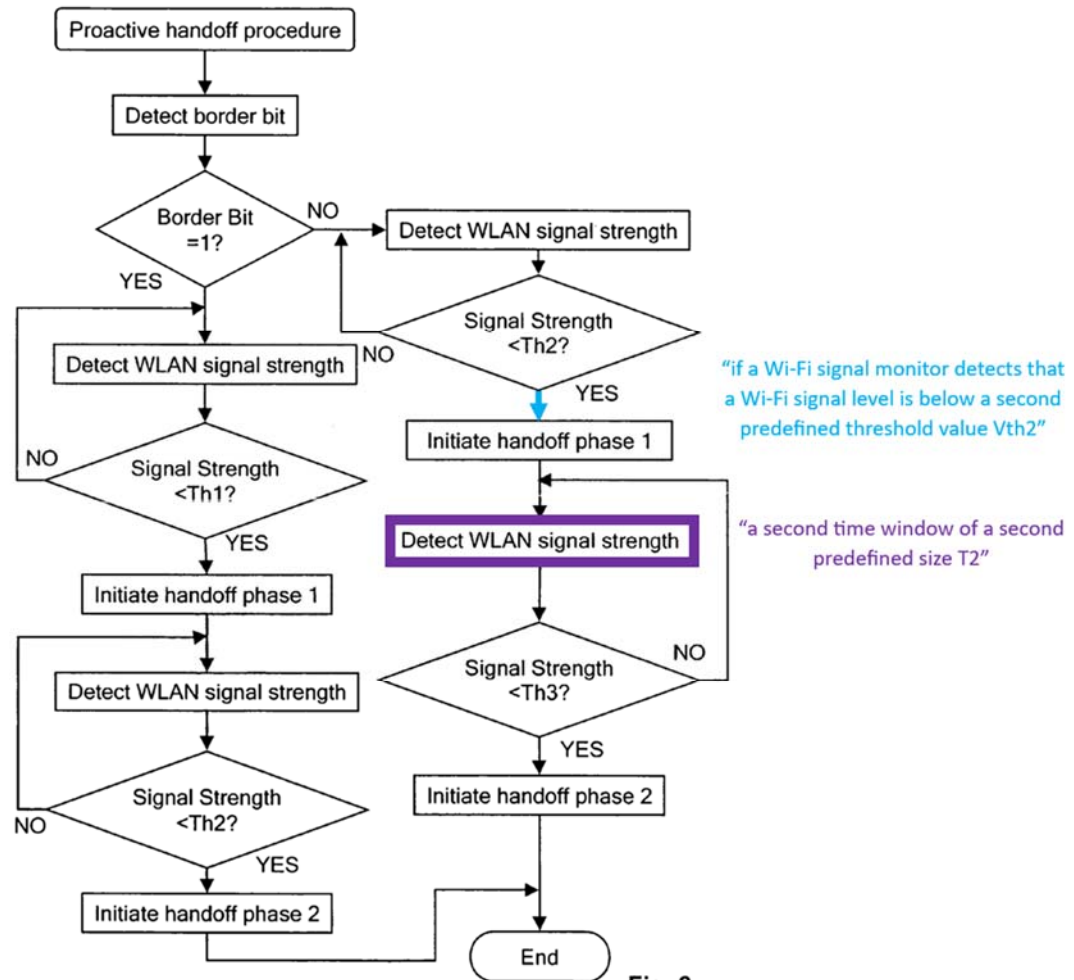


Fig. 9

- [0015]: “The invention enables smart detection of hot spot (such as **802.11 WLAN** or HiperLAN) border crossing.”
- [0073]: “After initiation of phase 1, **WLAN signal strength is detected** again and while the **detected WLAN signal strength is larger than a predetermined threshold Th3**, the mobile node waits.”

120. See my discussion of element [1.c] above (Section IX.A.6.d).

121. Chaskar further discloses that after handoff phase 1, the monitor then detects the “WLAN signal strength” again in another signal strength averaging window to determine whether “the signal strength has fallen below Th3.” Chaskar,

[0073], Fig. 9. Chaskar further discloses implementing the WLAN using 802.11. Chaskar, [0015].

122. Willhoff discloses the timer is activated to establish a second time window of a second predefined size T2 (*e.g.*, starting timer measuring “window of time” of a shorter “width”). *See, e.g.*, Willhoff:

123. See my discussion of element [1.c] above (Section IX.A.6.d).

124. Willhoff further discloses a second signal strength measurement during handoff over a short term of “tens to hundreds of milliseconds.” Willhoff, 9:59-61.

125. As I explained above in Section IX.A.5, a person of ordinary skill in the art would have been motivated to apply Willhoff’s teachings of a timer for measuring a window of time to Chaskar’s averaging window of a predetermined size.

126. Moreover, to the extent that the claimed “second time window of a second predefined size T2” must be different than “a time window of a predefined size,” as I explained above in Section IX.A.5, a person of ordinary skill in the art would have been motivated to apply Willhoff’s teachings of using time windows of different sizes to Chaskar’s handoff procedure.

f. Element [1.e]

127. **Element [1.e] recites “wherein a third predefined threshold value Vth3 is smaller than Vth2.”** This element is met by Chaskar.

128. Chaskar discloses a third predefined threshold value V_{th3} (e.g., “Th3”) is smaller than V_{th2} (e.g., “Th2”). See, e.g., Chaskar:

- [0069]: “Then, after the signal strength has declined below the threshold, the mobile node waits for T seconds in order to filter spurious triggers. Finally, if the WLAN signal strength has fallen below a predetermined threshold which may be less than the above-mentioned threshold, entire handoff process is initiated. According to an alternative embodiment of the proactive handoff procedure, **multiple thresholds can be used, for example $Th1 > Th2 > Th3$** . FIG. 9 shows such embodiment.”

129. See my discussion of element [1.d] above (Section IX.A.6.e).

130. Chaskar further discloses “multiple thresholds can be used, for example $Th1 > Th2 > Th3$.” Chaskar, [0069].

g. Element [12.pre]

131. **Element [12.pre] recites “A method comprising.”** This element is met by Chaskar.

132. To the extent the preamble is limiting, Chaskar discloses a method (e.g., “method”). See, e.g., Chaskar:

- [0022]: “The **methods** of the present invention **includes detecting information about regions of an area of the first technology network, and deciding initiating a handover procedure between the first and second technology networks based on the detected region information.**”

133. Chaskar discloses a method for switching between two different networks. Chaskar, [0022].

h. Element [12.a]

134. **Element [12.a] recites “determining a first context.”** This element is

met by Dorenbosch.

135. Dorenbosch discloses determining a first context (e.g., “detect[ing] a WLAN border cell”). See, e.g., Dorenbosch:

- Fig. 10:

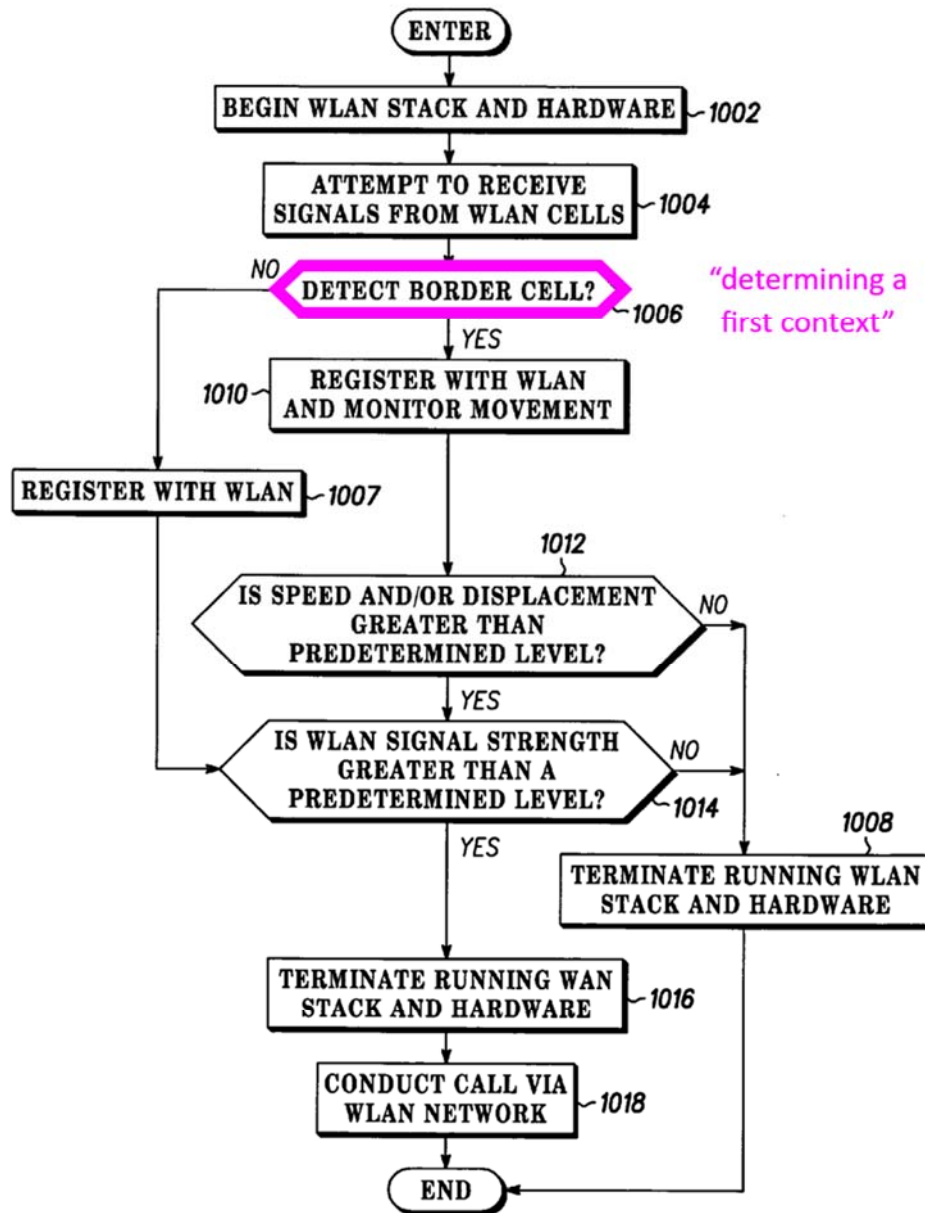


FIG. 10 1000

- [0045]: “FIG. 10 illustrates a procedure used by the subscriber device 306 when moving from WAN coverage to WLAN coverage. From time to time, ***while on the WAN network, the unit 306 will execute this process in order to check for coverage of the WLAN system.*** As with the previously described methods, this process will run more often during a call than when idle (not on a call). The unit 306 enters the method, at step 1002 where it ***begins running the WLAN stack 510 and its associated hardware 404, 406.*** The unit then ***attempts to receive signals from WLAN cells at step 1004.*** If the unit ***detects a WLAN border cell, at step 1006,*** then the unit 306 registers with the WLAN and begins to monitor its movement, at step 1010. Otherwise, ***if the unit 306 determines that the unit is within a normal WLAN cell 104, the unit will immediately register with the WLAN, at step 1007,*** and begin to handover any current call(s) to the WLAN system, (i.e. the unit will bypass the steps for checking the movement and skip ahead to step 1014). ***For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the unit will check the signal strength of the WLAN signal, at step 1014.***”
- [0049]: “The novel system and related methods for improving WLAN handover behavior and phone battery life provide significant advantages for dual-mode cellular communication systems (WLAN/WAN systems), such as improving the reliability of the handover, thereby allowing for significant cost savings by allowing more calls to be made over the WLAN. ***The WAN system will no longer be burdened with the unnecessary load of placing calls for users that remain within the WLAN coverage even though they are using the border cells.*** Users who work or are inside WLAN border cells for significant periods of time will especially benefit from the novel system and methods of the present invention.”

136. Dorenbosch discloses a mobile device, “while on the WAN network...check[ing] for coverage of the WLAN system,” attempting to “detect[] a WLAN border cell.” Dorenbosch, [0045].

137. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teaching of transitioning

from a WAN to a WLAN to Chaskar's device.

i. Element [12.b]

138. **Element [12.b] recites “activating a timer to establish a first time window of a first predefined size T1 based on the detected first context.”** This element is met by Chaskar in view of Dorenbosch and Willhoff.

139. Chaskar discloses a first time window of a first predefined size (*e.g.*, “signal strength averaging window[]” having a “width[]”). *See, e.g.*, Chaskar:

140. See my discussion of element [1.c] above (Section IX.A.6.d).

141. Dorenbosch discloses performing a signal strength measurement (*e.g.*, “check[ing] the signal strength of the WLAN signal”) based on the detected first context (*e.g.*, “detect[ing] a WLAN border cell”). *See, e.g.*, Dorenbosch:

- Fig. 10

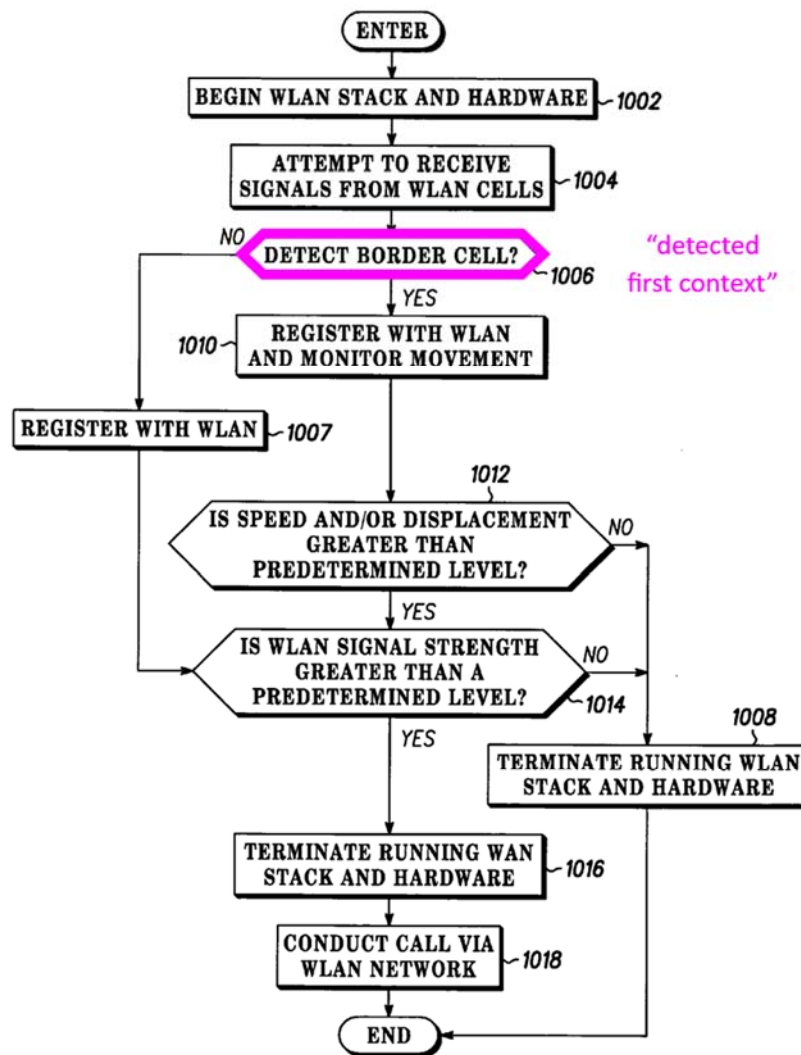


FIG. 10 1000

- [0045]: “The unit 306 enters the method, at step 1002 where it begins running the WLAN stack 510 and its associated hardware 404, 406. The unit then attempts to receive signals from WLAN cells at step 1004. ***If the unit detects a WLAN border cell, at step 1006, then the unit 306 registers with the WLAN and begins to monitor its movement, at step 1010. Otherwise, if the unit 306 determines that the unit is within a normal WLAN cell 104, the unit will immediately register with the WLAN, at step 1007, and begin to handover any current call(s) to the WLAN system, (i.e. the unit will bypass the steps for checking the movement and skip ahead to step 1014). For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the***

unit will check the signal strength of the WLAN signal, at step 1014. Otherwise, the unit 306 again terminates running the WLAN stack 510 and hardware 404, 406, at step 1008, if either the movement information or the WLAN signal strength is insufficient to warrant a handover. If all the conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then the unit 306 will terminate running the WAN stack 508 and hardware 410, 412, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.”

