

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

**T-MOBILE USA, INC., AT&T SERVICES, INC., CELLCO PARTNERSHIP D/B/A
VERIZON WIRELESS, ERICSSON INC. AND NOKIA OF AMERICA CORPORATION**

Petitioners,

v.

HEADWATER PARTNERS II LLC

Patent Owner.

Case No. IPR2024-_____

U.S. Patent No. 9,094,868

**Declaration of Dr. Stan McClellan in Support of
Petition for *Inter Partes* Review of U.S. Patent No. 9,094,868**

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I, Dr. Stan McClellan, declare and state as follows:

1. I have been retained on behalf of T-Mobile USA, Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson Inc., and Nokia of America Corporation (“Petitioners”) as an independent technical expert in this proceeding before the United States Patent and Trademark Office (“PTO”) regarding U.S. Patent No. 9,094,868 (the “’868 Patent”). I have been asked to consider whether certain references disclose or suggest the features recited in Claims 1-34 of the ’868 Patent (the “Challenged Claims”). My opinions are set forth below.

1. Background and Qualifications

2. I am currently serving as the Director of the JSC Engineering, Technology and Science Program (JETS) at Texas State University, a partnership with Jacobs Technology Group and NASA’s Johnson Space Center (JSC). Previously, I held the following positions at Texas State:

- Professor in the Ingram School of Engineering from 2013-2023;
- Co-Director of the Connected Infrastructure initiative for Education, Demonstration, and Research (CIEDAR) from 2019 to 2023;
- Director of the Ingram School of Engineering from 2013 to 2018;
- Associate Director of the Ingram School of Engineering from 2011 to 2013;
- and
- Associate Professor in the Ingram School of Engineering from 2008 to 2013.

My other academic experience is as an Associate Professor of Electrical and Computer Engineering at the University of Alabama at Birmingham from 1995 to 2002.

3. I received my Ph.D. from Texas A&M University (1995) in Electrical Engineering (EE) with a specialization in communication and data processing. Also from Texas A&M, I received a M.S. in EE (1991) and a B.S. in EE (1986).

4. My research activities at Texas State involved the development and management of FCC-licensed private 5G and LTE wireless networks, and the management of a regional LoRaWAN wireless network for low-rate, real-time data collection in multiple projects at CIEDAR. During my time as a Professor, I developed performance enhancements for Internet transport protocols and packet handling based on signal processing and machine learning algorithms, and designed a multi-building “5G-capable” core network to support multiple faculty re-search projects as well as academic priorities. During my time as an Associate Professor, I investigated various Smart Grid systems and advanced technologies for broadband networking (e.g. 40/100Gb Ethernet), developed novel PHY layer for low-frequency communication via power lines, and developed performance enhancements for IP transport protocols.

5. I also have technical experience from my time in the private sector. I previously held executive or senior engineering positions at companies including

Power Tagging Technologies, ZNYX Networks, SBE, Hewlett Packard, General Dynamics and LTV Aerospace and Defense Company. I have also served as a technical consultant for companies such as Cisco, American Express, 3COM, BellSouth, N.E.T., Alcatel, AT&T, Research in Motion (RIM), F5 Networks, LSU Medical Center, and the U.S. National Science Foundation.

6. I have published dozens of books and peer-reviewed research papers in this field, and have given numerous related technical talks world-wide. I am a named inventor on fourteen patents and have served as a technical expert witness in numerous patent litigation cases.

7. My full qualifications and experience are set forth in my Curriculum Vitae, which is attached as Exhibit A to this declaration.

2. Compensation

8. I am being compensated at my standard hourly rate of \$350 per hour for my work performed in connection with this matter. My compensation does not depend in any way upon the outcome of this matter.

3. Materials Considered

9. I have relied on the following documents in forming my opinions:

- a. The '868 Patent
- b. The '868 Patent's File History (U.S. Application No. 14/053,574)
- c. U.S. Provisional Application No. 61/714,151

- d. U.S. Patent Publ. No. 2008/0248822 A1 (“Jarvinen”)
- e. U.S. Patent Publ. No. 2012/0064908 A1 (“Fox”)
- f. Yingqi Xu et al., “Exploring Spatial Correlation for Link Quality Estimation in Wireless Sensor Networks,” Fourth Annual IEEE International Conference on Pervasive Computing and Communications (2006) (“Xu”)
- g. Vincent K.N. Lau et al., “Variable-rate adaptive trellis-coded QAM for high-bandwidth efficiency applications in Rayleigh fading channels,” HKIE Transactions, 5(2) (1998) (“Lau”)
- h. Sajid Hussain, “Dynamic Radio Resource management in 3GPP LTE,” Blekinge Institute of Technology, School of Engineering (2009) (“Hussain”)

4. Legal Standards

10. I am not an attorney and offer no legal opinions. For the purposes of this Declaration, I have been informed by Counsel about certain aspects of the law that are relevant to my analysis, as summarized below.

11. I have been informed by Counsel that the first step in an invalidity analysis involves construing the claims, as necessary, to determine their scope. I have also been informed by Counsel that claims are generally given their ordinary and custom meaning as understood by a person of ordinary skill in the art

(“POSITA”) at the time of the invention, in light of the patent’s claims, specification and file history. I have additionally been informed by Counsel that claim construction is a matter of law and that the final claim constructions for this proceeding will be determined by the Patent Trial and Appeal Board (“PTAB”).

12. I have further been informed by Counsel that a patent claim is obvious under 35 U.S.C. §103, and therefore invalid, if the claimed subject matter, as a whole, would have been obvious to a POSITA as of the priority date of the patent based on one or more prior art and/or knowledge of a POSITA. I have been further informed by Counsel that a claim is invalid under 35. U.S.C. § 102 if it is anticipated, which requires that every element of a claim is disclosed in a single prior art reference, arranged as in the claim.

13. I have additionally been informed by Counsel that an obviousness analysis must consider (1) the scope and content of the prior art, (2) the differences between the claims and the prior art, (3) the level of ordinary skill in the pertinent art, and (4) secondary considerations, if any, of non-obviousness (such as unexpected results, commercial success, long-felt but unmet need, failure of others, copying by others, and skepticism of experts).

14. I have been informed by Counsel that a prior art reference may be combined with other references to disclose each element of the invention under 35 U.S.C. § 103. I have further been informed by Counsel that a reference may also be

combined with the knowledge of a POSITA, and that this knowledge may be used to combine multiple references. I have further been informed by Counsel that a POSITA is presumed to understand the relevant prior art. I have also been informed by Counsel that the obviousness analysis may take into account the inferences and creative steps that a POSITA would employ.

15. In determining whether a prior art reference would have been combined with other prior art or other information known to a POSITA, I have been informed by Counsel that the following principles may be considered:

- a. whether the references to be combined involve non-analogous art;
- b. whether the references to be combined are in different fields of endeavor than the alleged invention in the Patent;
- c. whether the references to be combined are reasonably pertinent to the problems to which the inventions of the Patent are directed;
- d. whether the combination is of familiar elements according to known methods that yields predictable results;
- e. whether a combination involves the substitution of one known element for another that yields predictable results;

- f. whether the combination involves the use of a known technique to improve similar items or methods in the same way that yields predictable results;
- g. whether the combination involves the application of a known technique to a prior art reference that is ready for improvement, to yield predictable results;
- h. whether the combination is “obvious to try”;
- i. whether the combination involves the known work in one field of endeavor prompting variations of it for use in either the same field or a different one based on design incentives or other market forces, where the variations are predictable to a POSITA;
- j. whether there is some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- k. whether the combination requires modifications that render the prior art unsatisfactory for its intended use;
- l. whether the combination requires modifications that change the principle of operation of the reference;

- m. whether the combination is reasonably expected to be a success;
and
- n. whether the combination possesses the requisite degree of
predictability at the time the invention was made.

16. I have been informed by Counsel that in determining whether a combination of prior art references renders a claim obvious, it is helpful to consider whether there is some teaching, suggestion, or motivation to combine the references and a reasonable expectation of success in doing so. I have further been informed by Counsel that the existence of an explicit teaching, suggestion or motivation to combine known elements of the prior art is a sufficient, but not a necessary, condition to finding of obviousness. This so-called “teaching-suggestion-motivation” test is not the exclusive test and is not to be applied rigidly in an obviousness analysis.

17. I have been informed by Counsel that “a person of ordinary skill in the art” is a hypothetical person to whom an expert in the relevant field could assign a routine task with reasonable confidence that the task would be successfully carried out. I have also been informed by Counsel that evidence of the level of ordinary skill in the art can be found in the patent-in-question.

18. I have been informed by Counsel that a method claim is composed of a series or sequence of steps, each of which state an operation to be performed. I am

further informed by Counsel that the sequential arrangement of the steps is not important unless it is essential to the invention itself, and to determine whether the steps recited in a method claim must be performed in the sequence in which they appear in the claim in order, one must look to the nature of the steps themselves and to the written description of the method in the specification.

5. Level of Ordinary Skill in the Art

19. I have reviewed the relevant disclosures of the Patent-in-Suit (the '868 Patent) as well as relied on the documents identified above, and on my education and experience, to arrive at my opinions regarding the level of a person of ordinary skill in the art ordinary skill in the art.

20. In my opinion, a person of ordinary skill in the art in the field of the '868 Patent in the relevant time frame would have been someone with at least (1) a bachelor's degree in electrical engineering, computer engineering/science, or a related scientific field, and (2) either (a) a master's degree in electrical engineering, computer engineering/science, or a related field, or (b) two or more years of work or research experience in wireless networking and/or computing.

21. In determining the level of ordinary skill in the art, I considered, for example, the type of problems encountered in the art, prior art solutions to those problems, the rapidity with which innovations were made, the sophistication of the technology, and the educational level of active workers in the field.

22. I met the definition of a POSITA in the relevant time frame. I also had greater knowledge and experience than a POSITA in the relevant time frame. I render my opinions, however, from the perspective of a POSITA, based on my knowledge and research and teaching experience. Indeed, my opinions concerning the '868 Patent and the prior art are from the perspective of a POSITA.

6. Overview of the '868 Patent

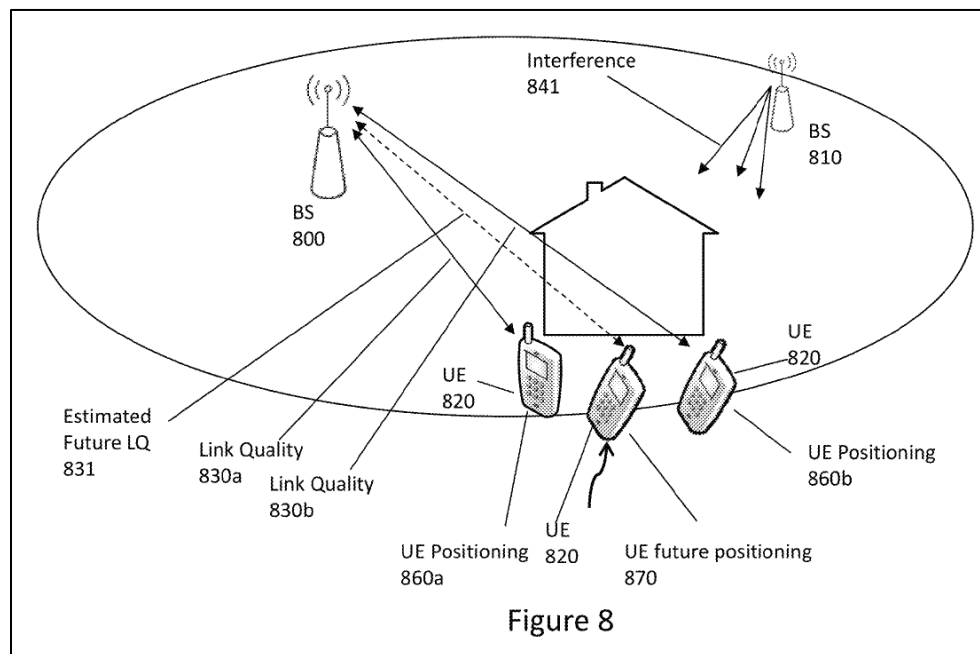
23. Below, I provide a brief summary of the background technology and the state of the art as of the priority date of the '868 Patent as context for understanding the disclosure and claims of the '868 Patent.

24. The '868 Patent claims priority to a U.S. Provisional Application No. 61/714,151, filed on October 15, 2012.

25. The '868 Patent relates to “estimating a user equipment link quality” based on the position of the user equipment (or “UE,” e.g., a smartphone). ('868 Patent, Abstract.) “Link quality” refers to any measurement of the quality of the connection between the UE and a base station, which could include one or more of “path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), channel quality indicator (CQI), channel state information (CQI), [and] packet error rate

(PER).” (’868 Patent, cl. 2.) A UE’s “position” includes its “location” or “orientation.”¹ (’868 Patent, cl. 1.)

26. The UE connects to base station in order to send or receive information in a cellular network. (’868 Patent, 1:40-43.) Figure 8 shows the UE (820) and its connection to the base station (800):



(’868 Patent, 24:42-46, Fig. 8.) That connection has a link quality (e.g., 830a, 830b). (*Id.* at 24:40-46.) A high link quality helps the UE and base station “exploit high data rates while providing desirable robustness of the data communication.” (*Id.* at 1:24-27.) This link quality, however, “varies significantly over time, space (for example movement of the user equipment), frequency band, etc., for example due to

¹ A UE’s “orientation” refers to the angle at which it is positioned relative to the base station. This angle may change rapidly as a user is holding a UE to their ear and walking.

space/time/frequency selective fading, or shadowing from objects (buildings, trees, etc.), etc.” (*Id.* at 1:19-23.) As a result of this variance, “[l]ink quality information exchanged between the base station and the user equipment may become stale (if not updated fast enough)[.]” (*Id.* at 1:29-33.)

27. The '868 Patent seeks to solve this alleged problem of monitoring and maintaining link quality by “estimating a user equipment link quality based on a positioning of the user equipment,” and storing that information. (*Id.* at 1:33-36.) Later, the '868 Patent teaches predicting a UE’s future positioning and link quality at that future position based on that stored information. (*Id.*) Specifically, the patent teaches:

1. Collecting link qualities at several possible UE positions or orientations;
2. Storing the link qualities at those positions;
3. Estimating the future position of a UE; and
4. Estimating the link quality that the UE will experience when it is at the future position.

(*See id.* at 1:40-64. *See also id.* at 24:46-54 (estimating different link qualities (830a, 830b) at different possible UE positions (860a, 860b)), 24:54-62 (storing and using those positions when the system estimates the future position of a UE (870) and its likely link quality at that position (831)).)

28. An alleged benefit of estimating a UE's future location or orientation as well as its future link quality is that the network can adjust channel parameters before the UE reaches a future position. (*Id.* at 26:45-51 (“[T]he scheduler assigns resources to each of the plurality of UE devices based on the plurality of estimated future LQs[.]”). *See also id.* at 27:24-35.) The network can also adjust transmission modes for the UE based on these estimations. (*Id.* at 27:36-46 (“... the selecting the transmission mode for the UE link is based on the estimated future LQ 831.”).) According to the '868 Patent, making connection configuration decisions before the UE is at a given position or orientation “may improve one or more of the link efficiency, link robustness, PER, spectral efficiency, latency, of the wireless communication directed by scheduler.” (*Id.* at 25:27-32.)

6.1 Challenged Claims

29. This Declaration addresses Claims 1-34 of the '868 Patent, which I have been informed by Counsel are the Challenged Claims. I have added indices of the form 1[pre], 1[a], 1[b], etc. to the claim limitations for ease of reference.

30. The '868 Patent has four independent claims (1, 24, 33 and 34) that are substantially similar to one another. For example, Independent Claim 1 describes determining and storing link quality information at various positions of a UE, and estimating a future link quality at a future position of the UE based on the stored information, and Independent Claim 24 differs from Independent Claim 1 in that the

method uses the UE's nearby neighboring position to estimate link quality instead of its future position:²:

Claim 1	Claim 24
1. A method, comprising: determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE; storing information associated with the plurality of LQs for the plurality of positionings; estimating at least one future positioning of the UE; and estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.	24. A method, comprising: determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE; storing information associated with the plurality of LQs for the plurality of positionings; estimating at least <u>a positioning of the UE</u>; <u>determining at least one neighboring positioning of the positioning of the UE</u>; and estimating one or more <u>neighboring link qualities (LQs)</u> of the UE at the at least <u>one neighboring positioning</u> of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.

² Here and elsewhere in this Section, I underline and bold portions of the independent claims other than claim 1 where they differ from the limitations of claim 1.

Independent Claim 33 is a system claim, and directed to the UE's components and functions:

Claim 1	Claim 33
1. A method, comprising: determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE; storing information associated with the plurality of LQs for the plurality of positionings; estimating at least one future positioning of the UE; and estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.	33. <u>A user equipment (UE), the UE comprising:</u> <u>a transceiver operative to communicate with a link partner device through a communication link, wherein the communication link includes a link quality;</u> <u>a controller, the controller operative to:</u> determine a plurality of link qualities (LQs) of the UE for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE; store information associated with the plurality of LQs for the plurality of positionings; estimate at least one future positioning of the UE; and estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.

Independent Claim 34 adds that the positionings are of one or more UEs, and the position and link quality estimation is for a second UE:

Claim 1	Claim 34
1. A method, comprising: determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE; storing information associated with the plurality of LQs for the plurality of positionings; estimating at least one future positioning of the UE; and estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.	34. A method, comprising: determining a plurality of link qualities (LQs) of <u>one or more user equipment (UE)</u> for a plurality of positionings of the one or more UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of <u>a first UE of the one or more UE</u>; storing information associated with the plurality of LQs for the plurality of positionings; estimating at least one future positioning of <u>a second UE</u>; and estimating a future link quality (LQ) of <u>the second UE</u> at the at least one future positioning of <u>the second UE</u> based on the stored information associated with the plurality of LQs at the plurality of positionings of the one or more UE.

31. Dependent claims 2-23 and 25-32 add various limitations to the independent claims:

2. The method of claim 1, wherein at least one of the future LQ or the plurality of LQs comprises one or more of a path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR),

channel quality indicator (CQI), channel state information (CQI), packet error rate (PER).

3. The method of claim 1, wherein at least one of the future LQ or the information associated with the plurality of LQs is associated with an uplink or downlink transmission.

4. The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a frequency band or a frequency channel.

5. The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a wireless communication technology.

6. The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a link partner of the UE.

7. The method of claim 1, wherein a link quality positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated future positioning or the estimated future LQ.

8. The method of claim 7, wherein the UE obtains at least a portion of the link quality positioning information from a link partner or wherein the UE communicates the at least the portion of the link quality positioning information to the link partner.

9. The method of claim 7, further comprising determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information.

10. The method of claim 9, wherein the UE usage information comprises UE information indicating one or more of a user handheld mode, a hands-free mode, a speaker phone mode, a car Bluetooth mode, a headset Bluetooth mode.