142. See my discussion of elements [12.a] and [1.c] above (Sections IX.A.6.h and IX.A.6.d).

143. Dorenbosch further discloses checking the WLAN signal strength based on whether a border cell is detected: If a border cell is not detected, the signal strength measurement is performed immediately upon registration with the WLAN; if a border cell is detected, the signal strength measurement is performed only if the speed and/or displacement of the device is greater than a threshold. Dorenbosch, [0045], Fig. 10. The '281 patent explains that the mobile device uses the first context to determine whether to activate the timer and establish a window of size T_1 , during which the device determines whether the Wi-Fi signal is above the threshold V_{th1} . '281 patent, 5:64-6:24 (“Wi-Fi antenna 2 together with Wi-Fi module 4 and Wi-Fi signal monitor 8 continuously monitor for to detect Wi-Fi signals. If a detected Wi-Fi signal level is greater than a predefined threshold value V_{th1} , Wi-Fi signal level monitor 8 activates timer 7 via signal line 10 and sends a wake-up signal to network switch unit 6 via signal line 12, thereby to change the state of network

switch unit 6 from a sleep mode, during which network switch unit consumes relatively small power, to a stand-by mode, during which network switch unit consumes an intermediate amount of power....If the detected Wi-Fi signal level is greater than V_{th1} , timer unit 7 is activated to establish a first time window of a first predefined size T_1 , as shown in FIG. 2. During time window T_1 , as shown in Fig.2. During time window T_1 , Wi-Fi antenna 2 together with Wi-Fi module 4 and Wi-Fi signal monitor 8 continue to monitor and detect the level of received Wi-Fi signal. If the Wi-Fi signal level detected during time window T_1 remains equal to or greater than V_{th1} , at the expiration of time window T_1 , timer unit 7 sends a cellular tear-down signal and a Wi-Fi link-up signal to the network switch unit 6 via signal line 11.”).

144. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teaching of transitioning from a WAN to a WLAN to Chaskar’s device, and when doing so, the signal strength would be measured using a signal strength averaging window of a particular width.

145. Willhoff discloses activating a timer (*e.g.*, starting timer measuring “window of time”) to establish a first time window of a first predefined size T_1 (*e.g.*, “window of time” of shorter “width”) to perform a signal strength measurement (measure “RSSI”). *See, e.g.*, Willhoff:

146. See my discussion of element [1.c] above (Section IX.A.6.d), which also addresses the motivation to apply Willhoff’s teachings to Chaskar (as modified

by Dorenbosch).

147. As I explained above in [1.c], Willhoff discloses measuring signal strength over a period of time. Moreover, as I explained above, a person of ordinary skill in the art would have understood when applying Dorenbosch’s teachings of WAN-to-WLAN switching to Chaskar, the WLAN signal strength would be measured using a signal strength averaging window of a particular width. Thus, because the WLAN signal strength is measured based on whether there is a detected border bit (the “first context”), as I noted above, when applying Willhoff’s teachings of a timer to measure a window to Chaskar (as modified by Dorenbosch), the timer would be activated based on the “first context.”

j. Element [12.c]

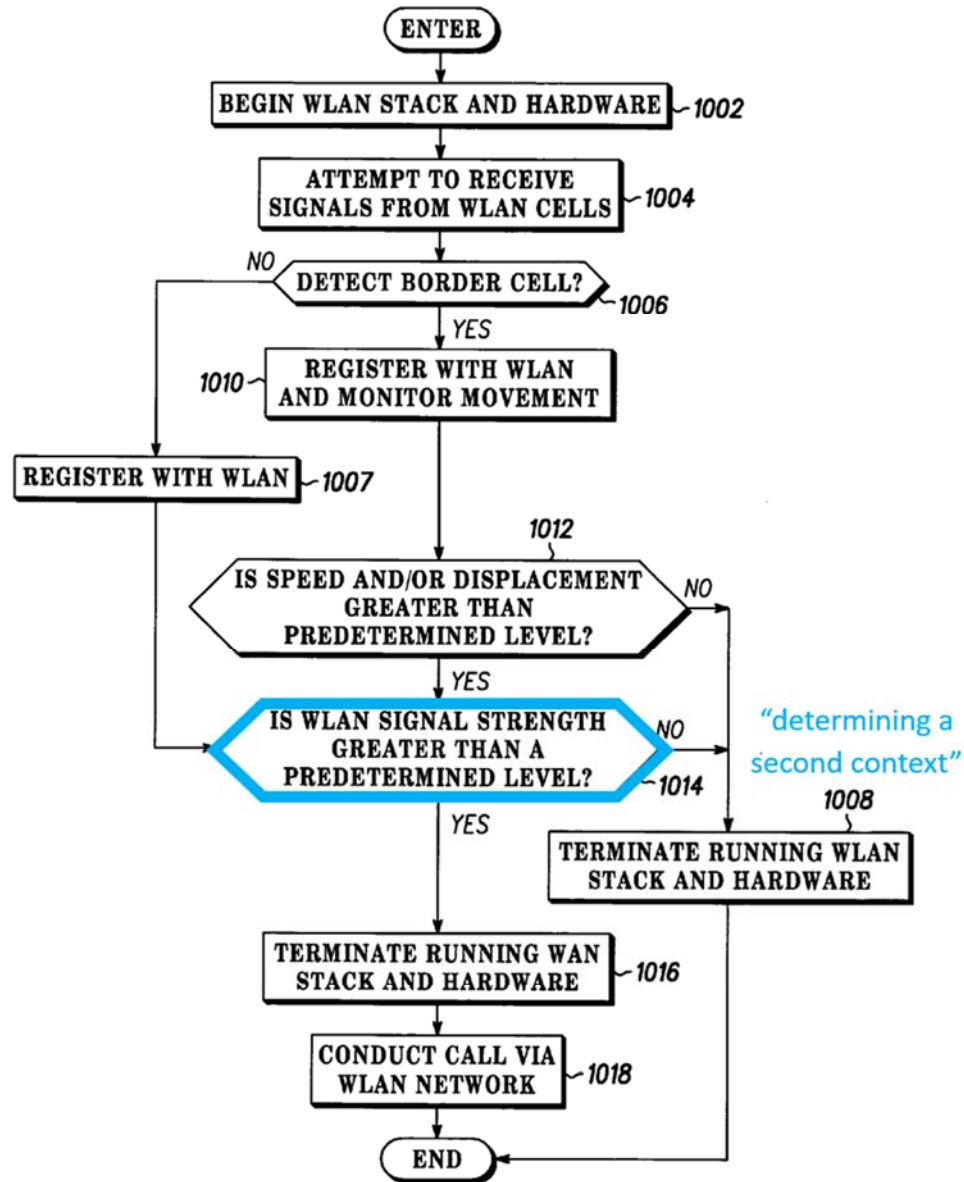
148. **Element [12.c] recites “determining a second context during the first time window.”** This element is met by Chaskar in view of Dorenbosch and Willhoff.

149. Chaskar discloses the first time window (*e.g.*, “signal strength averaging window[]”). *See, e.g.*, Chaskar:

150. See my discussion of element [1.c] above (Section IX.A.6.d).

151. Dorenbosch discloses determining a second context (*e.g.*, while connected to WAN network, “check[ing] the signal strength of the WLAN signal” and finding “sufficient [WLAN] signal strength”). *See, e.g.*, Dorenbosch:

- Fig. 10:



- [0045]: “For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the unit will check the signal strength of the WLAN signal, at step 1014. Otherwise, the unit 306 again terminates running the WLAN stack 510 and hardware 404, 406, at step 1008, if either the movement information or the WLAN signal strength is insufficient to warrant a handover. *If all the*

conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then the unit 306 will terminate running the WAN stack 508 and hardware 410, 412, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.”

152. See my discussion of element [12.b] above (Section IX.A.6.i).

153. Dorenbosch further discloses, if a border cell is detected, the unit registers with the WLAN and begins to monitor whether its speed and/or displacement exceed predetermined thresholds, and thereafter checks the signal strength of the WLAN signal. Dorenbosch, [0045], Fig. 10.

154. As I explained above in Section IX.A.3, a person of ordinary skill in the art would have been motivated to apply Dorenbosch’s teaching of transitioning from a WAN to a WLAN to Chaskar’s device, such that strength is checked during the window.

155. Willhoff discloses the first time window (*e.g.*, “window of time”). *See, e.g.*, Willhoff:

156. See my discussion of element [1.c] above (Section IX.A.6.d) which also addresses the motivation to apply Willhoff’s teachings to Chaskar (as modified by Dorenbosch).

k. Element [12.d]

157. **Element [12.d] recites “automatically switching a communication in progress via a wireless network to a communication via a Wi-Fi network**

based on the second detected context.” This element is met by Dorenbosch.

158. Dorenbosch discloses automatically switching (*e.g.*, “conduct[] any present and/or subsequent calls via the WLAN system”) a communication in progress via a wireless network (*e.g.*, “present....call[]”) to a communication via a Wi-Fi network (*e.g.*, “WLAN” using “IEEE Standard 802.11” protocols) based on the second detected context (*e.g.*, handoff based on “sufficient signal strength” of the WLAN). *See, e.g.*, Dorenbosch:

- Fig. 10:

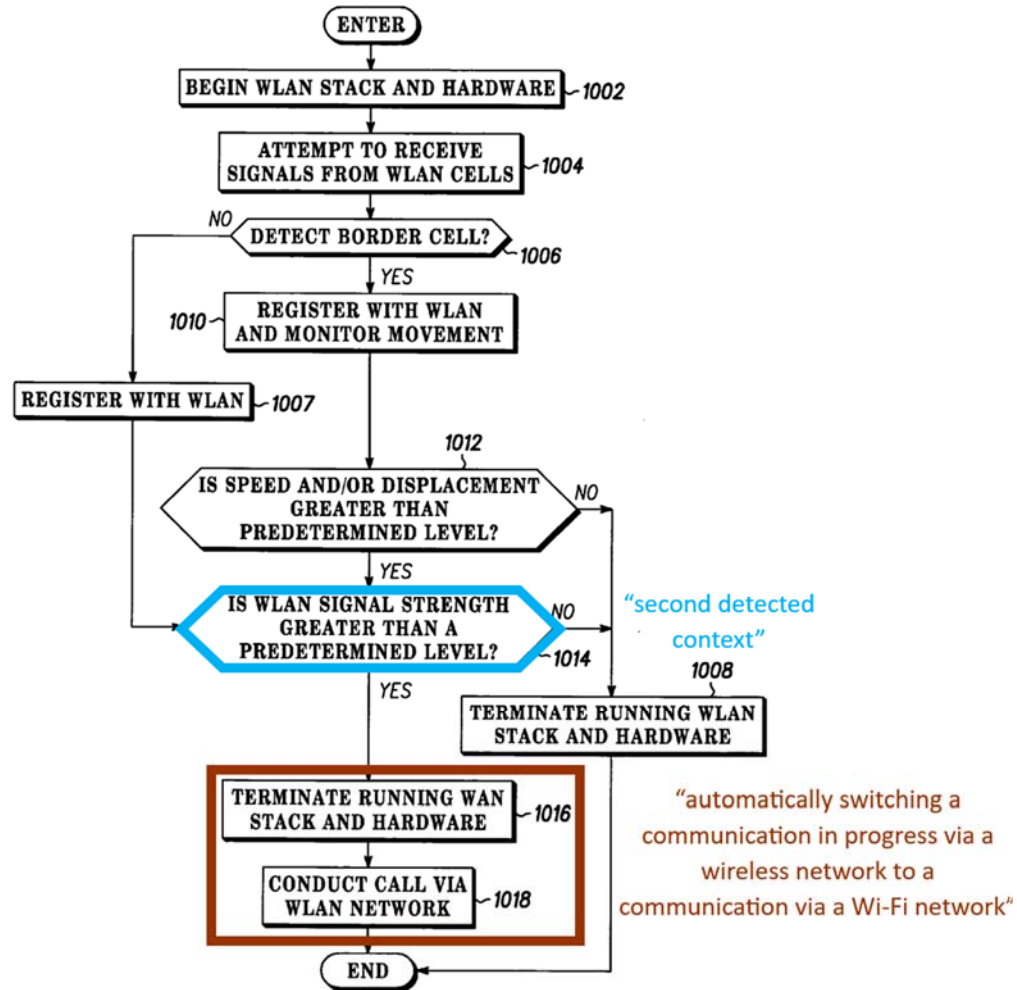


FIG. 10 1000

- [0045]: “The unit 306 enters the method, at step 1002 where it begins running the WLAN stack 510 and its associated hardware 404, 406. The unit then attempts to receive signals from WLAN cells at step 1004. **If the unit detects a WLAN border cell, at step 1006, then the unit 306 registers with the WLAN and begins to monitor its movement, at step 1010.** Otherwise, if the unit 306 determines that the unit is within a normal WLAN cell 104, the unit will immediately register with the WLAN, at step 1007, and begin to handover any current call(s) to the WLAN system, (i.e. the unit will bypass the steps for checking the movement and skip ahead to step 1014). **For a unit 306 that detects a border cell, if the speed and/or displacement exceed predetermined thresholds, at step 1012, then the unit will check the signal strength of the WLAN signal, at step 1014.** Otherwise, the unit 306 again terminates running the WLAN stack 510 and

hardware 404, 406, at step 1008, if either the movement information or the WLAN signal strength is insufficient to warrant a handover. ***If all the conditions are met (i.e. sufficient signal strength, necessary movement conditions within border cell coverage) then the unit 306 will terminate running the WAN stack 508 and hardware 410, 412, at step 1016, and conducts any present and/or subsequent calls via the WLAN system, at step 1018.***

- [0049]: “The novel system and related methods for improving WLAN handover behavior and phone battery life provide significant advantages for dual-mode cellular communication systems (WLAN/WAN systems), such as improving the reliability of the handover, thereby ***allowing for significant cost savings by allowing more calls to be made over the WLAN.***”
- [0008]: “Additionally, the handover decision must not be made prematurely to avoid the ***service cost associated with*** handing over a subscriber to ***the macro network*** 102 when the SU 106 does not actually leave the WLAN coverage area 104.”

159. See my discussion of element [12.c] above (Section IX.A.6.j).

160. Dorenbosch further discloses, when handover manager 514 is connected to a WAN signal, for which a user must pay a “cost” for usage, and detects a “WLAN signal strength greater than a predetermined level” while the speed or displacement of the device exceeds a threshold, handover manager 514 switches to the WLAN to conduct the “present call.” Dorenbosch, [0008], [0045], [0049]. The 802.11 Wi-Fi WLAN is preferable because it has sufficient signal strength and there are no charges for use of that network. Dorenbosch, [0049]. Switching is performed automatically because it is performed without human intervention.

161. As I explained above in Section IX.A.3, a person of ordinary skill in

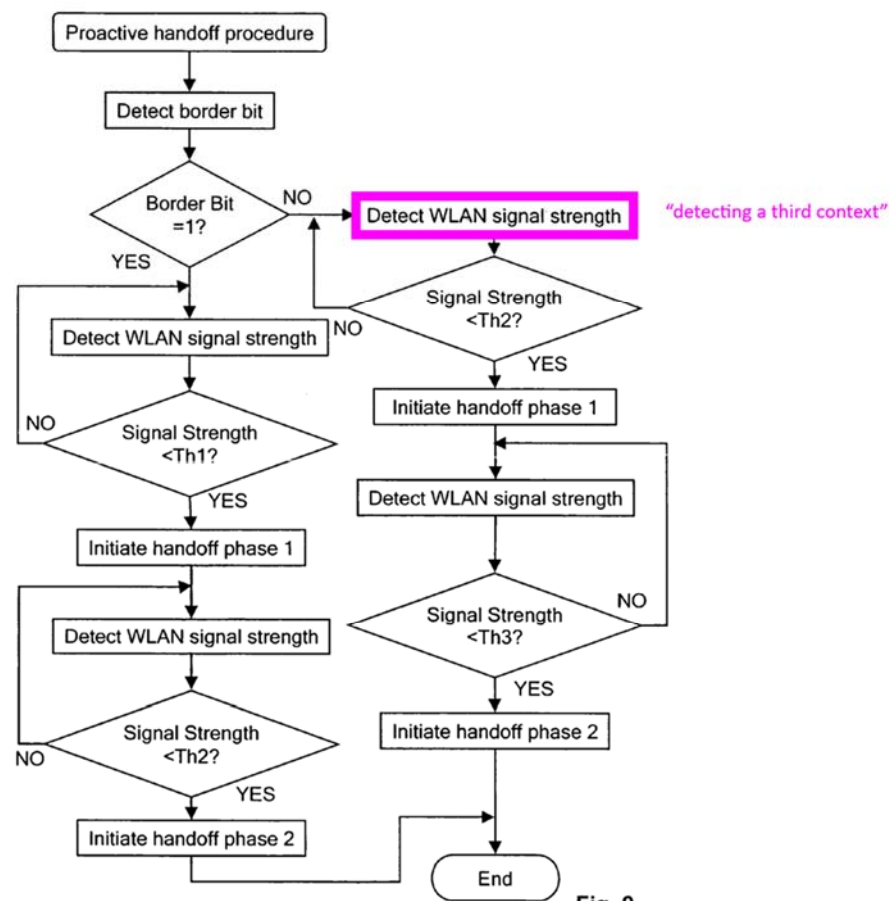
the art would have been motivated to apply Dorenbosch's teaching of transitioning from a WAN to a WLAN to Chaskar's device.

I. Element [12.e]

162. **Element [12.e]** recites “**detecting a third context.**” This element is met by Chaskar.