11. The method of claim 7, further comprising determining a UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information.

12. The method of claim 11, wherein the UE environment information comprises information associated to one or more of a traffic load, a network load, an interference, time of day, whether information, day of year, season.

13. The method of claim 11, wherein the UE environment information comprises information associated with surrounding objects or information associated with a user of the UE.

14. The method of claim 13, wherein the information associated with the user of the UE includes positioning of the user of the UE or positioning of the user of the UE relative to the UE.

15. The method of claim 11, further comprising assisting determining the UE environment information using sensors of the UE.

16. The method of claim 1, further comprising allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future LQ.

17. The method of claim 1, further comprising selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future LQ.

18. The method of claim 17, wherein the transmission mode comprises one or more of a modulation, a code, a modulation and coding scheme (MCS), a multiple input multiple output (MIMO) mode, a beamforming parameter, a transmit power.

19. The method of claim 1, further comprising obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time.

20. The method of claim 1, further comprising a second plurality of positionings wherein the second plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of LQs based on the second plurality of positionings.

21. The method of claim 20, further comprising allocating a resource block (RB) to a UE link based on the estimated second plurality of LQs.

22. The method of claim 1, wherein the plurality of positionings is constrained to a physical area.

23. The method of claim 1, wherein at least one of the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an accuracy, a deformation, a velocity, an acceleration.

25. The method of claim 24, further comprising adjusting or changing a configuration of the UE based on the one or more neighboring LQs.

26. The method of claim 24, further comprising presenting the one or more neighboring LQs of the UE at the at least one neighboring positioning.

27. The method of claim 24, further comprising selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring LQs.

28. The method of claim 27, further comprising presenting the selected candidate positioning to a user of the UE.

29. The method of claim 24, wherein a link quality neighboring positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated at least a positioning of the UE, the determined at least one neighboring positioning, or the one or more neighboring LQs.

30. The method of claim 29, further comprising determining a UE environment information, wherein at least a portion of the link quality

neighboring positioning information is based on the UE environment information.

31. The method of claim 30, the UE environment information comprises information associated with a user of the UE.

32. The method of claim 30, further comprising selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning and a user positioning relative to the UE.

7. Grounds of Unpatentability

32. I am informed by Counsel that Claims 1-34 of the '868 Patent are challenged. As explained below, an element-by-element analysis of the Challenged Claims demonstrates that they are disclosed or taught by the prior art.

7.1 Ground 1: Claims 1-34 Are Rendered Obvious by Jarvinen and Fox and Further in View of a Person of Ordinary Skill in the Art

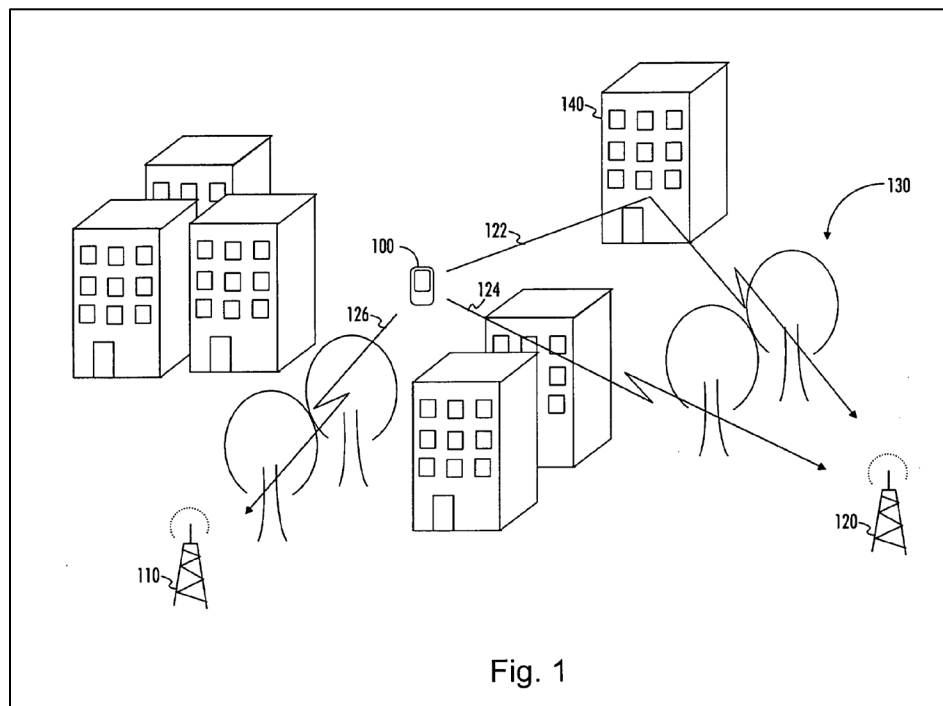
33. I have been asked by Counsel to review and provide my opinion as to the validity of the Challenged Claims of the '868 Patent over Jarvinen, either alone or in view of Fox and further in view of a person of ordinary skill's knowledge.

8. The Prior Art

34. I have been asked by Counsel to review and provide my opinions as to the validity of the Challenged Claims of the '868 Patent in view of both Jarvinen and Fox.

8.1 Jarvinen

35. Jarvinen relates to “managing transmission conditions in a mobile telecommunication system according to movement of a mobile terminal[.]” (Jarvinen, Abstract.) A “mobile terminal” is synonymous with a UE. (See Jarvinen, ¶¶0019, Fig. 1.) Like the ’868 Patent, Jarvinen discloses a method of adapting the communications link between a UE and a base station. (Jarvinen, ¶¶0001 (“The invention relates to radio link adaptation in a mobile telecommunication system.”), 0004 (“An object of the invention is to provide an improved solution for radio link adaptation.”).) Jarvinen’s Figure 1 shows “a mobile terminal 100 [that] is currently communicating with a first base station 120”:



(Jarvinen, ¶¶0011, 0019, Fig. 1.) Jarvinen states that “[r]adio link adaptation is an important factor in a mobile telecommunication system in order to react to variations in a radio channel environment.” (Jarvinen, ¶0002. *See also id.* at ¶¶0016-18.)

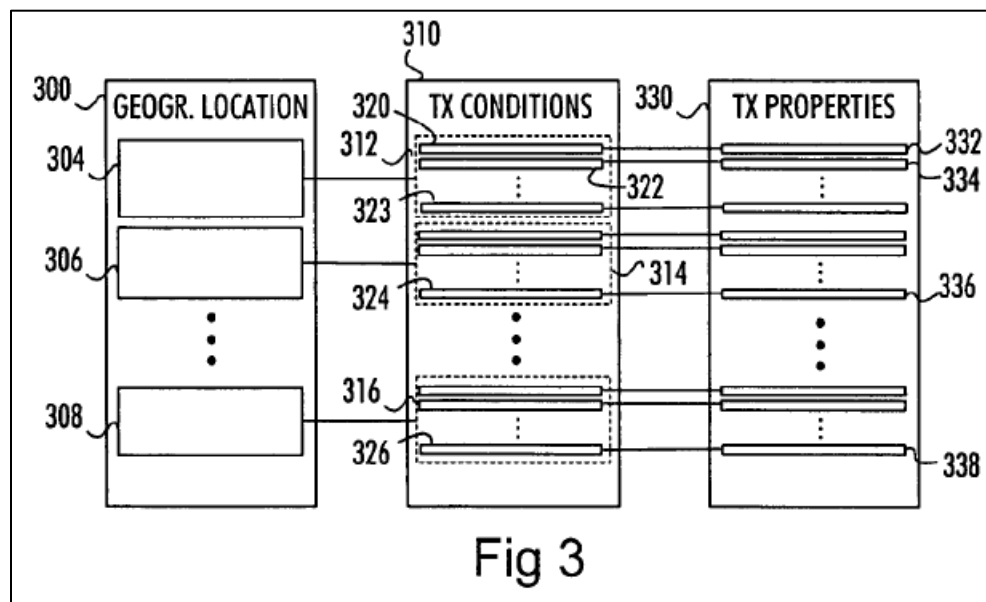
36. Jarvinen states that a then existing solution to the link quality degradation problem was to “perform[] a channel estimation procedure based on a pilot sequence transmitted from the radio transmitter [e.g., the base station] to the radio receiver [e.g., the UE].” (Jarvinen, ¶0003.) After channel estimation is performed, “the radio receiver [e.g., the UE] instructs the radio transmitter [e.g., the base station] to change the transmission parameters to ones that are more optimal for the current radio channel environment.” (Jarvinen, ¶0003.) Jarvinen, however, criticizes this method of link adaptation as too slow to react: “action is taken after the radio channel properties have changed, i.e. the quality of a *transmitted information signal has degraded before action is taken to remedy the degradation.*” (Jarvinen, ¶0003, Fig. 1.)

37. To speed up the link adaptation process, Jarvinen discloses the same solution as the ’868 Patent:

1. Collecting link qualities at several possible UE positions or orientations; (*See* Section 9.3; Jarvinen, ¶¶0009, 0031, 0034, 0036, 0044, cls. 6-8, 26, 27, Fig. 4.)
2. Storing the link qualities at those positions; (*See* Sections 9.3, 9.4; Jarvinen, ¶¶0021, 0035-47, cl. 7, Figs. 3, 4.)

3. Estimating the future position of a UE; (See Sections 9.5, 9.6; Jarvinen, ¶¶s 0048-66, Fig. 5.) and
4. Estimating the link quality that the UE will experience when it is at the future position. (See Sections 9.7-9.9; Jarvinen, ¶¶0035-66, Figs. 3, 5.)

Central to Jarvinen’s proposed solution is its database, shown in Figure 3 below, which stores UE link qualities (“Tx Properties”) at different geographic locations (“Geogr. Location”):



(Jarvinen, Fig. 3. See also *id.* at ¶0035 (“the base station then in block 406 stores the *location of the mobile terminal* in a first data field 300 in the database . . . the base station stores, in block 410, a *measured reception level of the signal received from the mobile terminal in a third data field 330 of the database to form a transmission property value 332 . . .*”), Fig. 4.) The remaining data in the database, “Tx Conditions,” refers to “radio system parameters, such as the transmission

frequency and a serving base station but also other conditions such as bearing of the mobile terminal and transmit power[,]” that can be adjusted to affect link quality. (Jarvinen, ¶0041.)

38. Jarvinen’s benefits mirror an alleged benefit of the ’868 Patent: the network can accommodate the UE’s future needs before waiting to measure channel quality at a future position. “When provided with knowledge of data transmission properties (or quality measures of a communication link) obtainable with different transmission conditions from a given geographical location, *one may select appropriate transmission conditions for a mobile terminal* located in the geographical location[,]” and Jarvinen explains that, by estimating the UE’s future positioning and link quality, “optimal transmission conditions may be selected *before* a change in the radio channel environment to prevent the degradation of signals.” (Jarvinen, ¶0031.)

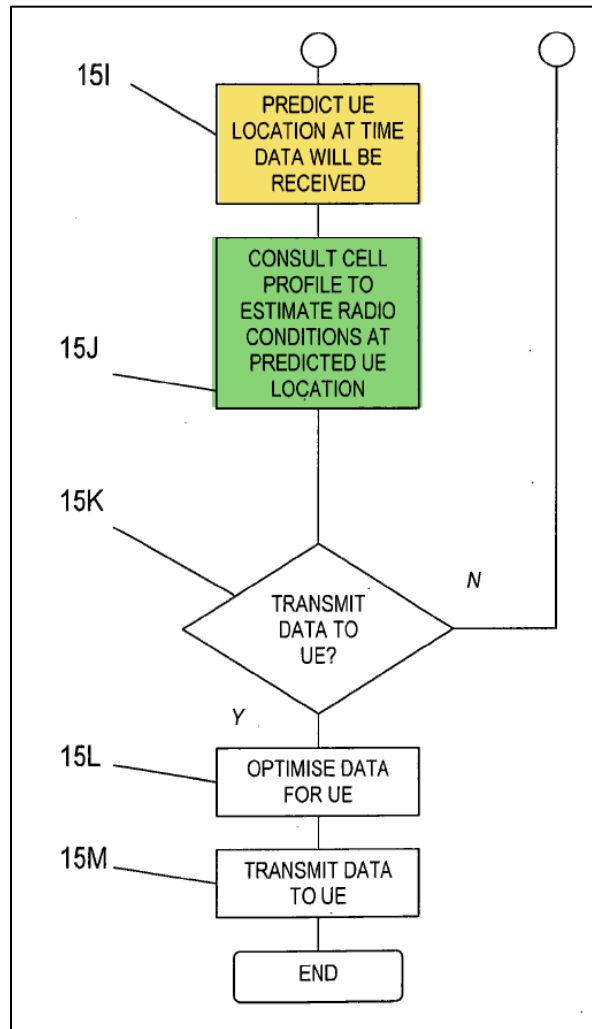
8.2 Fox

39. Fox relates to, among other things, a radio access network “controller that controls allocation of network resources to the mobile terminals,” and “gauges radio conditions available to the mobile terminals[.]” (Fox, cl. 1.) Like the ’868 Patent and Jarvinen, Fox uses previously measured link qualities at specific locations to estimate a UE’s (or second UE’s) future (or neighboring) link qualities at future (or neighboring) locations. (Fox, cl. 8 (“the controller uses a record of radio quality

across coverage area and the calculated location and velocity of one of the mobile terminals to estimate radio conditions available to the one of the mobile terminals at a future location”), Figs. 15A, 15B.)

40. The controller first monitors the communications link quality between base station and UE. (Fox, ¶¶0043 (“The radio measurements may include received signal strength, transmit power levels, neighbour cell measurements.”), 0048 (“The radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qqual, RSSI, RSCP . . . etc.”).) The controller then stores this information along with the location where it measured the link quality. (Fox, ¶0022 (“The controller may build and maintain *a record of radio quality across a coverage area of the network* . . . The record may be in the form of *a map of the coverage area, indicating which areas of the coverage area provide which qualities of radio coverage.*”).)

41. The controller later uses “the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to *estimate the radio conditions available to that mobile terminal at a future location[.]*” (Fox, ¶0022.) The controller predicts the UE’s future location, as shown in Figure 15B at Step 15I:



(Fox, ¶0367 (“At step 15I the processor 1244 predicts the location of mobile terminal 1200”), Fig. 15B.) In Step 15J, the controller uses “the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to *estimate the radio conditions available to that mobile terminal at a future location*[.]” (Fox, ¶¶0022, 0368 (“At step 15J the cell map/profile from the store 1242 is consulted by the processor 1244 to retrieve data relating to the predicted future location of the mobile terminal.”), Fig. 15B.) Once the controller

estimates link quality at the future location, it can accordingly allocate the most optimal radio resources, including resource blocks, to the UE. (Fox, ¶¶0022 (the controller can “control the transmission of data between the radio access network and that mobile terminal at the calculated location in dependence thereon.”), 0566 (“The radio resource allocation may be defined for a type of application or user—the *pre-allocated resource blocks* or Codes, or Timeslots.”), 0583 (“The radio resource allocation may be defined for a type of application or user, by allocating particular *resource blocks*, codes or time slots.”). *See also id.* at 0578 (“Resource Blocks in LTE”).)

9. Ground of Unpatentability

42. I am informed by Counsel that Claims 1-34 of the '868 Patent are challenged on a single ground: obviousness by Jarvinen and Fox and further in view of a Person of Ordinary Skill in the Art. As explained below, an element-by-element analysis of the Challenged Claims demonstrates that they are disclosed or taught by the prior art. In my opinion, all Challenged Claims are invalid in view of the prior art.

9.1 1[pre] A method, comprising

24[pre] A method, comprising

34[pre] A method, comprising

43. To the extent the claims' preambles are limiting, it is my opinion that Jarvinen discloses these limitations. As discussed in detail below and in Sections 8.1 and 9.1-9.8, Jarvinen discloses systems and methods to determine and store link qualities corresponding to UE positions, estimate future UE positions and estimate a future link quality for the UE at its future positions. (See Jarvinen, Abstract ("A method for managing transmission conditions in a mobile telecommunication system . . ."), cls. 1-20 (claiming "methods"), 21-41, Figs. 4, 5.)

9.2 33[pre] A user equipment (UE), the UE comprising:

a transceiver operative to communicate with a link partner device through a communication link, wherein the communication link includes a link quality;

a controller, the controller operative to:

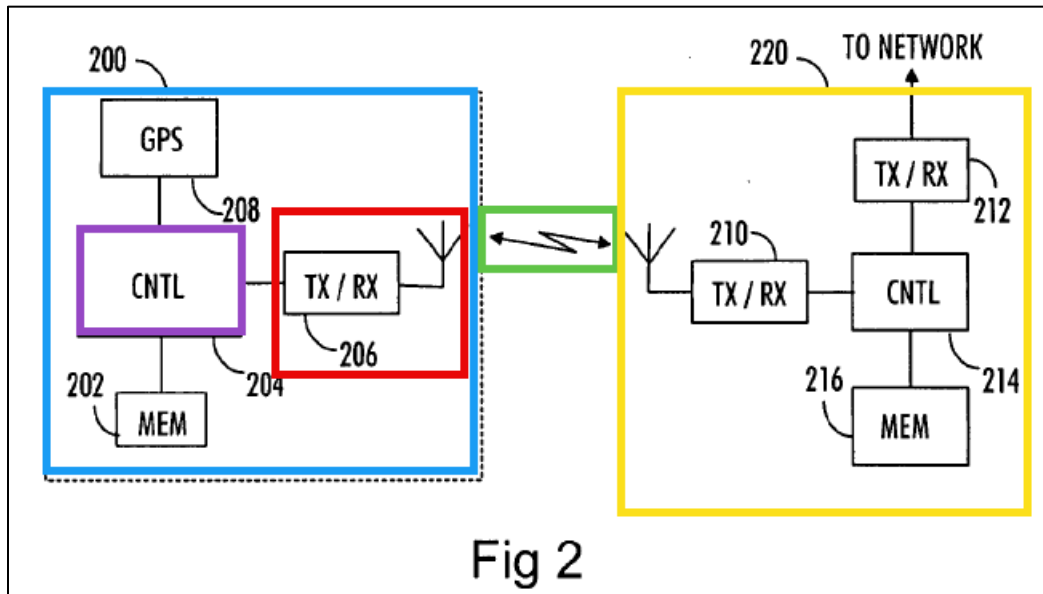
44. Claim 33 is a system claim, and directed to the UE's components and functions. Claim 33's preamble recites a UE having (1) a transceiver that communicates with a link partner device (e.g., a base station)³ over a communication

³ In my opinion, a POSITA at the time of the '868 Patent's filing would have understood "link partner" to mean "a device with which another device

link that has link quality; and (2) a controller operative to perform functions. In my opinion, Jarvinen discloses these claim limitations.