163. Chaskar discloses detecting a third context (e.g., if “detected border bit is equal to 0” while connected to the WLAN network, “detect[ing] WLAN signal strength”). See, e.g., Chaskar:

- Fig. 9:



- [0017]: *“The invention provides a method which:”*
- [0018]: *“1. can reduce the number of spurious handoff triggers without delaying the handoff trigger when it indeed needs to happen,”*
- [0019]: *“2. can reduce the number of false starts (of handoff preparation) in proactive handoff schemes,”*
- [0020]: *“3. make the implementation of proactive handoff schemes efficient by enabling the mobile terminal to complete handoff preparation while the signal from WLAN is still strong, and”*
- [0021]: *“4. enable implementation of user policies to be described in the following.”*
- [0072]: *“In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, **while a detected WLAN signal strength is larger than Th2, the mobile node waits. After the signal strength has fallen below Th2, in order to be proactive, handoff phase 1 is initiated.**”*

164. See my discussion of element [1.d] above (Section IX.A.6.e).

165. As discussed in [1.d], Chaskar discloses, when a border bit equal to 0 is detected, the WLAN signal strength is detected to determine if it is above or below Th2. Chaskar, [0072], Fig. 9.

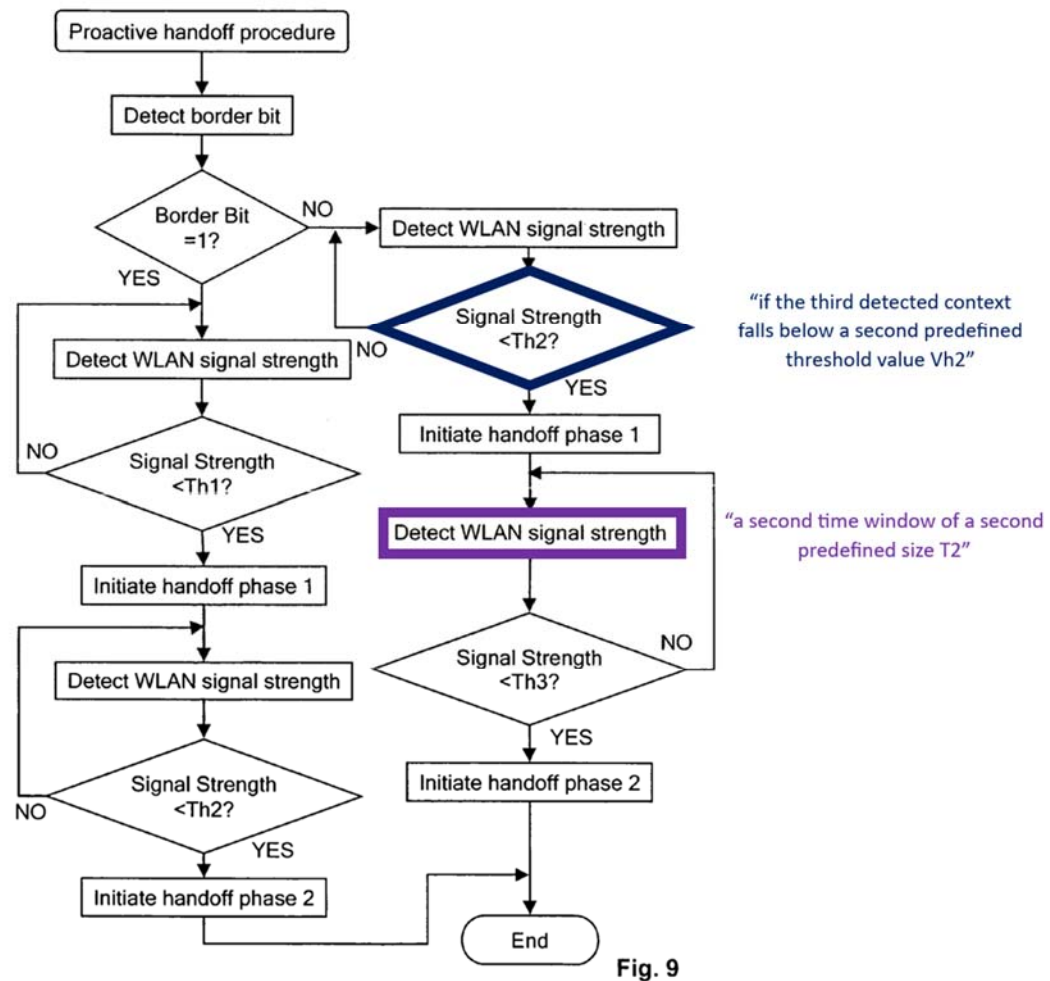
m. Element [12.f]

166. Element [12.f] recites **“establishing a second time window of a second predefined size T2 if the third detected context falls below a second predefined threshold value Vth2.”** This element is met by Chaskar in view of Willhoff.

167. Chaskar discloses establishing a second time window of a second

predefined size T2 (e.g., establishing “signal strength averaging window[]” having a “width[]”) if the third detected context falls below a second predefined threshold value Vth2 (e.g., if “detect[ed] WLAN signal strength...falls below Th2”). See, e.g., Chaskar:

- Fig. 9:



- [0072]: “In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, **while a detected WLAN signal strength is larger than Th2, the mobile node waits.**”

- [0073]: “After initiation of phase 1, ***WLAN signal strength is detected again and while the detected WLAN signal strength is larger than a predetermined threshold Th3, the mobile node waits.***”

168. See my discussion of elements [1.d] and [12.e] above (Sections IX.A.6.e and IX.A.6.l).

169. Chaskar discloses that a second time window is established to detect if the WLAN strength falls below Th3 after the device determines that the WLAN strength falls below a Th2, such that the WLAN signal strength is monitored to determine if it continues to decrease such that a handoff to the cellular network is required. Chaskar, [0072]-[0073], Fig. 9.

170. To the extent further disclosure of a second predefined size is required, Willhoff discloses a second time window of a second predefined size T2 (e.g., “window of time” of shorter “width”). See, e.g., Willhoff:

171. See my discussion of element [1.d] above (Section IX.A.6.e), which also addresses the motivation to apply Willhoff’s teachings to Chaskar (as modified by Dorenbosch).

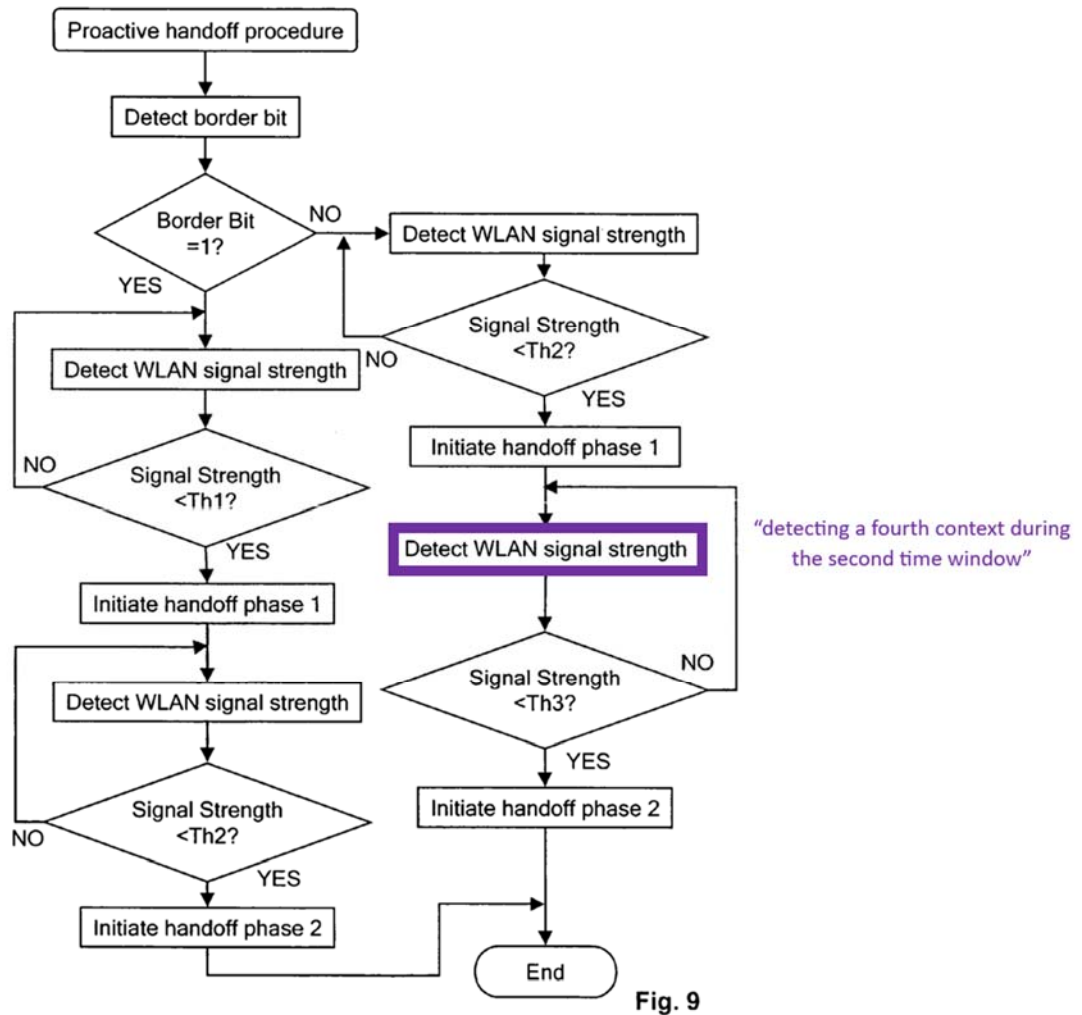
n. Element [12.g]

172. **Element [12.g] recites “detecting a fourth context during the second time window.”** This element is met by Chaskar.

173. Chaskar discloses detecting a fourth context (e.g., after handoff phase 1 is initiated “detect[ing] WLAN signal strength”) during the second time window

(e.g., time window established for “signal strength averaging windows”). See, e.g., Chaskar:

- Fig. 9:



174. See my discussion of element [12.f] above (Section IX.A.6.m).

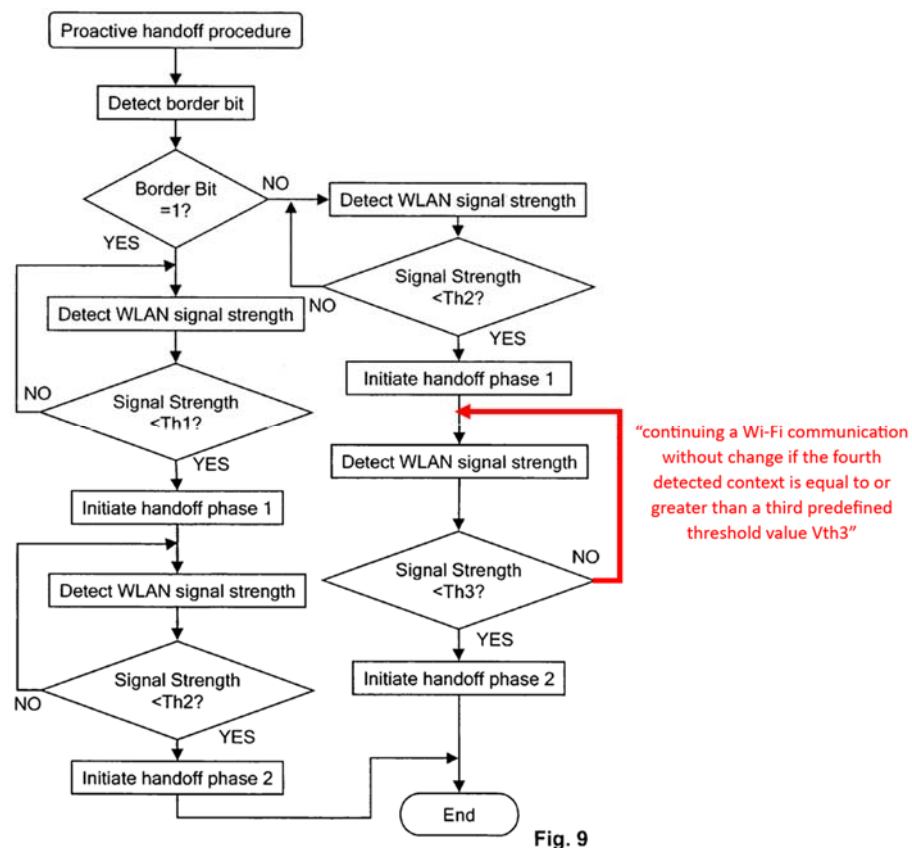
175. As I explained above in [12.f], Chaskar discloses detecting the WLAN signal strength again, during a signal strength averaging window, after handoff phase 1 is initiated. Chaskar, [0072]-[0073].

o. Element [12.h]

176. Element [12.h] recites “continuing a Wi-Fi communication without change if the fourth detected context is equal to or greater than a third predefined threshold value Vth3.” This element is met by Chaskar.

177. Chaskar discloses continuing a Wi-Fi communication without change if the fourth detected context is equal to or greater than a third predefined threshold value Vth3 (e.g., “mobile node” continues Wi-Fi (802.11) communication “while the detected WLAN signal strength is larger than a predetermined threshold Th3”). See, e.g., Chaskar:

- Fig. 9:



- [0073]: “After initiation of phase 1, WLAN signal strength is detected again and ***while the detected WLAN signal strength is larger than a predetermined threshold Th3, the mobile node waits.*** After the signal strength has fallen below Th3, handoff phase 2 is initiated.”

178. See my discussion of elements [1.d] and [12.f] above (Sections IX.A.6.e and IX.A.6.m).

179. Chaskar discloses that, if the detected signal strength remains above Th3, the 802.11 communication continues until the WLAN signal strength drops below Th3. Chaskar, [0073].

p. Element [12.i]

180. **Element [12.i]** recites “wherein Vth3 is smaller than Vth2.” This element is met by Chaskar.

181. Chaskar discloses Vth3 (e.g., “Th3”) is smaller than Vth2 (e.g., “Th2”). See, e.g., Chaskar:

- [0069]: “According to an alternative embodiment of the proactive handoff procedure, ***multiple thresholds can be used, for example Th1>Th2>Th3. FIG. 9 shows such embodiment.***”

182. See my discussion of element [1.e] above (Section IX.A.6.f).

183. Chaskar further discloses “multiple thresholds can be used, for example Th1>Th2>Th3.” Chaskar, [0069].

q. Element [37.pre]

184. **Element [12.i]** recites “A device comprising.” This element is met by Chaskar.

185. See my discussion of element [1.pre] above (Section IX.A.6.a).

r. Element [37.a]

186. **Element [37.a] recites “a switching system to switch operation between a first communication module and a second communication module.”**

This element is met by Chaskar and Dorenbosch.

187. See my discussion of element [1.a] above (Section IX.A.6.b).

s. Element [37.b]

188. **Element [37.b] recites “wherein during an established communication if a monitor detects that a context changes, the established communication is switched to a second communication over a network, wherein switching is based on detecting a second context being preferred over the context within a set of known networks.”** This element is met by Chaskar in view of Dorenbosch.

189. Chaskar discloses during an established communication (*e.g.*, established “voice call[]”) if a monitor detects that a context changes (*e.g.*, monitor detects “WLAN signal strength...fall[s] below Th3”), the established communication is switched to a second communication over a network (*e.g.*, “handoff” to “cellular”). *See, e.g.*, Chaskar:

190. See my discussion of element [1.b] above (Section IX.A.6.c).

191. Further, a person of ordinary skill in the art would have understood or

at least found it obvious that Chaskar's detection of the WLAN signal strength falling below Th3 is performed by a monitor, such as through software running on the mobile node. For example, it was well known to include a monitor in a mobile node to determine when a signal level drops below a certain threshold and to make handoff decisions based on such received signal levels. For example, U.S. Patent Application Publication No. 2004/0008645 (filed Dec. 20, 2002 and published January 15, 2005) teaches the use of a sensor that measures the signal strength of a radio signal. Ex. 1021, [0029] ("The mobile terminal 18 will preferably include radio technology sensor and switcher (RTSS) logic to facilitate the operation and interaction between these interfaces. The primary functions of the RTSS are to cooperate with the various interfaces to aid in determining which interface to use for communications and control the transition from one interface to another during a handoff."); [0030] ("[T]he RTSS in the mobile terminal 18 will detect the presence and the strength of the WLAN signal from the Access Point 32...."). A signal strength monitor thus would have been straightforward for a person of ordinary skill in the art to implement in a mobile device.

192. Dorenbosch discloses detecting a second context (*e.g.*, "signal strength of the WAN signal is" "good") being preferred over the context within a set of known networks ("WAN" preferred over "[i]f...WLAN signal degradation is detected"). *See, e.g.*, Dorenbosch:

193. See my discussion of element [1.b] above (Section IX.A.6.c), which also addresses motivation to apply Dorenbosch’s teachings to Chaskar. “WAN” and “WLAN” are known networks in order to evaluate their signals.

t. Element [37.c]

194. **Element [37.c] recites “wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to an active mode, wherein the timer is activated to establish a time window of a predefined size.”** This element is met by Chaskar in view of Dorenbosch and Willhoff.