45. Jarvinen's Figure 2 discloses all components recited in Claim 33's preamble:

communicates (e.g., a UE or base station.)” This is because the specification makes clear that a “link” is the communications link between a UE and a base station. ('868 Patent, 1:19-20 (“In many environments the *link* quality ***between a plurality of base stations and a plurality of user equipment . . .***”).) The specification also repeatedly makes clear that the “partners” to that link are the devices on either end: the UE or base station. ('868 Patent, 25:56-60 (“the stored or estimated future LQ is based on a *link partner* selection (for example if the UE device at a location where two serving ***BS*** may wirelessly communicate with the UE device).”), 26:32-33 (“for example one of more of a *link partner BS*”), 45:63-64 (UE “receives from a *link partner* (for example a ***BS***)”), 27:57-58 (“the *link partner* (for example one or more ***BS***)”).) Moreover, the concept of a link “partner” makes sense as applied to a UE and a base station because they share a communications link with one another.



(Jarvinen, Fig. 2, ¶0022 (“FIG. 2 illustrates block diagrams of a mobile terminal 200 and a base station 220 of a typical mobile telecommunication network.”).)

46. First, Jarvinen discloses a UE having a transceiver. Figure 2 shows “a mobile terminal 200 [annotated in blue] and a base station 220 [annotated in yellow] [.]” (Jarvinen, ¶0022.) The mobile terminal’s “communication interface 206” (annotated in red) is a transceiver that “may perform analog operations necessary for transmitting and receiving radio signals.” (Jarvinen, ¶0022.) The mobile terminal’s link partner is the base station, and they communicate over a communications link (annotated in green). (Jarvinen, ¶0022 (“The base station 220 comprises a first communication interface 210 to provide an air interface connection to one or several mobile terminals, such as mobile terminal 200.”).)

47. That communications link includes a link quality. (Jarvinen, ¶¶0034 (“The reception level of the signal may be a received signal strength indicator (RSSI) calculated in any case by the base station for other purposes. . . . another communication *link quality* indicator may be measured, such as a signal-to-interference power ratio.”), 0035 (“the base station stores, in block 410, a measured reception level of the signal received from the mobile terminal”), cls. 6 (“measuring a communication link quality indicator from a received signal”), 7, 8, 26, 27. *See also* Jarvinen at ¶¶0036, 0044, Fig. 4.)

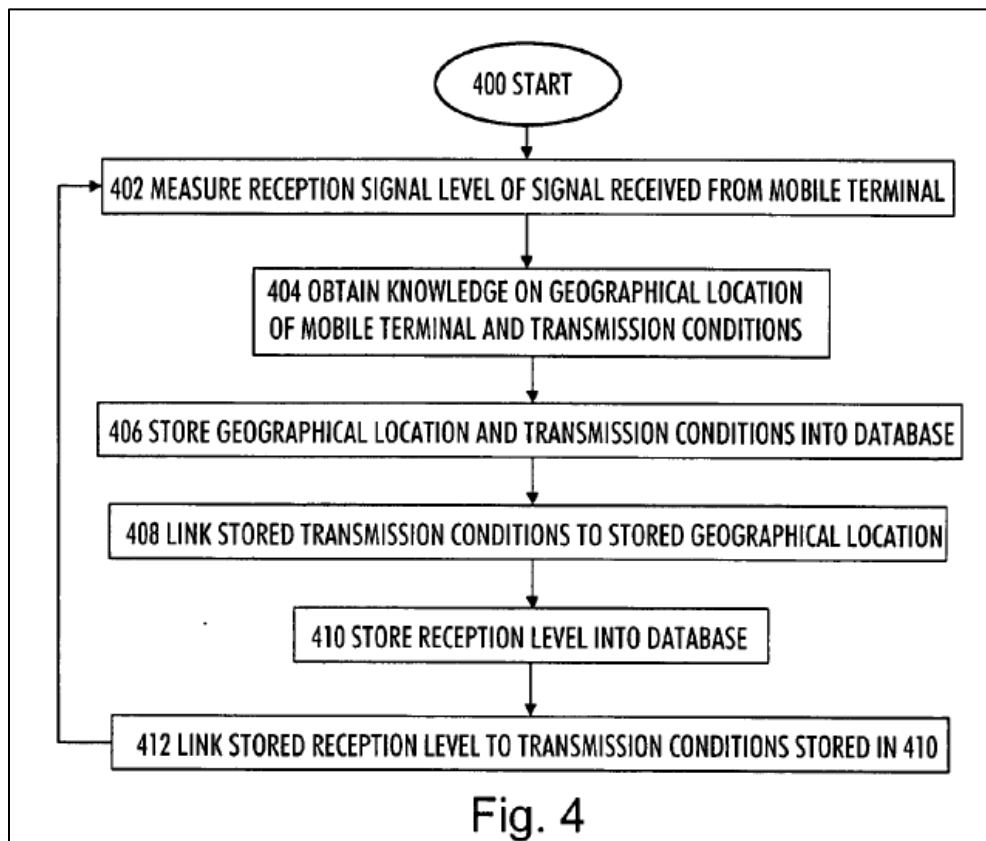
48. Second, Jarvinen discloses the UE having a controller (annotated in purple). (Jarvinen, ¶0027 (“The mobile subscriber unit 200 may further comprise a processing unit 204 to control functions of the mobile subscriber unit 200.”). *See also* Jarvinen at ¶¶0028, 0048, cls. 21, 38.)

9.3 1[a] / 24[a] / 33[a] determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE

34[a] determining a plurality of link qualities (LQs) of one or more user equipment (UE) for a plurality of positionings of the one or more UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of a first UE of the one or more UE

49. In my opinion, Jarvinen discloses methods and systems of determining a plurality of UE link qualities for a plurality of UE positionings. Figure 4 is a flow

chart depicting how Jarvinen collects and stores information associating a UE's location with its link quality at that location:



(Jarvinen, Fig. 4. *See also id.* at ¶0034.)

50. The process begins when the system⁴ “measures the level of a signal received from a given mobile terminal in block 402[.]” (Jarvinen, ¶0034.) This

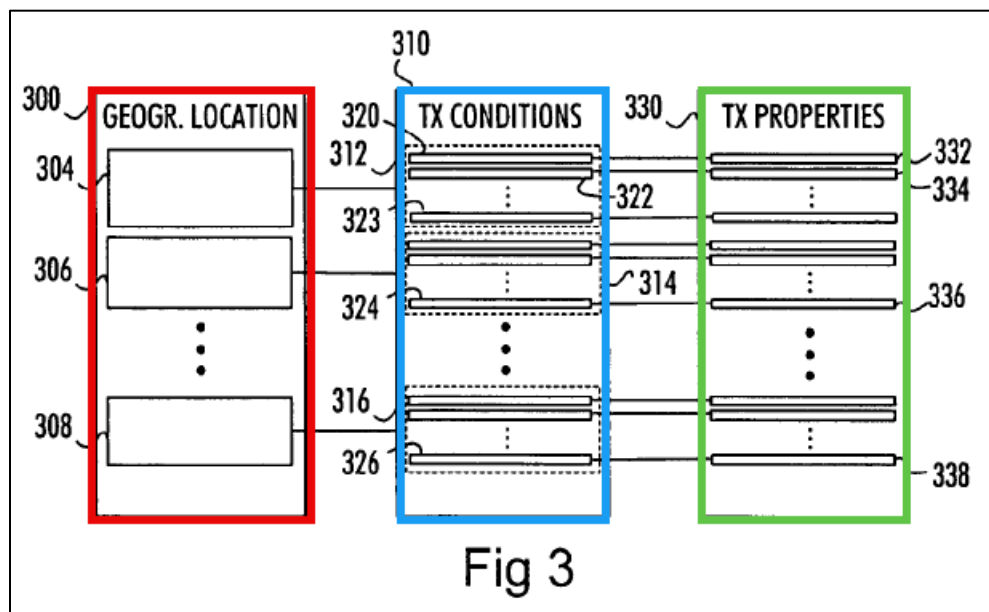
⁴ Although Jarvinen describes a base station performing the steps in Figure 4, “[a]lternatively, the database may be stored in a memory unit of the mobile terminal.” (Jarvinen, ¶0045. *See also id.* at ¶¶0057, 0067, cls. 21 (“receive information on a *geographical location of a mobile terminal* having a

“reception level” “may be a received signal strength indicator (RSSI)” or another measurement that “reflects the quality of the radio environment.” (Jarvinen, ¶¶0034, 0044. *See also* Jarvinen at ¶¶0036, 0044, cls. 6 (“measuring a communication link quality indicator from a received signal”), 7, 8, 26, 27, Fig. 4.) “As an alternative to the reception signal level, another communication link quality indicator may be measured, such as a signal-to-interference power ratio.” (Jarvinen, ¶0034. *See also* ’868 Patent, 19:34-45 (listing “Signal to Noise Ratio (SNR), Signal to Interference and Noise Ratio (SINR)” as examples of link quality), cl. 2 (“at least one of the future LQ or the plurality of LQs comprises one or more of . . . signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), . . .”).)

51. The process also involves “obtain[ing] knowledge of the geographical location of the mobile terminal at the time of transmission of the signal and transmission conditions used in the transmission of the signal.” (Jarvinen, ¶0034. *See also* Jarvinen at cls. 1-41.) The process repeats over time, and the system will *communication link with a base station* of a mobile telecommunication system”), 26 (“the processing unit is further configured to measure a *communication link quality indicator*”), 38 (“The apparatus of claim 21, wherein the apparatus is the *mobile terminal*”).)

determine link qualities and positionings for a plurality of UEs (and for a single UE). (Jarvinen, ¶0036 (“the process returns from block 412 to block 402” and determines “reception levels of signals received from *the same mobile terminal* or from *other mobile terminals* at different geographical locations and with different transmission conditions”).)

52. In my opinion, Jarvinen then discloses storing the many UEs’ positionings and link qualities at those positions in a database, shown in Figure 3:



(Jarvinen, Fig. 3. *See also id.* at ¶¶0035-47.) The database stores:

1. **Geographical Location** (annotated in red) – The position of the UE in geographic space. (See Jarvinen, ¶¶0021 (describing methods of locating UEs in geographic space), 0029 (same).)
2. **Transmission Conditions** (annotated in blue) – The radio system parameters used to transmit information between UE and base station. (Jarvinen, ¶0041 (“The transmission conditions may include radio system parameters, such as the transmission frequency and a serving

base station but also other conditions such as bearing of the mobile terminal and transmit power. In general, the transmission conditions include options available to the mobile terminal to affect the quality of the communication link between the mobile terminal and the base station.”.)

3. **Transmission Properties** (annotated in green) – The link quality at the geographic location. (Jarvinen, ¶¶0009 (“transmission property values representing quality of transmission”), 0031 (“data transmission properties (or quality measures of a communication link)”), 0034 (“As an alternative to the reception signal level, another communication link quality indicator may be measured, such as a signal-to-interference power ratio.”), 0044 (referring to “transmission property values” as “describing the quality of the communication link”). *See also* Jarvinen at ¶¶0036, cls. 6 (“measuring a communication link quality indicator from a received signal”), 7, 8, 26, 27, Fig. 4.)

53. These three sets of data are linked together in the database, and Transmission Properties (i.e., link quality) may be linked directly to Geographical Location. (Jarvinen, 0038 (“the transmission property values included in the third data field 330 *may be linked directly to the corresponding location values . . . the order of the second data field 310 and the third data field 330 may be reversed* compared to that illustrated in FIG. 3.”). *See also id.* at ¶0035, cl. 7.)

54. Limitation 34[a] requires that the method determine link qualities and positionings for more than one UE. In my opinion, Jarvinen discloses these claim limitations. Because, as discussed above, Jarvinen discloses a method to determine link qualities and positions for more than one UE, Jarvinen meets Limitation 34[a] as well. (Jarvinen, ¶0036 (“the process returns from block 412 to block 402” and

determines “reception levels of signals received from the same mobile terminal or *from other mobile terminals* at different geographical locations and with different transmission conditions”).)

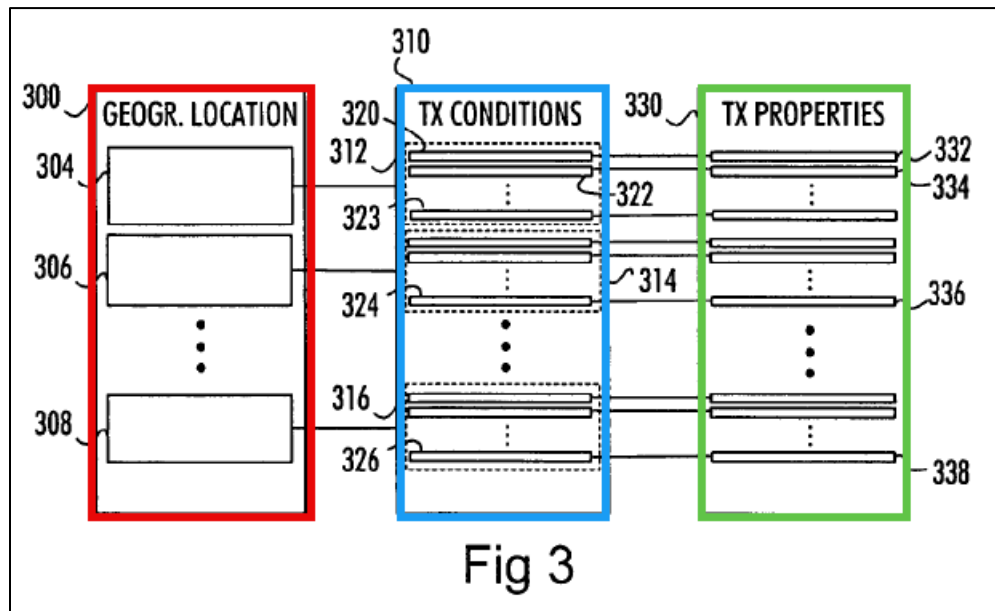
55. The “positioning” limitation can be met by either “a location or an orientation of the UE[,]” and Jarvinen also discloses a UE’s orientation, or bearing. Jarvinen states that “[t]he transmission conditions may include radio system parameters, such as the transmission frequency and a serving base station but also other conditions such as *bearing of the mobile terminal* and transmit power.” (Jarvinen, ¶0041, cls. 12, 31.) UE orientation can be determined using “motion sensors or a compass provided in the mobile terminal.” (Jarvinen, ¶0043.) “With the knowledge of the location of the base station, the mobile terminal is able to determine its bearing with respect to the base station[,]” and “[l]ocations of base stations may be stored in the database by utilizing the same notation as that used for storing the location values.” (Jarvinen, ¶0043. *See also* Jarvinen at ¶¶0058-59, 0066, 0072.)

9.4 1[b] / 24[b] / 34[b] storing information associated with the plurality of LQs for the plurality of positionings

33[b] store information associated with the plurality of LQs for the plurality of positionings

56. As discussed in Section 9.3, it is my opinion that Jarvinen discloses storing information associated with the plurality of link qualities for the plurality of

positionings (e.g., UE locations) in a database. That database is shown in Figure 3, where link qualities are stored under “Transmission Properties,” UE positioning is stored under “Geographical Location” and those pieces of information are associated with one another:

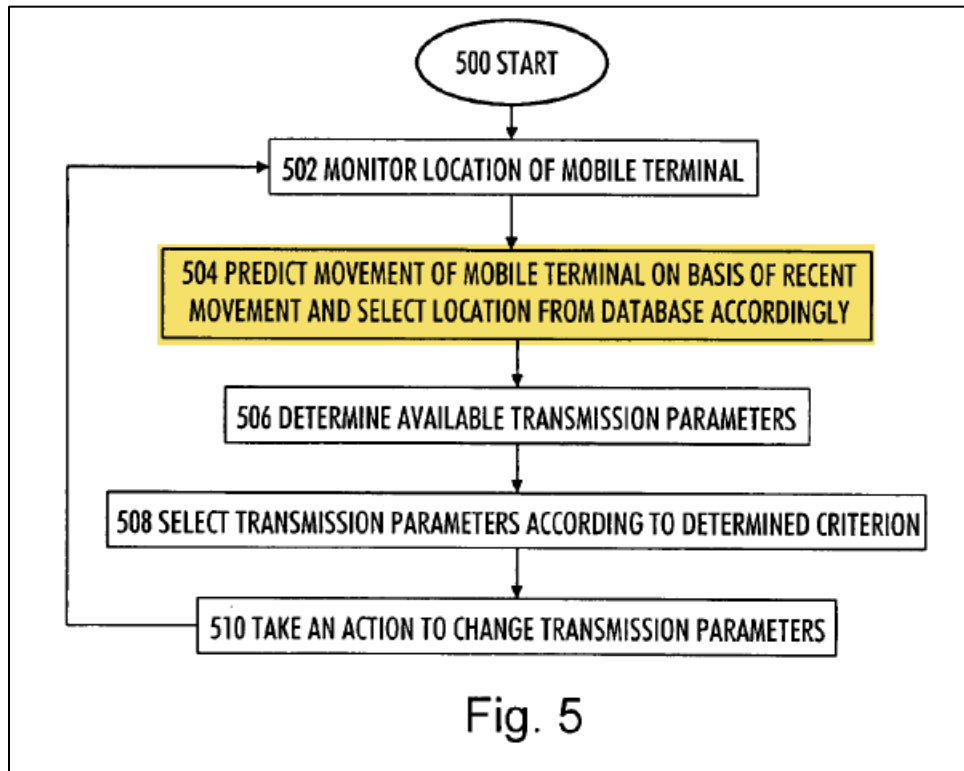


(Jarvinen, Fig. 3. *See also* Jarvinen at ¶¶0035-47, cls. 3, 6, 26, 37, 38.)

9.5 1[c] / 33[c] estimating at least one future positioning of the UE

34[c] estimating at least one future positioning of a second UE

57. In my opinion, Jarvinen discloses estimating the “future positioning” of a UE or of a “second UE.” This process is shown in Figure 5:



(Jarvinen, Fig. 5. *See also* Jarvinen at 0048-66.)

58. The method starts by monitoring the UE's current location (Block 502). (Jarvinen, ¶0049 ("The movement of the mobile terminal is tracked in block 502 with the help of information received from a positioning device included in the mobile terminal").) Next, the method estimates a UE's future location. (Jarvinen, ¶0050 ("The geographical location (a limited area) *the mobile terminal will be entering next is predicted in block 504*, for example, by extrapolating the latest movement of the mobile terminal, i.e. the stored history of the movement of the mobile terminal."). *See also* Jarvinen at 0065 ("Block 504 may be carried out, i.e.

the *movement of the mobile terminal may be predicted* and the corresponding location selected from the database, as described above.”), cls. 2, 22.)