195. See my discussion of element [1.c] above (Section IX.A.6.d).

u. Element [37.d]

196. **Element [37.d] recites “wherein if the monitor detects that a signal level is below a second predefined threshold value V_{th2} , the timer is activated to establish a second time window of a second predefined size $T2$.”** This element is met by Chaskar in view of Willhoff.

197. See my discussion of element [1.d] above (Section IX.A.6.e).

v. Element [37.e]

198. **Element [37.e] recites “wherein a third predefined threshold value V_{th3} is smaller than V_{th2} .”** This element is met by Chaskar.

199. See my discussion of element [1.e] above (Section IX.A.6.f).

B. Ground 2: Ground 1 in further view of Donovan (Ex. 1007, U.S. Patent App. Pub. No. 2005/0063348) (Claims 1, 12 and 37)

200. To the extent further disclosure of a “sleep mode” is required, **Donovan** discloses a “sleep mode” (also referred to as a “low power mode”). **Donovan** discloses a mobile station connected to a wireless LAN, where the mobile station includes “**wireless network communications device 48**” (communication module) that transitions between a “sleep mode” (or “low power mode”) and an “active mode.” Donovan, [0042], [0057].

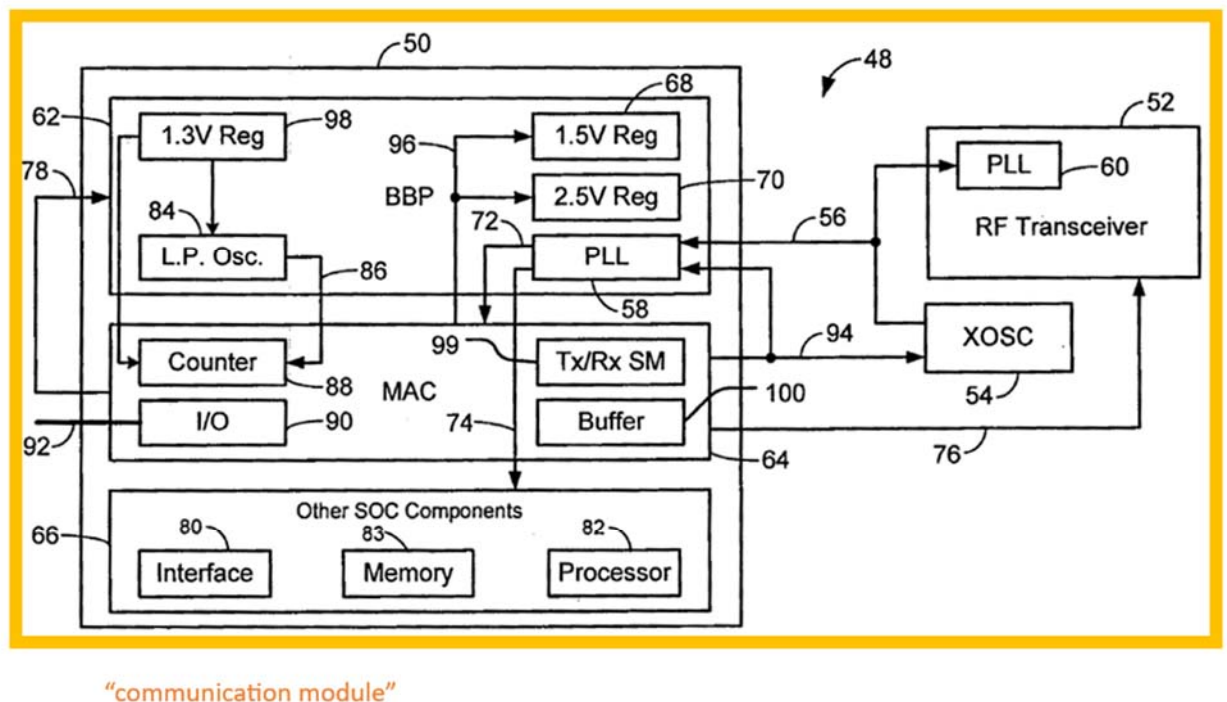
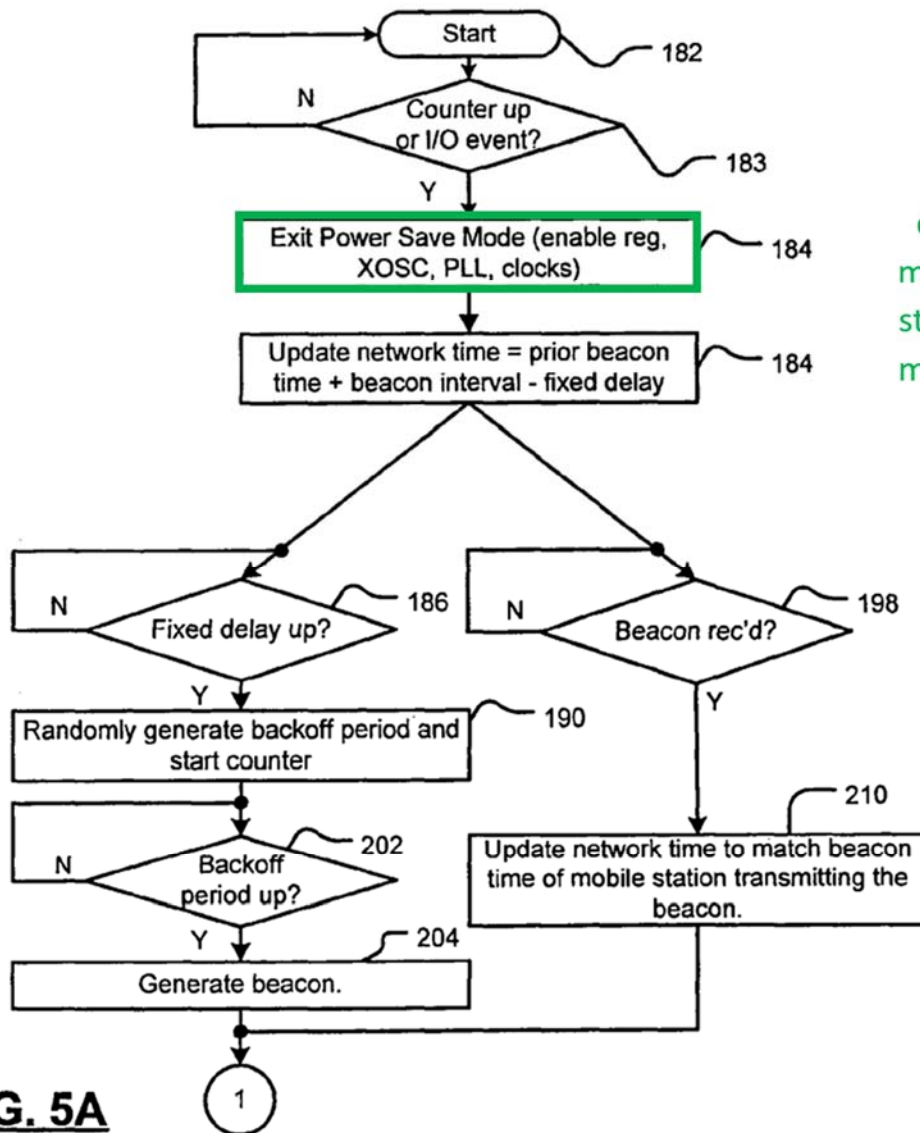


FIG. 2

Donovan, Fig. 2.

201. In the “active mode,” “the wireless network communications device 48

processes incoming and outgoing data.” Donovan, [0042]. In the “sleep mode,” **Donovan’s** RF transceiver “remains deactivated...and does not transmit or receive RF signals,” but “may utilize a small amount of power to ensure a quick transition from the low power mode to the active mode.” Donovan, [0045]. “In the event that a mobile station requires the wireless network communications device 48 to return to the active mode, the mobile station triggers an I/O input 92,” in which case “**the remaining circuitry is enabled in step 184.**” Donovan, [0050], [0057]; Fig. 5A. After entering the active mode, wireless communications device 48 transmits and receives signals. Donovan, [0058].



“the second communication module to change state from a sleep mode to an active mode”

FIG. 5A

Donovan, Fig. 5A.

202. Like Chaskar, Dorenbosch, and Willhoff, Donovan is analogous art, in the same field as the '281 patent, which includes wireless communications, and reasonably pertinent to alleged problems addressed by the '281 patent of connecting to wireless communication networks. *See, e.g.*, '281 patent, Abstract (“A mobile communication device includes, in part, a cellular communication module, a first

antenna adapted to receive and transmit data between the mobile communication module and a cellular network, a Wireless Fidelity (Wi-Fi) communication module, a second antenna adapted to receive and transmit data between the Wi-Fi communication module and a VoIP network, a signal monitoring circuit, and a switching circuit adapted to switch an existing communication from the cellular communication module to the Wi-Fi communication module or vice versa.”), 2:36-41 (“In accordance with the present invention, a mobile communication device is configured so as to automatically switch a communication that is already in progress using a wireless cellular network (hereinafter alternatively referred to as cellular network) to a wireless Voice over IP (VoIP) network or vice versa.; Donovan, [0042] (“Referring now to FIG. 2, the wireless network communications device 48 in a mobile station operates in two power modes. In an active mode, the wireless network communications device 48 processes incoming and outgoing data. In the low power mode, the wireless network communications device 48 does not transmit or receive data. In one implementation, the wireless network communications device 48 includes an SOC circuit 50, an external radio frequency (RF) transceiver 52, and a crystal oscillator (XOSC) 54.”), [0043] (“The RF transceiver 52 wirelessly transmits/receives data to/from an AP or another mobile station.”).

203. A person of ordinary skill in the art would have been motivated to apply Donovan’s teachings of a communication module changing state from a low power

sleep state to an active state in implementing Chaskar's device (as modified by Dorenbosch and Willhoff) to allow the device to reduce power consumption while also allowing faster wake-up time than if the communication module were completely shut off. As Dorenbosch teaches, using a "brute force" handover method, that includes "continually running the hardware and software stack for" two communication system, results in "significant detrimental effect on battery life because the device must operate both sets of hardware simultaneously." Dorenbosch, [0006]. Further, as Donovan teaches, "during the low power mode, the RF transceiver 52 may utilize a small amount of power to ensure a quick transition from the low power mode to the active mode." Donovan, [0045]. While Donovan discusses application of its network communications device 48 including an RF transceiver to a WLAN, a person of ordinary skill in the art would have understood that the power saving and quick transition from low power mode to active mode benefits would be equally applicable to Chaskar's "cellular" module and Dorenbosch's "transceiver" for "WAN system", which are also communication devices including an RF transceiver. Further, a person of skill in the art would have found it straightforward to apply these teachings to Chaskar's device as modified by Dorenbosch because Dorenbosch teaches turning off its WAN or WLAN communication module when communicating over the other module, and how that impacts the switching operation. See Dorenbosch, [0038] ("[T]he process of

initiating the registration sequence with a communications system, be it a cellular (WAN) system or a local area (WLAN) system, includes the steps necessary to bring up the corresponding hardware and software for that system.... When the registration sequence is completed, the unit will conduct any present call and subsequent calls via the WAN system, at step 814, and will terminate running the WLAN stack 510 and hardware 404, 406.”); *see also* Section IX.A.2.

204. Accordingly, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Donovan’s teachings of a sleep mode and active mode to Chaskar’s handoff procedure (as modified by Dorenbosch and Willhoff), and would have known such a combination (yielding the claimed limitations) would predictably work and provide the expected functionality.

C. Ground 3: Chaskar in view of Willhoff and Ruan (Claim 31):

1. Overview of Ruan (Ex. 1008, U.S. Patent App. Pub. No. 2004/0246922)

205. Ruan discloses a wireless device that makes “roaming decisions based on association qualities between the wireless device and one or more wireless access points.” Ruan, [0002]. Ruan’s mobile station 271 “includes quality calculation module 255,” “generat[ing] an association quality for a corresponding access point,” such as “access point 205” communicating via “IEEE 802.11,” based on “one or more inputs,” such as a measurement of the signal strength of the current access point. Ruan, [0043], [0048]-[0049].

206. Ruan's "[q]uality calculation module 255 compares the current quality association value to quality threshold value 254," and "[w]hen the retrieved current quality association value is greater than or equal to quality threshold value 254, current association 293 is viewed as being sufficient." Ruan, [0060]. But "when the current quality association value is less than quality threshold value 254, current association 293 is viewed as being insufficient," and "station 271 may roam to attempt to associate with a different access point." Ruan, [0061].

207. When roaming, Ruan's mobile station 271 "generat[es] a ranked candidate list" of access points by "identify[ing] any access points...that have an association quality value equal to or greater than the quality threshold value" ("sufficient access points") and "append[s] any access points...that have an association quality value less than the quality threshold value" ("insufficient access points"). Ruan, [0076]-[0077]. Thereafter, the mobile station "select[s] a ranked access point from the ranked candidate list," "attempt[s] to associate with the selected ranked access point," and once successful, "communicates with resources included in network 201 through access point." Ruan, [0082]-[0083].

208. Ruan teaches "it may be that no other access point has an association quality value greater than the association quality value for access point 205" of the existing connection, in which case "station 271 may maintain current association 293 (even if current association 293 is insufficient)." Ruan, [0068].

2. Motivation to Apply Ruan's Teachings to Chaskar as modified by Willhoff

209. Like Chaskar and Willhoff, Ruan is analogous art, in the same field as the '281 patent, which includes wireless communications, and reasonably pertinent to alleged problems addressed by the '281 patent of switching between wireless communication networks. *See, e.g.*, Ruan, [0082], ("After the sufficient access points are included in the ranked candidate list, any insufficient access points can be appended to the ranked candidate list. The method 400 includes an act of selecting a ranked access point from the ranked candidate list (act 403). Act 403 can include the wireless access point selecting a ranked wireless access point from the ranked candidate list. For example, access point selection module 257 can select a ranked access point from the ranked candidate list for station 271. It may be that access point selection module 257 selects a highest ranked access point first."), [0083] ("The method 400 includes an act of attempting to associate with the selected ranked access point (act 404). Act 404 can include the wireless device attempting to associate with the selected ranked wireless access point. For example, station 271 can attempt to associate with access point 206. When the association is successful, new association 294 (the dotted line) is established. Station 271 then communicates with resources included in network 201 through access point 206.").

210. A person of ordinary skill in the art would have been motivated to apply Ruan's alternative Wi-Fi search and connection teachings to Chaskar's mobile

device to advantageously continue a call using Wi-Fi instead of switching the call to cellular. As I explain in Section IX.A.3, it was well known in the art that a connection via a cellular network: has higher service fees as compared to a Wi-Fi connection, increases power consumption of the mobile device, and provides slower service than Wi-Fi. *See also* Chaskar, [0004] (“[I]t is supposed that the user has chosen WLAN as the preferred access to the IP network...because WLAN access it typically cheaper and faster than cellular access.”). In implementing Ruan’s Wi-Fi search teachings in Chaskar’s system, a person of ordinary skill in the art would have understood or at least found obvious that the mobile node would search for the alternative Wi-Fi signals after the mobile node determines that the WLAN signal strength has fallen below Th_2 , before initiating a first phase of a handoff procedure. *See* Chaskar, [0072] (“In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility....”). A person of ordinary skill in the art would have understood that there will be situations where a mobile device user is located in an area with multiple Wi-Fi access points, such that when signal strength of a currently used Wi-Fi network degrades, switching a communication to a cellular network is not the only option. Ruan, [0061] (“On the other hand, when the current quality association value is less than quality threshold value 254, current association 293 is viewed as being insufficient. When current

association 293 is insufficient, station 271 may roam to attempt to associate with a different access point.”). In that situation, switching to an alternative Wi-Fi connection would avoid unnecessarily using the cellular functionality when another Wi-Fi signal is available. Such a switch would predictably allow the WLAN communication module to perform operations without interruption until a determination is made that no WLAN signal is sufficient, in which case an in-progress call is in danger of being dropped, and a switch to cellular communications is necessary.

211. Accordingly, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Ruan’s teachings of searching for alternative Wi-Fi networks to Chaskar’s handoff procedure (as modified by Willhoff), and would have known such a combination (yielding the claimed limitations) would predictably work and provide the expected functionality.

3. Invalidity of Claim 31 Over Chaskar in view of Willhoff and Ruan

212. As I discuss below, Claim 31 is rendered obvious by Chaskar in view of Willhoff and Ruan. In addition to my discussion in Section IX.C.1-2, the following discussion identifies example disclosures followed by bulleted excerpts that each disclose Claim 31.

213. As I explain below, this ground involves the use of Chaskar’s multi-threshold comparison process for switching from Wi-Fi to cellular (see Section

IX.A.1), to which is applied Ruan’s procedure for switching to another Wi-Fi network before switching to cellular (see Section IX.C.1) to improve performance. Willhoff’s teaching of using a timer for measuring signal strength (see Section IX.A.4) is applied to each signal strength measurement involved in these switching processes.

a. Element [31.pre]

214. **Element [31.pre] recites “A method comprising.”** This element is met by Chaskar.