59. Limitation 34[c] adds that estimating at least one future positioning must be for a “second UE,” and Jarvinen discloses this element as well. In my opinion, Jarvinen discloses this claim limitation. As discussed in Section 9.3, Jarvinen discloses estimating the location and associated link qualities of multiple UEs over time. (See Jarvinen, ¶0036.) After Jarvinen’s method determines the position of a first UE, it will continue to determine the future location of a “second UE,” as further discussed in this Section 9.5.⁵

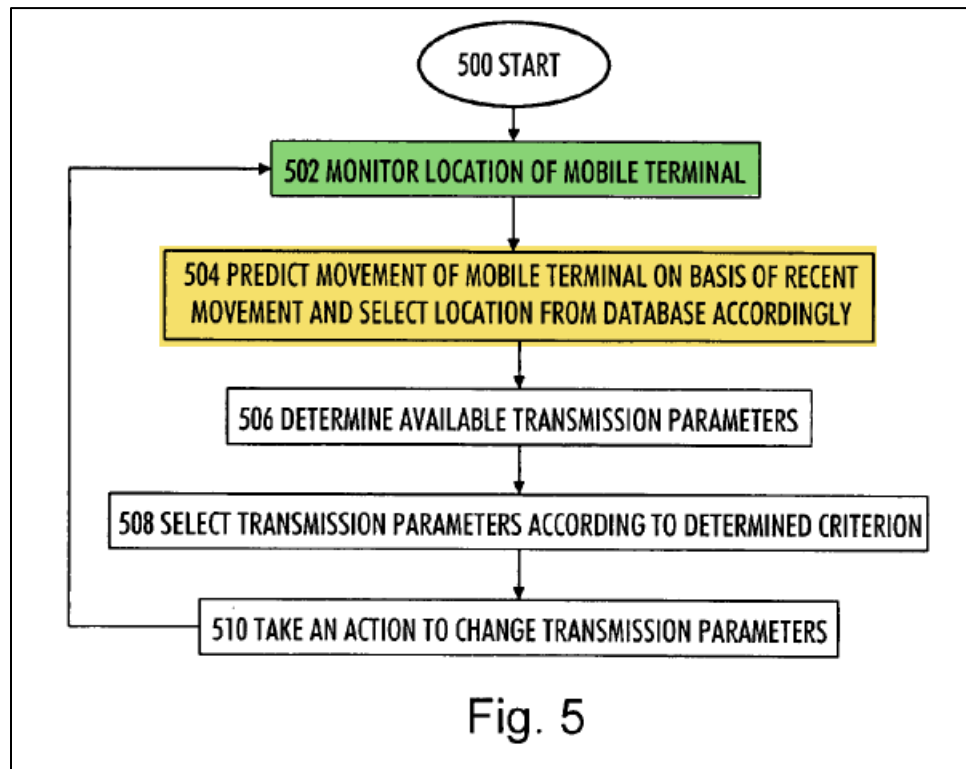
9.6 24[c] estimating at least a positioning of the UE;

determining at least one neighboring positioning of the positioning of the UE

60. In my opinion, Jarvinen discloses estimating a UE’s current positioning (e.g., location) and determining at least one of that UE’s neighboring positioning. (Jarvinen, ¶0064 (“the mobile terminal may check the database for a *neighboring (or nearby) location* stored in the database”).) Figure 5 shows a method of estimating a UE’s location before estimating a neighboring (e.g., future) location.

⁵ As discussed in Section 9.3, Jarvinen describes a UE performing the disclosed method instead of, or in addition to, the base station. (See Jarvinen, cls. 21, 22, 38.)

Block 502 (highlighted in green) shows the method's real-time tracking of a UE's location. (Jarvinen, ¶0049 (“The movement of the mobile terminal is tracked in block 502 with the help of information received from a positioning device included in the mobile terminal”).)



(Jarvinen, Fig. 5. *See also* Jarvinen at 0048-66.) Block 504 (highlighted in yellow) shows the method's determination of the UE's neighboring location:

The geographical location (a limited area) the mobile terminal will be entering next is predicted in block 504, for example, by extrapolating the latest movement of the mobile terminal, i.e. the stored history of the movement of the mobile terminal. . . . the prediction algorithm may predict that the upcoming location of the mobile terminal is the next geographical location located along that straight path and included in the database. Accordingly, a geographical location value closest to the predicted next geographical location along the path of the mobile

terminal is selected from the first data field 300 of the database in block 504 (Jarvinen, ¶0050. *See also* Jarvinen at 0065 (“Block 504 may be carried out, i.e. the movement of the mobile terminal may be predicted and the corresponding location selected from the database, as described above.”), cls. 2, 22.)

9.7 1[d] estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE

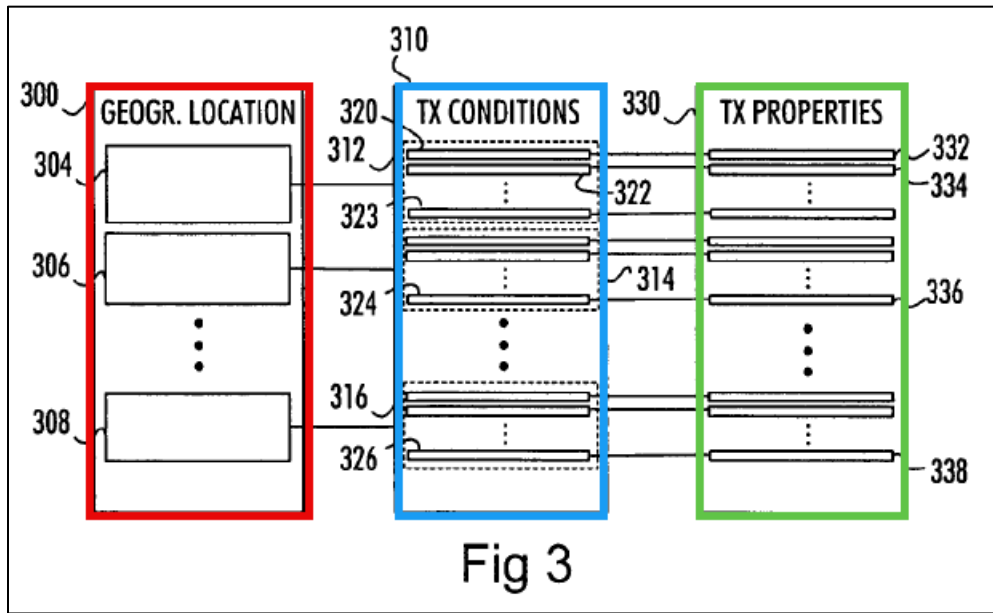
24[d] estimating one or more neighboring link qualities (LQs) of the UE at the at least one neighboring positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.

33[d] estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE

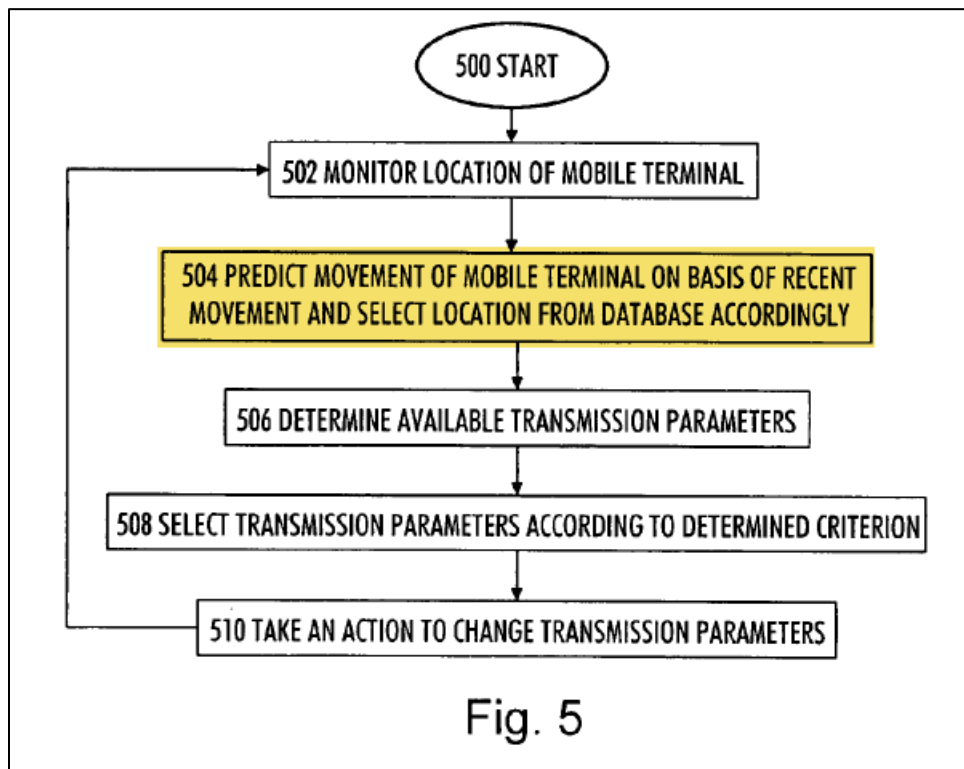
34[d] estimating a future link quality (LQ) of the second UE at the at least one future positioning of the second UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the one or more UE

61. In my opinion, Jarvinen discloses estimating a future link quality of a UE at a future position (e.g., location) based on stored information about a plurality of link qualities at UE positions.

62. As discussed above at Sections 9.3 and 9.4, Jarvinen determines UE locations and link qualities at those locations, then stores them in the database depicted in Figure 3:



(Jarvinen, Fig. 3. *See also* Jarvinen at ¶¶0035-47.) Jarvinen later estimates a future location of a UE, as discussed in Section 9.5. Jarvinen’s estimation of future UE location is shown at Block 504 in Figure 5:



(Jarvinen, Fig. 5. *See also* Jarvinen at 0048-66.)