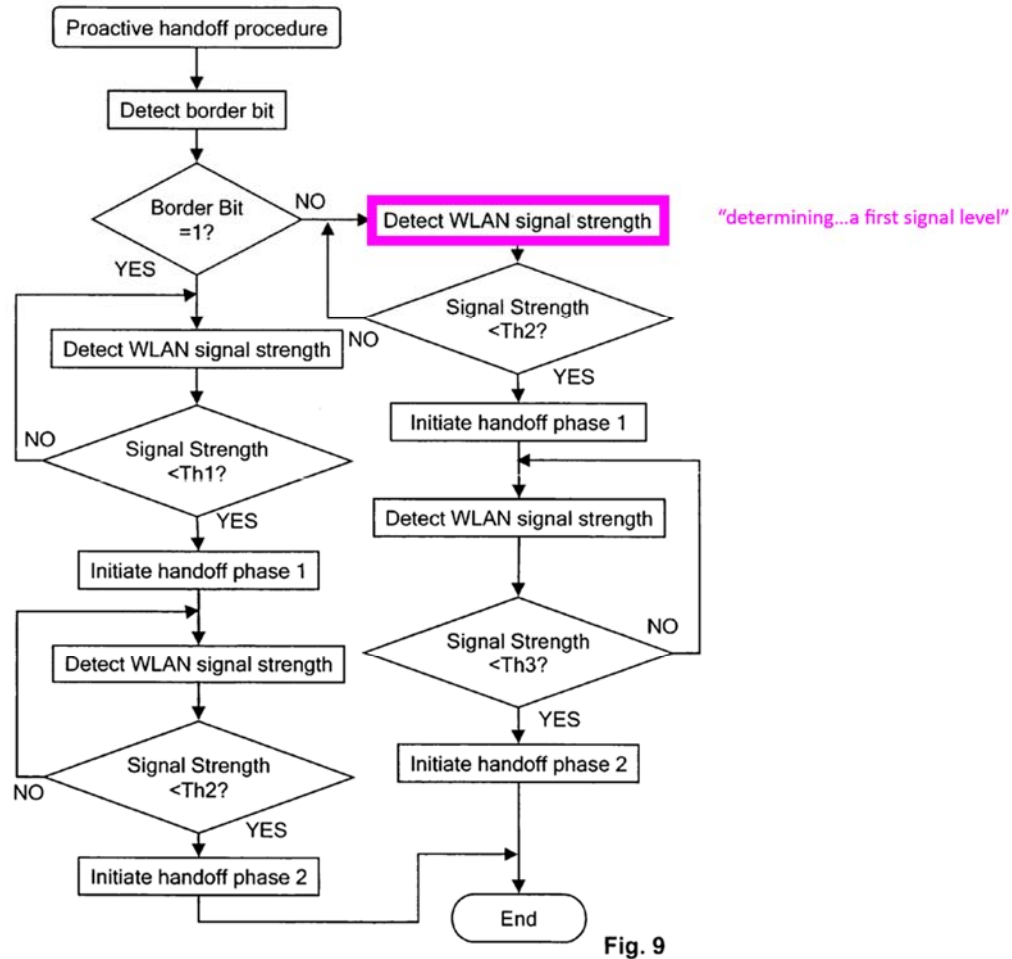
215. See my discussion of element [12.pre] above (Section IX.A.6.g).

b. Element [31.a]

216. **Element [31.a] recites “determining, with a server, a first signal level.”** This element is met by Chaskar.

217. Chaskar renders obvious determining (*e.g.*, “detect[ing]”), with a server (*e.g.*, “mobile node”), a first signal level (*e.g.*, “WLAN signal strength”). See, *e.g.*, Chaskar:

- Fig. 9:



- [0072]: “In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, **while a detected WLAN signal strength is larger than Th2**, the mobile node waits. **After the signal strength has fallen below Th2**, in order to be proactive, handoff phase 1 is initiated.”

218. See my discussion of element [12.e] above (Section IX.A.6.l).

219. Chaskar further discloses the mobile node’s handover procedure that detects whether the “WLAN signal strength” is larger than Th2. [0072].

220. A person of ordinary skill in the art would have found it obvious to implement Chaskar’s mobile node as the well-known concept of a server to

advantageously allow portable service of data between devices, e.g., to allow one user to download information from another user's portable device. *See* DeAnna, [0022] (disclosing implementing a portable wireless device as a server to allow “sharing and processing of data throughout a distributed organization”), [0121]. *See also* the McGraw-Hill Dictionary of Computing & Communications (6th ed., 2003) (which I understand has been identified as Ex. 1024, and would have been accessible to a person of ordinary skill in the art, e.g., through a library or a college bookstore) at 340 (defining “server” to be “[a] computer or software package that sends requested information to a client or clients in a network”) and the Modern Dictionary of Electronics (7th ed., 1999) (which I understand has been identified as Ex. 1025, and would have been accessible to a person of ordinary skill in the art, e.g., through a library or a college bookstore) at 683 (defining “server” to be “[a] computer or processor that holds applications, files, or memory shared by users on a network”). As explained by DeAnna, which I discuss further in Section IX.D, a server is incorporated in a system “designed with a highly mobile and rapidly evolving organization in mind, where even remote client devices can operate as servers [for] device-to-device information processing and communications,” which “enables flexible and rapid device and software integration, reduces development risk and moves one step closer to the goal of pervasive computing and knowledge sharing within large, distributed, diverse systems of users, software and hardware

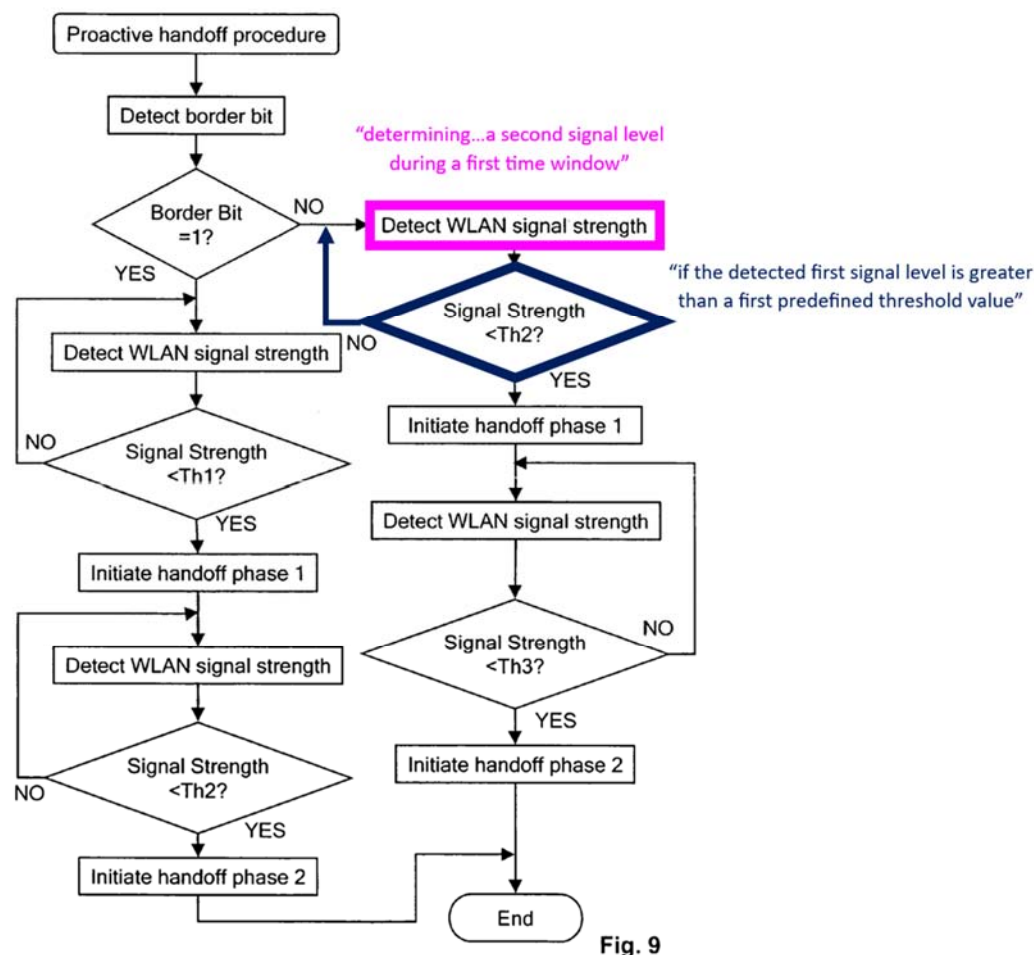
platforms.” DeAnna, [0022].

c. Elements [31.b]-[31.c]

221. **Element [31.b] recites “activating, with the server, a timer to establish a first time window of a first predefined size T1 if the detected first signal level is greater than a first predefined threshold value.” Element [31.c] recites “determining, with the server, a second signal level during the first time window.”** These elements are met by Chaskar in view of Willhoff.

222. **Chaskar renders obvious with the server (see [31.a.]), establishing a first time window of a predefined size T1 (e.g., “signal strength averaging window[]” of a “width[]”) if the detected first signal level is greater than a first predetermined threshold value (e.g., “while a detected WLAN signal strength is larger than Th2”), and determining (e.g., “measur[ing]”), with the server, a second signal level during the first time window (e.g., “detect[ing] WLAN signal strength” a second time during “signal strength averaging window[]”). See, e.g., Chaskar:**

- Fig. 9:



223. See my discussion of elements [1.c] and [12.b] above (Sections IX.A.6.d and IX.A.6.i).

224. Chaskar further discloses that, if the mobile node detects the WLAN signal strength is larger than Th2, the mobile node repeats this process, and again detects the WLAN signal strength within another “signal strength averaging window” for comparison with Th2. Chaskar, [0072], [0076], Fig. 9.

225. Willhoff discloses activating a timer (e.g., starting timer measuring “window of time”) to establish a first time window of a first predefined size T1 (e.g.,

“window of time” of longer “width”).

226. See my discussion of element [1.c] above (Section IX.A.6.d).

227. As I explained above in Section IX.A.5, a person of ordinary skill in the art would have been motivated to apply Willhoff’s teaching of using a timer to compute signal strength in implementing Chaskar’s mobile node.

d. Element [31.d]

228. **Element [31.d] recites “if the second detected signal level falls below the first predefined threshold value, then searching for alternative Wi-Fi signals having signal level above the first predefined threshold value, with the server.”** This element is met by Chaskar in view of Ruan.

229. Chaskar renders obvious the second detected signal level falls below the first predefined threshold value (*e.g.*, “detected WLAN signal strength...fall[s] below Th2”) and the server (*e.g.*, “mobile node”; *see* [31.a]). *See, e.g.*, Chaskar:

- [0072]: “In case the detected border bit is equal to 0, i.e. the mobile node is in a non-border region of the WLAN area and the need of an inter-technology handoff in the middle of session is a small possibility, while a detected WLAN signal strength is larger than Th2, the mobile node waits. ***After the signal strength has fallen below Th2***, in order to be proactive, handoff phase 1 is initiated.”

230. See my discussion of elements [31.a] to [31.c] above (Sections IX.C.3.b-c).

231. Chaskar further discloses detecting whether WLAN signal strength has fallen below Th2. Chaskar, [0072].

232. Ruan discloses searching for alternative Wi-Fi signals (*e.g.*, “802.11” signals from “different access point[s]”) having signal level above a predefined threshold value (*e.g.*, signals from “access points” with “an association quality value equal to or greater than the quality threshold value”). *See, e.g.*, Ruan:

- [0043]: “Network architecture 200 also includes station 271, which can be a wireless station computer system that accesses network 201 via an associated wireless access point computer system. **Station 271 includes quality calculation module 255. Quality calculation module 255 can receive one or more inputs corresponding to an association with an access point....From received inputs, quality calculation module 255 can generate an association quality for a corresponding access point.**”
- [0048]: “The method 300 includes an act of calculating an association quality for the current access point (act 301). Act 301 can include a wireless device calculating an association quality for a current wireless access point based on a plurality of parameters relevant to the quality the current association. For example, **station 271 can calculate an association quality for access point 205 based on parameters relevant to the quality of current association 293.** Some parameters may be generated at station 271, while others are received from access points.”
- [0049]: “For example, signal strength measurement module 252 can measure the **signal strength** associated with packets, such as, for example, data packet 231 and beacon packet 274, **received from access point 205.**”
- [0053]: “For example, AP workload module 245 can measure RF usage of the underlying wireless channel (*e.g.*, an **IEEE 802.11** channel in the 2.4 GHz or 5 GHz spectrum) currently being utilized by access point 205.”
- [0061]: “On the other hand, **when the current quality association value is less than quality threshold value 254**, current association 293 is viewed as being insufficient. When current association 293 is insufficient, **station 271 may roam to attempt to associate with a different access point.** A quality threshold value is configurable such that a user or system administrator can set a desired quality threshold to appropriately suit particular network environments.”
- [0062]: “The method 300 includes a functional, result-oriented step for identifying a least one other wireless access point that has a sufficient

- association quality (step 306). Step 306 can include any corresponding acts for identifying a least one other access point that has a sufficient association quality. However, in the illustrated example of FIG. 3, step 306 includes a corresponding act of calculating an association quality for at least one other access point (act 303.) Act 303 can include the wireless device calculating an association quality for at least one of the other wireless access points included in the plurality of wireless access points.”
- [0063]: “For example, station 271 can calculate association quality values for other access points in network architecture 200, such as, for example, access points 206 and 207. Station 271 can receive beacon and/or probe response packets that contain AP availability parameters (and potentially one or more AP configuration parameters) from other access points. ***Upon receiving beacon and/or probe response packets, signal strength measurement module 252 can measure a signal strength associated with the received beacon and/or probe response packets. For example, signal strength measurement module 252 can measure the signal strength associated with access point 206 when beacon packet 282 is received at station 271. Accordingly, beacon packet 282 may provide station 271 with all the information for calculating an association quality value for access point 206.***”
 - [0064]: “Access points can be configured to automatically send beacon packets at specified intervals. As beacon packets are received from an access point, quality calculation module 255 can calculate a new quality association value for the access point. Quality calculation module 255 can update entries in access point list 256 by storing new quality association values in corresponding quality parameter fields. For example, it may be that entry 277 corresponds to access point 206. Accordingly, an AP identifier identifying access point 206 may be stored in AP identifier field 278 and AP configuration parameters for access point 206 may be stored in AP configuration parameters field 296. When a new association quality value is calculated for access point 206, the new quality association value can be stored in quality parameter field 279 (potentially overwriting a previously calculated quality association value).”
 - [0065]: “It may be that station 271 is to calculate an association quality value for an access point at some time between beacon packets. Accordingly, station 271 can send a probe request packet to an access point to request an AP availability parameter. ***For example, station 271 can send probe request packet 291 to access point 207.*** In response, access

point 207 can send probe response packet 284, which contains AP availability parameter 286 (and potentially one or more AP configuration parameters), back to station 271. Signal strength measurement module 252 can measure the signal strength associated with access point 207 when probe response packet 284 is received at station 271. Accordingly, ***probe request packet 284 may provide station 271 with all the information for calculating an association quality value for access point 206.***

- [0066]: “***Quality calculation module 255*** can calculate a new quality association value for access point 207. ***Quality calculation module 255*** can update an entry in access point list 256 by storing a new quality association value in a corresponding quality parameter field. For example, it may be that entry 287 corresponds to access point 207. Accordingly, an AP identifier identifying access point 207 may be stored in AP identifier field 288 and AP configuration parameters for access point 207 may be stored in AP configuration parameters field 297. When a new quality association value is calculated for access point 207, the new quality association value can be stored in quality parameter field 289 (potentially overwriting a previously calculated quality association value).”
- [0076]: “For example, access point selection module 257 can ***identify any access points*** from among access points 205, 206, and 207 ***that have an association quality value equal to or greater than the quality threshold value*** (hereinafter referred to as ‘sufficient access points’).”

233. Ruan discloses mobile station 271 includes “quality calculation module 255” that “generate[s] an association quality for a corresponding access point,” such as “access point 205” communicating via “IEEE 802.11,” based on “one or more inputs,” such as a measurement of the signal strength of the current access point. Ruan, [0043], [0048]-[0049], [0053]. When the signal strength “is less than quality threshold value 254,” station 271 “attempt[s] to associate with a different access point” with a sufficient quality based on a stored access point list. Ruan, [0061]-[0065]. The station “send[s] a probe request packet to an access point,” such as access point 207, to “measure the signal strength” and updates the access point list

accordingly. Ruan, [0065]-[0066]. The station then “identif[ies] any access points...that have an association quality value equal to or greater than the quality threshold value.” Ruan, [0076].

234. As I explained above in Section IX.C.2, a person of ordinary skill in the art would have been motivated to apply Ruan’s alternative Wi-Fi search teachings to Chaskar’s mobile device, and, in doing so, a person of ordinary skill in the art would have understood or at least found obvious that the mobile node would search for the alternative Wi-Fi signals exceeding Th2 after the mobile node determines that the WLAN signal strength has fallen below Th2, before initiating a first phase of a handoff procedure.

e. Element [31.e]

235. **Element [31.e] recites “if an alternative signal level is above the first predefined threshold value, then switching a Wi-Fi communication in progress to a source of the alternative Wi-Fi signal, with the server.”** This element is met by Chaskar in view of Ruan.

236. Chaskar renders obvious the first predefined threshold value (*e.g.*, “WLAN signal strength is larger than Th2”; *see* [31.b]), a Wi-Fi communication in progress (*e.g.*, “voice call[]” using “802.11” communications) and the server (*e.g.*, “mobile node”; *see* [31.a]). *See, e.g.*, Chaskar:

- [0015]: “The invention enables smart detection of hot spot (such as **802.11 WLAN** or HiperLAN) border crossing.”

- [0043]: “The handoff policies as described above can be simultaneously applied to different applications. For example, policy 1 for **voice calls** and policy 2 for entertainment applications such as games.”

237. See my discussion of elements [1.d] and [31.a] to [31.c] above (Sections IX.A.6.e and IX.C.3.b-c).

238. Chaskar further discloses the call in progress is over a Wi-Fi WLAN. Chaskar, [0015], [0043].

239. Ruan discloses if an alternative signal level is above a predefined threshold value (*e.g.*, a signal from another “access point” has “an association quality value equal to or greater than the quality threshold value”), then switching a communication to a source of the alternative Wi-Fi signal (*e.g.*, “associate with the...wireless access point”). *See, e.g.*, Ruan:

- [0076]: “For example, access point selection module 257 can **identify any access points** from among access points 205, 206, and 207 **that have an association quality value equal to or greater than the quality threshold value** (hereinafter referred to as “sufficient access points”). Ranking module 258 can then randomly **rank the sufficient access points** relative to one another such that each **sufficient access point is ranked** differently than the other sufficient access points. Ranking module 258 can arrange the **sufficient access points in a ranked candidate list based on rank.**”
- [0077]: “Ranking module 258 can then append any access points from among access points 205, 206, and 207 that have an association quality value less than the quality threshold value (hereinafter referred to as ‘insufficient access points’) to the ranked candidate list. Ranking module 258 can rank the insufficient access points randomly or can rank the insufficient access points based solely on association quality. However, it may be that the lowest ranked sufficient access point is ranked higher than the highest ranked insufficient access point. Thus, there is an increased

likelihood of station 271 becoming associated with a sufficient access point.”

- [0082]: “After the **sufficient access points are included in the ranked candidate list**, any insufficient access points can be appended to the ranked candidate list. The method 400 includes an act of **selecting a ranked access point from the ranked candidate list** (act 403). Act 403 can include the wireless access point selecting a ranked wireless access point from the ranked candidate list. For example, access point selection module 257 can **select a ranked access point from the ranked candidate list** for station 271. It may be that access point selection module 257 selects a highest ranked access point first.”
- [0083]: “The method 400 includes an act of **attempting to associate with the selected ranked access point** (act 404). Act 404 can include the wireless device **attempting to associate with the selected ranked wireless access point**. For example, station 271 can attempt to associate with access point 206. When the association is successful, new association 294 (the dotted line) is established. Station 271 then communicates with resources included in network 201 through access point 206.

240. See my discussion of element [31.d] above (Section IX.C.3.d).

241. Ruan further discloses the identified “sufficient access points” having “an association quality value equal to or greater than the quality threshold value” are “ranked” and an access point is “select[ed].” Ruan, [0076]-[0077], [0082]. The mobile station “attempt[s] to associate with the selected ranked wireless access point,” and upon success, communicates with another device via the new access point. Ruan, [0083].

242. As I explained above in Section IX.C.2, a person of ordinary skill in the art would have been motivated to apply Ruan’s teachings of switching to an alternative Wi-Fi signal to Chaskar’s mobile device, such that if Th2 is exceeded by

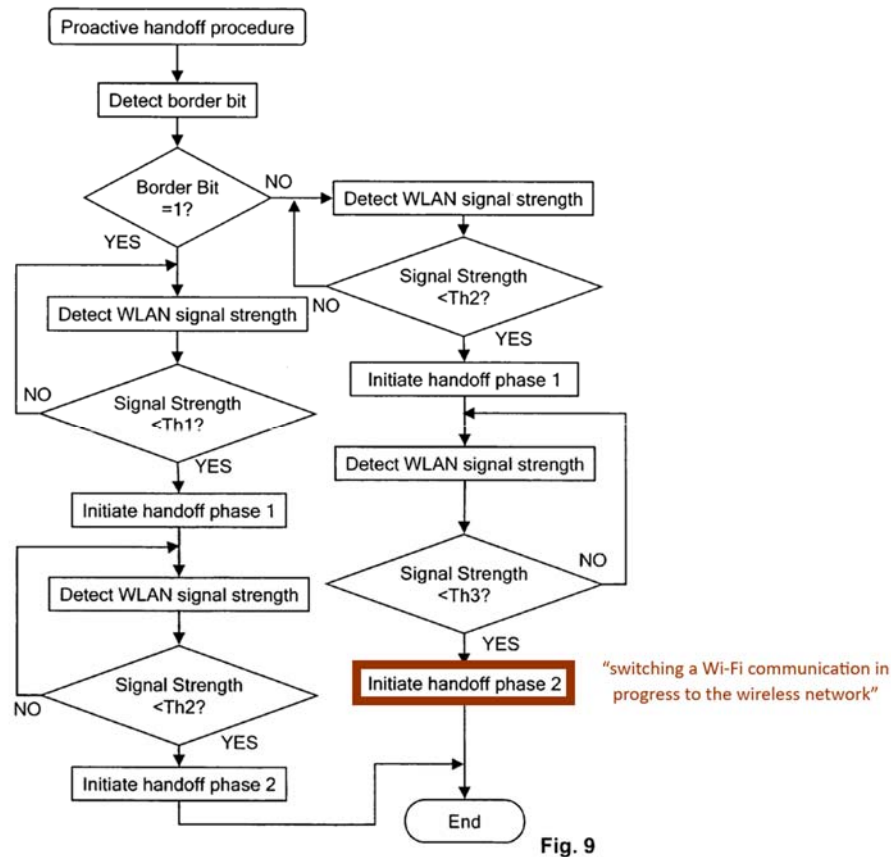
another W-Fi access point, the device switches to that access point.

f. Element [31.f]

243. **Element [31.f] recites “if no alternative signal level is above the first predefined threshold value, then switching a Wi-Fi communication in progress to the wireless network, with the server.”** This element is met by Chaskar in view of Ruan.

244. Chaskar renders obvious the first predefined threshold value (*see* [31.e]) and switching a Wi-Fi communication in progress to the wireless network (*e.g.*, “handoff” to “cellular”), with the server (*e.g.*, “mobile node”). *See, e.g.*, Chaskar:

- Fig. 9:



- [0036]: “The idea of the present invention is to control **handover** between a first technology network and a **second technology network** by detecting information about regions of an area of the first technology network, and deciding initiating a handover procedure between the first and second technology networks based on the detected region information. The first technology network may be a WLAN and the **second technology network may be a cellular network.**”
- [0037]: “Moreover, the handover procedure may be separated in a phase 1 in which handover is prepared and a **phase 2 in which handover is carried out.**”
- [0073]: “**After initiation of phase 1, WLAN signal strength is detected again** and while the detected WLAN signal strength is larger than a predetermined threshold Th3, the mobile node waits. **After the signal strength has fallen below Th3, handoff phase 2 is initiated.**”

245. See my discussion of elements [1.b] and [31.a] to [31.e] above

(Sections IX.A.6.c and IX.C.3.b-e).

246. Chaskar further discloses, initiating handoff phase 1, performing a subsequent measurement of WLAN signal strength to determine if “the signal strength has fallen below Th3,” carrying out handover to a cellular network. Chaskar, [0036]-[0037], [0073].

247. Ruan discloses no alternative signal level is above a predefined threshold value (e.g., “no other access points has an association quality value greater than” “the quality threshold value”). See, e.g., Ruan:

- [0068]: “Based on association quality value comparisons, **station 271 may determine that station 271 should not attempt to associate with a different access point. For example, it may be that no other access point has an association quality value greater than the association quality value for access point 205. Accordingly, station 271 may maintain current association 293 (even if current association 293 is insufficient)** when no other access points could provide increased quality.”
- [0077]: “Ranking module 258 can then append any **access points** from among access points 205, 206, and 207 that **have an association quality value less than the quality threshold value** (hereinafter referred to as ‘insufficient access points’) to the ranked candidate list.”

248. See my discussion of elements [31.d] to [31.e] above (Sections IX.C.3.d-e).

249. Ruan further discloses a scenario where “current association 293 is insufficient” (i.e., having “an association quality value less than the quality threshold value”) and no other access points could provide increased quality. Ruan, [0068], [0077]. In this scenario, the connection to the original access point is maintained.

Ruan, [0068], [0077].

250. As I explained above in Section IX.C.2, a person of ordinary skill in the art would have been motivated to apply Ruan's alternative Wi-Fi search teachings to Chaskar's mobile device.

251. In implementing Ruan's alternative signal teachings in Chaskar's system, a person of ordinary skill in the art would have understood or at least found obvious that, in order to prevent any delay in any eventual handoff, the mobile device would continue to initiate the handoff process, while comparing the signal strength of the current WLAN connection against Th3 to ensure that a handoff is necessary to maintain and in-progress call. At this point in operation, the mobile device will have determined that (1) the signal strength of the existing has fallen below the threshold Th2, and (2) no better Wi-Fi signal is available, and thus, there is a need to search for an alternative signal in order to maintain the connection. The handoff would then be completed only if the WLAN signal strength is below Th3, as taught by Chaskar. *See* Chaskar, [0073], Fig. 9.

g. Element [31.g]

252. **Element [31.g] recites “wherein if a signal monitor detects that the alternative signal level is below a second predefined threshold value, a timer is activated to establish a second time window of a second predefined size.”** This element is met by Chaskar in view of Ruan and Willhoff.

253. Chaskar discloses wherein if a signal monitor (*e.g.*, monitor for detecting “WLAN signal strength”) detects that a WLAN signal level is below a second predefined threshold value (*e.g.*, “WLAN signal strength...has fallen below Th2”), establishing a second time window of a second predefined size (*e.g.*, “signal strength averaging window[]” having a “width[]” to determine if “the signal strength has fallen below Th3”). *See, e.g.*, Chaskar:

254. See my discussion of element [1.d] above (Section IX.A.6.e).

255. Ruan discloses the alternative signal level (*e.g.*, a signal from another “access point” with which the mobile station “associate[d]”; *see* [31.e]). *See, e.g.*, Ruan:

256. See my discussion of elements [31.d] to [31.e] above (Sections IX.C.3.d-e).

257. This limitation is rendered obvious regardless of whether “the alternative signal level” refers to “an alternative signal level” of [31.e] or to “no alternative signal level” of [31.f].

258. If it refers to “an alternative signal level,” this limitation is met because a person of ordinary skill in the art would have understood when applying Ruan’s teachings of connecting to an alternative Wi-Fi signal to Chaskar’s mobile device, after the device switches to the alternative Wi-Fi signal (*see* [31.e]), and in order to ensure the alternative Wi-Fi signal can maintain and in-progress call, the mobile

device would perform Chaskar's algorithm for switching (see [1.d]), except based on the detected signal strength of the alternative Wi-Fi signal.

259. If "the alternative signal level" refers to "no alternative signal level" of [31.g], this limitation is met because a person of ordinary skill in the art would have understood when applying Ruan's teachings of not connecting to an alternative Wi-Fi signal to Chaskar's mobile device, the mobile device would perform Chaskar's algorithm for switching (see [1.d]) based on the original Wi-Fi signal.

260. Willhoff discloses activating a timer (*e.g.*, starting timer measuring "window of time") to establish a first time window of a first predefined size T1 (*e.g.*, "window of time" of shorter "width"). *See, e.g.*, Willhoff:

261. See my discussion of elements [1.d], and [31.c] above (Sections IX.A.6.e and IX.C.3.c).

262. As I explained above in Section IX.A.5, a person of ordinary skill in the art would have been motivated to apply Willhoff's teaching of using a timer to compute signal strength in implementing Chaskar's mobile node. Moreover, as I explained above in IX.A.5, a person of ordinary skill in the art would have been motivated to use a longer window of time, such as several seconds as taught by Willhoff for Chaskar's measurement of signal strength for comparison against Th2 because this would avoid premature handoff based on a momentary fluctuation in detected signal strength. This reasoning applies also when Chaskar's mobile device

is modified by Ruan, as Ruan’s applied teachings would have no impact on how signal measurements are performed.

h. Element [31.h]

263. **Element [31.h] recites “wherein a third predefined threshold value is smaller than a second predefined threshold value.”** This element is met by Chaskar.

264. See my discussion of elements [1.d] and [1.e] above (Sections IX.A.6.e and IX.A.6.f).

D. Ground 4: Deanna (Ex. 1009, U.S. Patent App. Pub. No. 2003/0084056) in view of Ground 3 (Chaskar, Willhoff and Ruan) (Claim 31)

265. Claim 31 requires “a server” for handover. To the extent it is argued that Chaskar does not render obvious a server based on the knowledge of a person of ordinary skill in the art, DeAnna discloses a **“ZeoSphere server”**—“a lightweight server operable on portable devices such as remote, wireless and handheld hardware devices.” DeAnna, [0022]. DeAnna’s server allows the device to “make” and “process[]” requests over a wireless network, for example, connected to a “Radio Tower.” DeAnna, [0026], [0114], [0120], [0124], Figs. 1-2A. Moreover, DeAnna teaches that its server is carried by a user as a “server-enabled portable or embedded device[]” and adapted for real time availability, with desired minimal service interruptions. DeAnna, [0007], [0121].

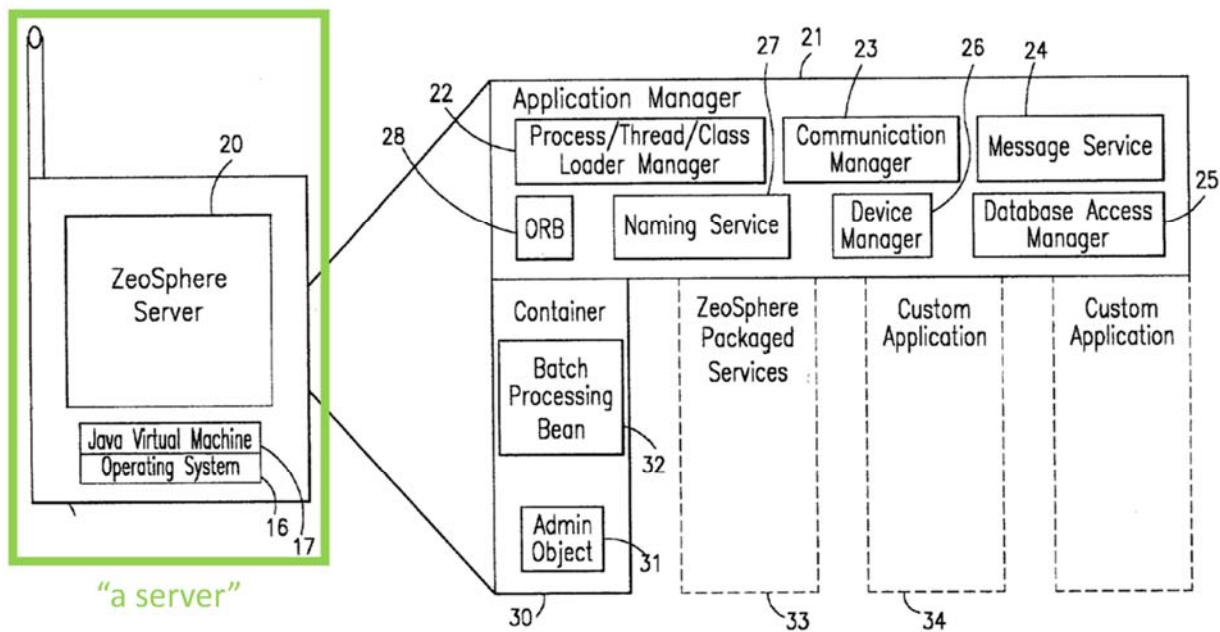
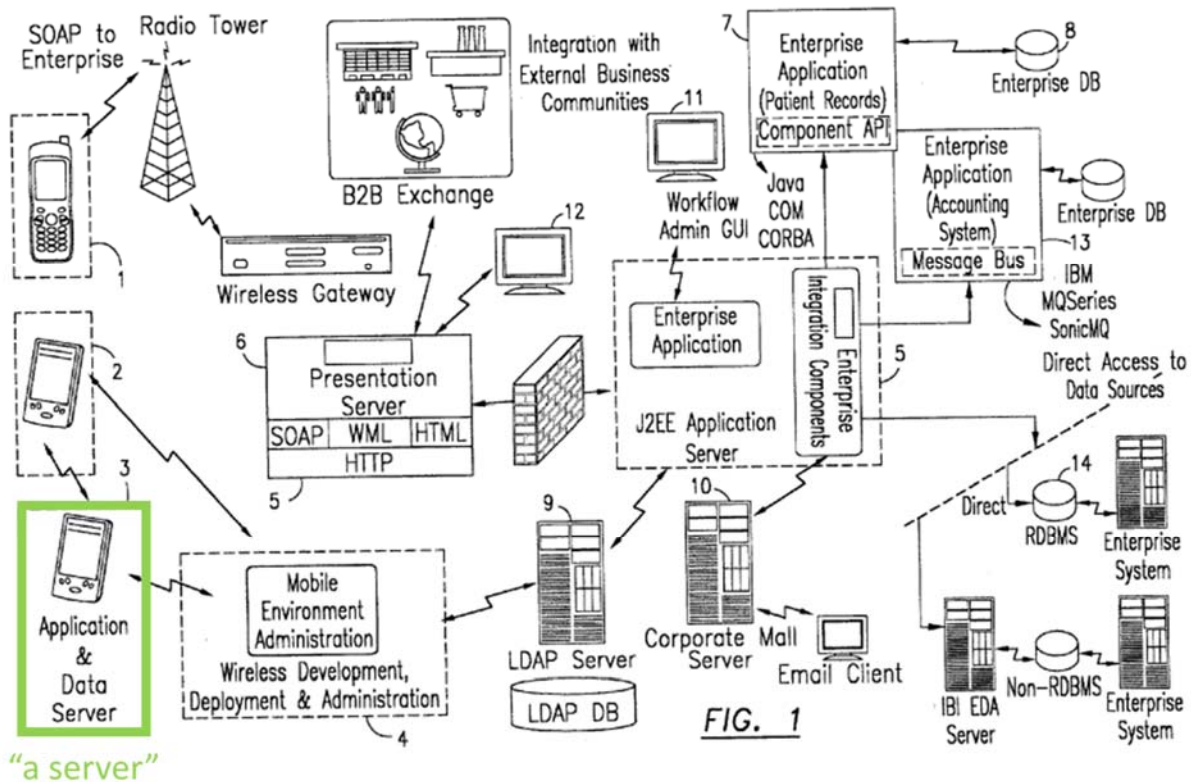


FIG. 2A

266. Like Chaskar, Willhoff, and Ruan, DeAnna is in the same field as the

'281 patent—which includes wireless communications—and is reasonably pertinent to the problems purportedly addressed by the '281 patent—e.g., maintaining a strong network connection. *See* DeAnna, Abstract (“A lightweight application server for use on portable or embedded devices...allowing for remote and rapid deployment and maintenance of applications, objects and features associated with the server-enabled portable or embedded devices. This permits portable devices like PDAs to provide server functionality to each other, in a fully portable network if desired.”), [0022] (“The ZeoSphere mobile platform...provides a robust solution for extending the sharing and processing of data throughout a distributed organization, and empowering a rapid development and deployment environment within that system.”), [0024] (“The ZeoSphere mobile platform...provid[es] intelligent, server functionality to mobile devices, and providing a flexible architecture for changing device features on demand.”), [0121]; *see* Sections IX.A.5, IX.C.2. For example, DeAnna teaches that “a platoon could stay tightly linked carrying ZeoSphere-enabled wireless PDAs, and rescue parties or firefighters in remote areas could use a variety of platforms like 3G cell phones and PDAs with ZeoSphere servers and GPS-enabled mapping apps to carry out their mission with previously unattainable speed and accuracy of information sharing.” DeAnna, [0121].

267. A person of ordinary skill in the art would have been motivated to apply Chaskar’s teachings (as modified by Willhoff and Ruan) to DeAnna’s handheld

wireless server to advantageously create a seamless transfer between networks. A person of ordinary skill in the art would have recognized that the advantages of a fast transition between WAN and WLAN networks to maintain connectivity would be applicable when implementing DeAnna's server. For example, DeAnna teaches that use cases for its servers are "rescue parties" and "firefighters" where network transfer must be fast and accurate with no interruption. DeAnna, [0121]. Further, for example, Chaskar teaches that its handoff procedure "can reduce the number of spurious handoff triggers," "reduce the number of false starts (of handoff preparation) in proactive handoff schemes," and "make the implementation of proactive handoff schemes efficient." Chaskar, [0018]-[0020].

268. Moreover, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Chaskar's teachings (as modified by Willhoff and Ruan) to DeAnna's handheld wireless server to perform network switching. DeAnna's handheld wireless server is a standard wireless device, operable to use known WAN or WLAN networks and associated technology. Thus, a person of ordinary skill in the art would have understood that any known WAN and WLAN techniques—like the switching techniques of Chaskar (as modified by Willhoff and Ruan)—would be applicable to DeAnna's handheld wireless server. For example, DeAnna's server is implemented in "3G cell phones and PDAs," and Chaskar's mobile node is implemented on a "cellular [WAN] network." DeAnna,

[0121]; Chaskar [0036]. *See also* DeAnna. [0024]. Thus, Chaskar handover procedure between from a “WLAN” to a “cellular” network is directly applicable to DeAnna’s server. Chaskar, [0036]. In addition, DeAnna’s server is platform independent, allowing it to be implemented in a wide range of devices. DeAnna, [0024] (“The ZeoSphere mobile platform may advantageously be used with platform independent approaches like that offered by Java, permitting an organization to blend a disparate patchwork of devices like legacy enterprise applications 13, databases 14, administrators 4, 12, and handheld devices 1-3 into a system that can be structured to have all devices function to provide information services.”). And Chaskar teaches that its system is implementable using “[m]obile nodes or mobile terminals.” Chaskar, [0048].

269. Accordingly, a person of ordinary skill in the art would have had a reasonable expectation of success in applying Chaskar’s handoff teachings (as modified by Willhoff and Ruan) to DeAnna’s handheld wireless server, and would have known such a combination (yielding the claimed limitations) would predictably work and provide the expected functionality.

X. SECONDARY CONSIDERATIONS

270. The Challenged Claims of the ’281 patent are rendered obvious by the grounds presented herein. In my opinion, the strength of the grounds that I discuss above cannot be overcome by any alleged objective indicia.

271. Although I understand that Patent Owner has raised allegations of secondary considerations in the district court litigation (Ex. 1015, at 36-47; Ex. 1016, at 11-12), in my opinion Patent Owner has not demonstrated the required nexus between its allegations and the purported invention.

272. In addition, Patent Owner's allegations are conclusory and ostensibly relate to four different patents, but provide no explanation as to any nexus to any particular claim of the four patents, let alone the '281 patent claims. This gap in Patent Owner's analysis further confirms that there is no nexus between the alleged secondary considerations and the Challenged Claims of the '281 patent.

273. In addition to the lack of nexus, it is my opinion that Patent Owner's allegations of secondary considerations do not overcome the evidence of obviousness for the additional reasons set forth below.

274. **Commercial success:** Patent Owner provides no evidence of commercial success. While Patent Owner asserts that such success "will be shown" based on Samsung's own products (Ex. 1015, at 37), the success of Samsung's own products has no nexus to the Claims at least because the accused phone and tablet products include many unrelated features that drive their success.

275. **Long-felt need:** Patent Owner cites portions of U.S. Patent No. 8,886,181's specification as purported evidence of long-felt need, but these explanations are conclusory and self-serving (Patent Owner does not cite any

evidence from anyone other than the inventor), and also do not show any alleged need was “long-felt.” Ex. 1015, at 38-39.

276. **Industry recognition:** Patent Owner cites an award that Samsung received for Wi-Fi Innovation, but Patent Owner has not shown the requisite nexus between that award and the Claims. *Id.*, 39. Patent Owner also argues that praise and recognition is shown by the fact that Vasu patents have been cited during prosecution of other patents, but Patent Owner does not explain how mere citation during prosecution is praise or recognition, and Patent Owner has not shown that any such citation was for any functionality that is in the Claims. *Id.*, 40-47.

277. **Skepticism in the industry:** Patent Owner argues that unidentified contemporaneous publications acknowledged the difficulty of developing the claimed invention, but Patent Owner does explain how purported challenges show “skepticism” and also does not even attempt to explain the requisite nexus to the Claims. *Id.*, 47.

278. **Copying:** Patent Owner argues that Samsung copied Patent Owner’s technology, but Patent Owner’s argument is conclusory and based only on alleged knowledge of “patents and application that Vasu had filed because they were cited as prior art against [Samsung’s] own patent applications”— Patent Owner does not even allege that Samsung was aware of the ’281 patent specifically, as opposed to other Vasu patents and application, and does not allege knowledge of the ’281 patent

before Samsung developed its products. Ex. 1015, at 37, 47-53; Ex. 1014, 21-26, 76-77; Ex. 1016, at 11-12.

279. To the extent Patent Owner asserts the existence of any additional secondary considerations in its responses, or presents additional evidence or arguments, I reserve my right to address any such evidence.

XI. CONCLUSION

280. In summary, I have concluded that the Challenged Claims are rendered obvious over the prior art references as discussed above. Specifically, in my opinion, for at least the reasons above, the Challenged Claims of the '281 patent obvious.

281. To the extent it is argued that any further disclosure is required for an element in the Challenged Claims that I have identified as being disclosed, a person of ordinary skill in the art would certainly have found that element obvious to include based on the sample explicit disclosure or inherent disclosures and analysis I have identified above.

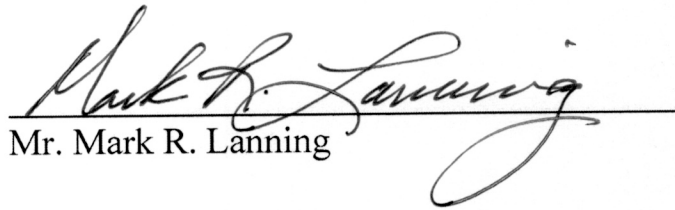
282. I reserve the right to supplement my opinions in the future to respond to any arguments that Patent Owner or its expert(s) may raise and to take into account new information as it becomes available to me.

283. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject

to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

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

285. Executed this 24th day of January 2025, in Greenville, Texas.


Mr. Mark R. Lanning

APPENDIX A

Curriculum Vitae

Mark R. Lanning

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Greenville, TX 75402-9027

Phone: 903-454-3399

Email: mark@telecom-architects.com

Mark R. Lanning

Mark is currently the President of Telecom Architects, Inc., I.N. Solutions, Inc.¹ and Reticle Consulting, LLC. Each of these companies provides professional consulting services and custom software development for one or more particular technical areas. I.N. Solutions (Intelligent Networking Solutions) was established in 1991 with an emphasis on applications design and network architecture engineering for telephone-based switching and Advanced Intelligent Networking systems. Telecom Architects was established in 1999 to provide specialized consulting services to fixed and wireless telecom service providers and their equipment suppliers. Reticle Consulting was created in 2009 to provide specialized consulting services for forensic software analysis and software source code comparison for software misappropriation cases.

Mark has over 35 years of engineering experience in all the development life cycle phases for hardware and software products. He has worked with both network operators and product suppliers regarding network architectures and product development and has acquired key insights into their perspectives and requirements as both suppliers and customers.

While working for three different product suppliers, Mark was directly responsible for the design, development and rollout of new products that have earned combined revenues in excess of one billion dollars for their respective companies. These products include: the DSC/Alcatel Signal Transfer Point (STP) product; the Telinq/ADC M13 transmission multiplexer and analyzer products; and the Tandem/HP Service Control Point (SCP), Service Management System (SMS); Service Creation Environment (SCE) products and their applications.

Since starting I.N. Solutions in 1991, Mark has worked with Motorola, Sprint, Nextel, and British Telecom (BT) to roll out some of the most successful telecom applications and network expansions worldwide. Mark was directly involved in the design of Sprint's Common Channel Signaling System 7 (SS7) network and the design and rollout of its FON (calling card) and 800 number services.

Mark was also the program manager responsible for the design and rollout of BT's Advanced Cellular Network (ACN) that used AIN functionality. BT's ACN was one of the largest cellular networks in the world and also includes advanced corporate virtual private network (VPN) and pre-pay validation services.

After completing BT's ACN network upgrade in 1992, I was the program manager and lead network architect for BT's (Cellnet) GSM cellular network design, rollout, testing and upgrades. In this role, I was responsible for defining, implementing and testing all aspects of its GSM network that included the Network Switches (MSCs and Tandems for PSTN connections), Base Station Subsystems (BSC and BTS), Short Message Service Center (SMSC), Home Location Registers (HLRs), Visitor Location Registers (VLRs), Authentication Center (AuC), Equipment Identity Register (EIR), cell phones (Mobile Station-MS) from multiple suppliers, Voice Message Systems, Subscriber Information Module (SIM) programming and distribution, Operation and Support System (OSS), and prepay and post-pay billing system interfaces. The network phases began with voice calling then later added mobile terminated and mobile originated Short Message Service (SMS) functionality and ultimately included adding the GPRS advanced data capabilities for both the GSM network and its cell phones.

¹ I.N. Solutions Inc. is no longer active.

Beginning in 1998, Mark and the Telecom Architects (TAI) team were contracted by Nextel to design their 2.5G cellular iDEN switching, VoIP dispatch network² and its TDM/SONET transmission networks. After completion of the 2.5G network design, Mark and the TAI team performed a large part of the qualification, testing and rollout phases for new equipment suppliers and their applicable products into Nextel's network.

Before starting his own consulting company in 1991, Mark was initially employed as individual contributor on both hardware and software development projects, later worked as a manager on hardware and software development groups that varying in size from 5-20 engineers and eventually held several executive management positions with responsibility of over 200 engineers.

Hardware and Software Development Experience

Mark's hardware and software experience began in 1974 while in the US Army Signal Corps. Mark was initially trained as a hardware technician on data and voice crypto (encrypted transmission) communications equipment. After achieving the "top graduate" award at three different hardware and software training schools, Mark received a Top Secret security clearance and was transferred to the Army Security Agency (ASA). His assignment with the ASA included joint software development with the National Security Agency (NSA) and the white house communications staff. The software development was done on "state of the art" computer and communication systems built by DEC and GE using assembly language.

From 1978-1983, Mark worked as both a hardware and software development engineer for IT&T Defense Communications. The majority of his time was spent on building a new store and forward message switching system that was used by the white house, US embassies worldwide and two major US airlines. DEC PDP-11 and PDP-15 computers were coupled together and operated in conjunction with custom IT&T hardware for this system. The system architecture was traditional mini-computer architecture with sixteen front-end communications computers to interface with hundreds of modems and perform various communications protocols. The software was written in DEC assembly language. Many different types of communications protocols and state of the art modems were used with this system.

In 1983, Mark was hired as hardware and software development engineer by Digital Switch Corporation (now a part of Alcatel) and was later promoted to design and development manager responsible for their initial SS7 protocol and Signal Transfer Point (STP) products. The STP product performed packet switching for thousands of messages per second between telephone switches for the purpose of connecting normal phone calls worldwide and support of advanced telephony services. The STP was designed to have a fault tolerant hardware and software architecture to provide 24x7 operation and provided interfaces to various telephone company management and support systems. A typical configuration of the STP product included at least 200 separate microprocessor boards working in a closely coupled distributed system architecture. Communications between the processors was performed over parallel hardware buses using DSC's proprietary operating system. Mark was also responsible for development of all the communication protocols the STP would require to communicate with other switching, operations and administration systems. These protocols were X.25, X.75, SS7 MTP/SCCP/TCAP and FTP. The hardware used was Zilog Z-8000 and Motorola 68xxx family microprocessors. The software was written in assembly and C languages.

² Also referred to as the Nextel push-to-talk, dispatch or walkie-talkie feature that did not require a voice bearer channel.

In 1985, Mark was hired by Teling Inc. (now part of ADC) as their director of software development and was later promoted to vice president of hardware and software development. Teling was a venture capital start-up company, and their initial two products were high speed digital TDM transmission multiplexers and analyzers mainly used by telecom network operators and service providers. The hardware consisted of multiple Motorola 68xxx family processors replicated different types of custom designed high-speed gate arrays. The software was distributed and written in C and assembly language.

In 1987, Mark joined the Telecom Division of Tandem Computers, Inc. (now part of HP) as their Vice President of hardware and software development. Tandem Telecom was a new division that built products for telephone companies that leveraged its fault tolerant Guardian and Unix based computer systems. The initial products built under Mark's direction were a Service Control Point (SCP), Service Management System (SMS) and Service Creation Environment (SCE). Although these product names are unique to Intelligent Networking telephony systems, they use state of the art hardware and software to perform many standard functions. The SCP system performs on-line transaction processing for the telephone switches in a network. These transactions support phone company services like 800 number translation, calling card number validation and home location register (HLR) functionality for cellular networks. The SCP was a fault tolerant multiple processor system capable of supporting hundreds of globally located nodes with multiple processors in each node. Each SCP required specialized communications software and hardware that was build by Tandem Telecom. The full suite of commercial communications software was supported including X.25, TCP/IP and SS7. The software was written in C, C++ and assembly language. The SMS system was build to manage multiple SCP systems, update the software applications and keep their multi-million record databases synchronized. The SMS software was written in C and C++. The SCE was telephone service authoring tool used by telephone company personnel to modify or create new services on their network without requiring them to be intimately familiar with the underlying system or detailed programming. The SCE software ran on Unix or PC Windows operating systems and was written in C++ and C and the most advanced software development workbench software.

Program and Project Management Experience

Mark has been directly involved with formal project management concepts and tools since 1984. Most, if not all, the projects listed above were managed using project management concepts and tools. The main techniques used for these projects were PERT and CPM. Mark either generated the initial PERT chart and staff assignments for each project or was directly involved in defining the program logic and assignments to be used. Since 1984, every project that Mark has been responsible for has included formal product life cycle documentation, requirements tracking, problem reporting and resolution.

Since 1991, Mark has been responsible for some large development and network architecture projects with a budget in excess of \$100 million each. Two of these projects were for British Telecom's cellular network division called Cellnet. The initial project, ACN, was an on-line transaction processing (OLTP) system responsible for real-time dialed digit translation for every phone call in the Cellnet network and was required to perform thousands of transactions per second. The second project replaced Cellnet's batch-oriented billing system with a distributed real-time call detail record collection and on-demand rating and billing system. Both of these systems required custom development for a majority of the software that was done by different companies located across multiple countries and continents. The ACN project lasted about four years and involved over 100 software development personnel located in Texas, Nebraska, California, Sweden, Spain, Finland and England. The billing system project lasted more than three years and required over 600 developers at its peak that were located in England, Colorado, Texas and Sweden. Both of these systems were 24x7 mission critical to completing wireless calls and

billing.

Mark and members of the Telecom Architects group have developed innovative methods for requirements definition, design, modeling and documentation of large telecommunications networks. Some of this methodology has been published by Wireless Review Magazine.

In 1977 and 1978 Mark obtained a Private Pilot, Commercial, Instrument, and Flight Instructor ratings.

Mark received a BS in Computer Science degree from Southern Methodist University in 1983 and has been a visiting lecturer at SMU on various data and voice telecommunications subjects.

Industry Memberships

Member of IEEE and IEEE Standards Association.

Member of ACM (Association for Computing Machinery).

Telecom Standards Definition

Mark is one of the Advanced Intelligent Network (AIN) and Signaling System Number 7 (SS7) pioneers. He was a contributing member of the first ANSI T1X1 standards group that defined and approved the initial North American AIN and SS7 requirements and was actively involved with this group for three years. These standards were later adopted by the ITU.

Telephony Systems

Mark has been directly involved with the development and/or detailed functional analysis of the following systems: DSC/Alcatel DEX-STP, DEX-400, DEX-600 and MegaHub circuit switches; Nortel DMS circuit switch for class IV and MSC applications; Ericsson AXE circuit switch for class IV, MSC and HLR applications; Lucent's 5ESS circuit switch in class IV, class V and MSC applications; Tandem/HP SCP, SMS, SCE and HLR.

Mark has also been intimately involved with the design, analysis and/or network implementation of many different PSTN and cellular network elements including at least: MSC, VLR, HLR, BSC, BTS, SMSC, MMSC, GGSN/SGSN, eNodeB, and RNC.

Network Design Experience Summary

Mark has extensive telecommunications network design experience for both North American and European fixed and wireless networks. He has participated in the creation of RFIs and RFPs and the evaluation of supplier responses; negotiated supplier equipment contracts; written requirements for custom hardware and software features and has led engineering teams in the design and rollout of new networks and network expansions. These network designs included LANs, WLANs, WANs, TDM and SONET transmission networks, signaling system 7 (SS7) networks, ATM/IP data switching/routing, mission critical on-line transaction processing enterprise networks and voice switching networks using traditional circuit switches, soft switches and media gateways.

Software Development Languages and Tools

Assembly language for DEC PDP-11, PDP-15, Zilog Z-80 & Z-8000, and Motorola 68xxx processors.
Fortran IV and Fortran 77.
Cobol.
Pascal.
Basic and Visual Basic
C and C++
X Windows, Motif and SmallTalk Toolkits
Microsoft Office FrontPage
Java and JavaScript

Publications

Mark Lanning and David Sanders, "In Sync" Wireless Review. January 15, 2000.

Technical Expert Experience for Cases Filed Since 2018.01.01

Barkan Wireless IP Holdings, L.P. v. Samsung and Verizon. C.A. No. 2:18-cv-28-JRG. Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of Samsung and Verizon.

Genband U.S. LLC and Sonus Networks, Inc. v. Metaswitch Networks Ltd and Countersuit. Cause No. DC-17-03697. Before the District Court of Dallas County, Texas, 134th Judicial District. Case regarding Internet and switching devices. On behalf of Genband.

Maxell, Ltd. v. Huawei Technologies Co. Ltd. et al. C.A. No. 5:16-cv-00178–RWS (Filed Nov. 2016). Before the United States District Court for the Eastern District of Texas, Texarkana Division. On behalf of Huawei. Inter Partes Review of U.S. Pat. Nos. 6,973,334, 6,983,140, and 7,324,487.

Zest Labs Inc et al v. Wal-Mart Inc. C.A. No. 4:18–cv–00500–JM (Filed Aug. 2018). Before the United States District Court for the Eastern District of Arkansas, Little Rock Division. Provided deposition and trial testimony. On behalf of Zest.

Zomm, LLC v. Apple Inc. C.A. No. 4:18-cv-04969–HSG (Filed Apr. 2018). Before the United States District Court for the Northern District of California, Oakland Division. On behalf of Apple. Inter Partes Review of U.S. Pat. No. 8,351,895. Provided multiple deposition testimony.

Sol IP, LLC, v. AT&T Mobility LLC. C.A. No. 2:18-cv-526-RWS-RSP (Filed 2018). Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of AT&T.

Packet Intelligence LLC v Nokia Solutions and Networks U.S. LLC. C.A. No. 2:18-cv-00382-JRG (Filed Aug. 2018). Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of Nokia.

Carucel Investments L.P. v. General Motors Company, et. al. C.A. No. 3:18–cv–03332 (Filed Dec. 2018). Before the United States District Court for the Northern District of Texas, Dallas Division. On behalf of Carucel. Provided multiple deposition testimony.

Rembrandt Wireless Technologies, L.P. v Apple Inc. C.A. 2:19-cv-00025-JRG (Filed Jan. 2019). Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of Apple. Inter Partes Review of U.S. Pat. Nos. 8,023,580 and 8,457,228.

Optis Wireless Technology, LLC, Unwired Planet, LLC, and Panoptis Patent Management, LLC v Apple Inc. C.A. No. 2:19-cv-66. (Filed Feb. 2019). Before the United States District Court for the Eastern District of Texas, Marshall Division. Provided deposition and trial testimony. On behalf of Apple.

Cellular Evolution LLC v. T-Mobile US, Inc. et al., C.A. 2:19-cv-232-JRG (Filed Jun. 2019). Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of T-Mobile.

DataQuill Limited v. TCL Communication Technology Holdings Limited et al., C.A. 2:19-cv-03394-AB-PLA (Filed Apr. 2019). Before the United States District Court for the Central District of California, Los Angeles Division. On behalf of TCL.

Huawei Technologies Co. Ltd. v Verizon Communications, Inc., et. al., C.A. 2:20-cv-00030 (Filed Feb. 2020). Before the United States District Court for the Eastern District of Texas, Marshall Division. On behalf of Verizon. Provided deposition and trial testimony.

Synkcloud Technologies, LLC v Adobe, Inc. CA 6:19-cv-00527-ADA (Filed Sep. 2019). Before the United States District Court for the Western District of Texas, Waco Division. On behalf of Adobe.

Castlemorton Wireless, LLC v. Verizon Communications Inc. et. CA 6:20-cv-00035-ADA (Filed Jan. 2020). Before the United States District Court for the Western District of Texas, Waco Division. On behalf of Verizon and Charter Communications.

Confidential Arbitration case on behalf of Nokia regarding cellular devices.

IPCom v. Verizon (Nokia). CA 2:20-cv-323 (Filed 2020.10.01.). Before the United States District Court for the Eastern District of Texas, Marshall Division. Also included petitioner IPRs. On behalf of Verizon and Nokia. Provided IPR deposition testimony.

IPCom v. AT&T (Ericsson). CA 2:20-cv-323 (Filed 2020.10.01.). Before the United States District Court for the Eastern District of Texas, Marshall Division. Also included petitioner IPRs. On behalf of AT&T and Ericsson. Provided IPR deposition testimony.

Philips v. Thales et al. ITC Investigation No. 337-TA-1240. Before the ITC. Also, declarations for Patent Owner IPRs. On behalf of Philips. Provided deposition and hearing testimony.

Sisvel S.p.A. v. TCL Communication Technology Holdings Limited et al., CA 1:20-cv-00654-MN. Before the United States District Court for Delaware. On behalf of TCL. Provided IPR deposition testimony.

Godo Kaisha IP Bridge 1 v Ericsson Inc. CA 2:21-cv-213-JRG. Before the United States District Court, Eastern District of Texas. On behalf of Ericsson.

Aegis 11 S.A. v Hisense Co. Ltd. CA 1:20-cv-03891-MHC. Before the United States District Court, Northern District of Georgia. On behalf of Hisense.

CommWorks Solutions, LLC v Comcast Cable Communications, d/b/a Xfinity, et al. CA 6:21-cv-00366. Before the Western District of Texas, Waco Division. On behalf of Comcast.

Collision Communications, Inc. v Ericsson. CA 2:21-cv-00327. Before the United States District Court, Eastern District of Texas. On behalf of Ericsson.

TQ Delta, LLC v. Nokia. CA 2:21-cv-309-JRG. Before the United States District Court, Eastern District of Texas. On behalf of Nokia and CommScope.

Maxell v Lenovo and Motorola Mobility. ITC Investigation No. 337-TA-1312/1324. On behalf of Lenovo and Motorola Mobility.

Smart Mobile Technologies LLC v. Apple Inc. CA 6:21-cv-00603-ADA. Before the United States District Court, Western District of Texas. On behalf of Apple.

Telecom Network Solutions, LLC v. AT&T Inc., et al. CA 2:21-cv-00415-JRG (Lead Case). With member cases CA 2:21-cv-00416-JRG and CA 2:21-cv-00418-JRG. Before the United States District Court, Eastern District of Texas. On behalf of T-Mobile.

VoIP-Pal.com v Verizon Wireless Services, LLC, et al. CA 16-cv-00271. Before the United States District Court in Nevada. On behalf of AT&T.

LG Electronics v TCL Electronics. CA 2:22-cv-00122-JRG. Before the United States District Court, Eastern District of Texas. Included IPR2023-00869 for U.S. 10,499,431 and IPR2023-00866 for U.S. 9,788,346. On behalf of TCL Electronics.

Howlink Global LLC v AT&T et al. and Verizon Communications, Inc. et al. CA 2:22-cv-00040. Before the United States District Court, Eastern District of Texas. On behalf of AT&T and Verizon (Ericsson and Nokia).

Ex-Parte Reexamination of U.S. Patent No. 9,137,830. On behalf of United Patents, Inc.

Silent Communication, LLC v Adobe Inc. CA 6:22-cv-00527. Before the United States District Court, Western District of Texas. On behalf of Adobe.

Mitsubishi Electric Corporation and Sisvel International S.A. v TCL Communication Technology Holdings Limited, et al. Case No. 8:22-CV-01073-GW-DFM. Before the United States District Court, Central District of California. Included IPR2023-00957 for U.S. 9,635,656 and IPR2023-00997 for U.S. 10,200,976 and IPR of U.S. 8,971,279. On behalf of TCL.

Ex-Parte Reexamination of U.S. Patent No. 7,924,802. On behalf of United Patents, Inc.
Case active as of 05/31/2024.

Dali Wireless, Inc. v. Cellco Partnership D/B/A Verizon Wireless et al., Case No. 6:22-cv-00104-ADA. Before the United States District Court, Western District of Texas.

Dali Wireless, Inc. v. AT&T Corp. et al. Case No. 2:22-CV-12-RWS-RSP. Before the United States District Court, Eastern District of Texas.

Dali Wireless, Inc. v. T-Mobile US, Inc., et al., Case No. 2:22-cv-414. Before the United States District Court, Eastern District of Texas.

All three above cases are on behalf of Ericsson.

Genghiscomm Holdings, LLC v. TCL Communication Inc., Case No. 2:23-cv-08949. Before the United States District Court, Central District of California. On behalf of TCL.

Zest Labs Inc et al v. Wal-Mart Inc. C.A. No. 4:18-cv-00500-JM (Filed Aug. 2018). Before the United States District Court for the Eastern District of Arkansas, Little Rock Division. This listing is for the second trial. On behalf of Zest. Case still active as of 01/20/2025.

Cerence Operating Company v. Samsung Electronics Co. Ltd. And Samsung Electronics America, Inc., Case No. 2:23-cv-00482. Before the United States District Court, Eastern District of Texas, Marshall Division. Includes IPRs for the 7,395,078 and 8,081,993 patents. On behalf of Samsung.
Case still active as of 01/20/2025.

Pegasus Wireless Innovation LLC v. Verizon Wireless et al., Case No. 2:23-cv-00640-JRG (Lead Case). Before the United States District Court, Eastern District of Texas, Marshall Division. Includes IPRs for the 10,181,931 and 11,405,942 patents. On behalf of Verizon. Case still active as of 01/20/2025.

Pegasus Wireless Innovation LLC v. AT&T Corp. et al., Case No. 2:23-cv-00638-JRG. Before the United States District Court, Eastern District of Texas, Marshall Division. On behalf of AT&T. Case still active as of 01/20/2025.

Vasu Holdings, LLC v. Samsung Electronics Co., Ltd. et al., Case No. 2:24-cv-00034-JRG-RSP. Before the United States District Court, Eastern District of Texas, Marshall Division. Includes IPRs for the 8,886,181, 10,206,154, 10,368,281 and the 10,419,996 patents. On behalf of Samsung. Case still active as of 01/20/2025.

Marble VOIP Partners LLC v. Microsoft Corporation. Case No. W-22-cv-00076-ADA. Before the United States District Court, Western District of Texas, Waco Division. On behalf of Microsoft. Case still active as of 01/20/2025.

Pegasus Wireless Innovation LLC v. Verizon Wireless et al. (i.e., Google), Case No. 2:23-cv-00640-JRG (Lead Case). Before the United States District Court, Eastern District of Texas, Marshall Division. Includes IPR for the 10,594,460 patent. On behalf of Google. Case still active as of 01/20/2025.

Headwater Research LLC v. Verizon Communications, Inc. et al. Case No. 2:23-cv-00352-JRG-RSP. Before the United States District Court, Eastern District of Texas, Marshall Division. On behalf of Verizon. Case still active as of 01/20/2025.

Headwater Research LLC v. T-Mobile USA Inc., et al. Case No. 2:23-cv-00379-JRG-RSP (Lead case). Before the United States District Court, Eastern District of Texas, Marshall Division. On behalf of T-Mobile. Case still active as of 01/20/2025.

APPENDIX B (LIST OF MATERIALS CONSIDERED)

Exhibit No.	DESCRIPTION
1001	U.S. Patent No. 10,368,281 (“’281”)
1002	File History of U.S. Application No. 15/480,293 (“’281FH”)
1004	U.S. Patent App. Pub. No. 2004/0137902 (“Chaskar”)
1005	U.S. Patent App. Pub. No. 2005/0048977 (“Dorenbosch”)
1006	U.S. Patent No. 6,049,715 (“Willhoff”)
1007	U.S. Patent App. Pub. No. 2005/0063348 (“Donovan”)
1008	U.S. Patent App. Pub. No. 2004/0246922 (“Ruan”)
1009	U.S. Patent App. Pub. No. 2003/0084056 (“DeAnna”)
1010	U.S. Patent App. Pub. No. 2005/0136927 (“Enzmann”)
1012	U.S. Patent App. No. 14/806,482 (“’482-App”)
1014	Plaintiff Vasu Holdings, LLC’s Objections and Responses to Defendants Samsung Electronics Co., Ltd, and Samsung Electronics America, Inc.’s First Set of Interrogatories (Nos. 1-25)
1015	Plaintiff Vasu Holdings, LLC’s Supplemental Objections and Responses to Defendants Samsung Electronics Co., Ltd, and Samsung Electronics America, Inc.’s Interrogatories (Nos. 1-5, 8, 9, 13-15, 19-22, 25)
1016	Plaintiff Vasu Holdings, LLC’s Objections and Responses to Defendants Samsung Electronics Co., Ltd, and Samsung Electronics America, Inc.’s Second Set of Interrogatories (No. 26)
1017	Gregory P. Pollini, Trends in Handover Design (March 1996)
1018	U.S. Patent App. Pub. No. 2003/0017842
1019	U.S. Patent App. Pub. No. 2002/0037715

Exhibit No.	DESCRIPTION
1020	U.S. Patent No. 7,826,868
1021	U.S. Patent App. Pub. No. 2004/0008645
1022	U.S. Patent No. 7,414,992
1023	Timer, The IEEE Standard Dictionary of Electrical and Electronics Terms (6th ed., 1996).
1024	Server, McGraw-Hill Dictionary of Computing & Communications (6th ed., 2003)
1025	Server, Modern Dictionary of Electronics (7th ed., 1999).

* I also considered any additional materials referenced in my declaration.