63. After estimating the UE's future position, Jarvinen estimates the UE's future link quality at that estimated position based on information stored in its database. This is shown in Jarvinen's Claim 4, where a UE's future link quality is estimated by reviewing Transmission Property values stored in the database at the UE's predicted future location:

4. The method of claim 1, wherein the checking of the database further comprises

reading transmission property values linked to the geographical location associated with a predicted movement of the mobile terminal,

selecting one of the transmission property values according to the determined optimality criterion, and

selecting transmission conditions linked to the selected transmission property value.

(Jarvinen, cl. 4.)

64. Jarvinen explains that this Transmission Property-focused (i.e., link quality-focused) embodiment occurs when Transmission Conditions (i.e., transmission parameters) are selected "according to a determined criterion[,]" and that criterion is Transmission Properties. (*See* Jarvinen, ¶¶0051-52.) Jarvinen states that one would look to the Transmission Properties criterion "to obtain the highest possible reception signal level with the lowest possible transmit signal level."

(Jarvinen, ¶0052.) When evaluating Transmission Conditions by the best possible Transmission Properties, “the transmission signal levels included in the available transmission condition groups may be compared with *the reception signal levels included in the transmission property values*, and the transmission property group providing the highest ratio between the reception signal level and *the transmission signal level may be selected.*” (Jarvinen, ¶0052. See also Jarvinen at ¶¶0053 (“The transmission condition group most suitable for the selected criterion may be *selected in block 508* by comparing *the transmission property values* of the transmission condition groups.”), 0064 (“*the transmission property values* associated with the predicted geographical location *may be checked* in block 506 and, if it is detected that none of the available transmission condition groups provide a sufficient transmission quality”), cls. 2, 22.)⁶

⁶ As discussed in Section 9.3, Jarvinen describes a UE performing the disclosed method instead of, or in addition to, the base station. (Jarvinen, cls. 21 (“a processing unit configured to check a database for *transmission conditions of the communication link* that are most optimal according to a determined optimality criterion for *current movement of the mobile terminal*”), 22, 26 (“the processing unit is further configured to *measure a communication link quality indicator*”), 38. See also Jarvinen. at ¶¶0048-52.)

65. Limitation 24[d], like Limitation 24[c] discussed at Section 9.6, refers to estimating the UE's "neighboring link qualities" at the UE's "neighboring positioning." As discussed above, these "neighboring" link qualities and positions are nearby link qualities and positions of the UE. (*See* Jarvinen, ¶0064.) For the reasons discussed in Section 9.7, in my opinion, Jarvinen meets Limitation 24[d]. In addition, Jarvinen's claim 4 describes a process 24[d] estimating one or more neighboring link qualities (LQs) of the UE at the at least one neighboring positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.

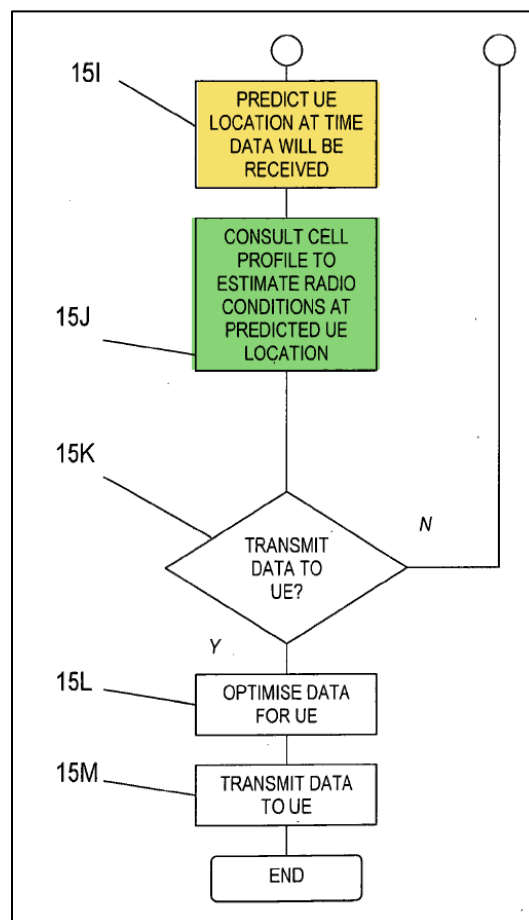
9.8 Limitations 1[d], 24[d], 33[d] and 34[d]: Obvious by Jarvinen in View of Fox Under 35 U.S.C. § 103

66. Fox discloses estimating a future (or neighboring) link quality of a UE (or second UE) at a future (or neighboring) position based on stored information associated with the plurality of link qualities at the plurality of positionings of the UE. In my opinion, all of Limitations 1[d], 24[d], 33[d] and 34[d] are taught or suggested in Jarvinen in view of Fox, and a POSITA would have been motivated to combine Fox with Jarvinen for the reasons set forth in Section 9.8.1.

67. Fox's controller first collects a plurality of link qualities at a plurality of UE positions. (*See* Fox, ¶0043 ("The radio measurements may include received signal strength, transmit power levels, neighbour cell measurements."), 0048 ("The

radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qqual, RSSI, RSCP . . . etc.”).) The controller then stores this information along with the location where it measured the link quality in a database. (Fox, ¶0022 (“The controller may build and maintain *a record of radio quality across a coverage area of the network* . . . The record may be in the form of *a map of the coverage area, indicating which areas of the coverage area provide which qualities of radio coverage.*”).)

68. Later, the controller predicts the UE’s future location, as shown in Figure 15B at Step 15I:



(Fox, ¶0367 (“At step 15I the processor 1244 predicts the location of mobile terminal 1200”), Fig. 15B.) In Step 15J, the controller uses “the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to *estimate the radio conditions available to that mobile terminal at a future location*[.]” (Fox, ¶0022, 0368 (“At step 15J the cell map/profile from the store 1242 is consulted by the processor 1244 to retrieve data relating to the predicted future location of the mobile terminal.”), Fig. 15B.)

9.8.1 Motivations to Combine Jarvinen and Fox

69. In my opinion, a POSITA would have been motivated to combine the teachings of Fox with Jarvinen. Jarvinen recognized the benefits of estimating a UE’s link quality at a future location because doing so allowed one to “*select appropriate transmission conditions for a mobile terminal* located in the geographical location” ahead of time. (Jarvinen, ¶0031 (“optimal transmission conditions may be selected *before* a change in the radio channel environment to prevent the degradation of signals.”).) Knowing appropriate transmission conditions beforehand may mean that the “transmit power level of the mobile terminal may be lowered in order to save the battery . . . and/or a data rate may be increased to provide a faster communication link between the mobile terminal and the base station[.]” or on the other hand, “the transmit power level may be increased and/or the data rate

may be lowered” to maintain the connection between the UE and the base station. (Jarvinen, ¶¶0060.)

70. A POSITA faced with the problem of estimating a UE’s future link quality at a location would have looked to Fox because Fox solves the problem of estimating future link quality with the exact same information available to Jarvinen. Specifically, both Jarvinen and Fox disclose measuring UEs’ link qualities at locations, then storing those pieces of information together in a database. (See Sections 9.3, 9.4; Jarvinen, ¶¶0009, 0021, 0031, 0034-47, cls. 6-8, 26, 27, Figs. 3, 4; Fox, ¶¶0022, 0043, 0048, Figs. 15A, 15B.) Fox further discloses estimating a UE’s link quality at a future location by referring to a previous link quality measurement taken at the same location. (Fox, ¶0022 (controller using “the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to *estimate the radio conditions available to that mobile terminal at a future location*[.]”).) All of the data upon which Fox relies is already disclosed and linked together in Jarvinen’s database, and it would have been obvious for a POSITA to combine Fox’s method of looking up previous link quality to estimate future link quality with Jarvinen’s teachings.

71. And there are additional similarities between the references that would have motivated a POSITA to combine them. Both references are in the same technological field: wireless networking. (Compare Jarvinen, Abstract with Fox,

Abstract.) Both references were seeking to solve the same problem: estimating a UE's future position and the link quality at that position. (*Compare* Jarvinen, ¶¶0035-66, Figs. 3, 5 *with* Fox, ¶¶0022, 0043, 0048, Figs. 15A, 15B.) Both references were seeking to solve this problem toward the same end: improving transmission conditions for the UE at the future position. (*Id.*) Both references refer to UMTS as an exemplary wireless networking technology. (*Compare* Jarvinen, ¶¶0042, 0043, 0057 *with* Fox, ¶¶0161, 0243.)

72. Moreover, in my opinion, modifying Jarvinen to perform Fox's link quality estimation would have constituted a simple substitution of a known element to yield predictable results. As discussed above, Jarvinen already stores all information necessary to perform Fox's estimation step. (*See* Jarvinen, ¶¶0009, 0021, 0031, 0034-47, cls. 6-8, 26, 27, Figs. 3, 4; Fox, ¶¶0022.) Moreover, the estimation step is a simple one to implement because it would require only a simple database lookup: searching Jarvinen's database for the UE's future location in the "Geographic Locations" column, then reading the "Transmission Properties" value associated with that location. (*Id.*) Using Fox's estimated link quality would have yielded predictable results because it would yield information already known in Jarvinen: the Transmission Properties (i.e., link quality) at a given location. (Jarvinen, ¶¶0035-66, Figs. 3, 5.; Fox, ¶¶0022.) Jarvinen teaches storing the exact same link quality information as Fox. (*Compare* Jarvinen, ¶¶0034 ("The reception

level of the signal may be a *received signal strength indicator (RSSI)* . . . another communication link quality indicator may be measured, such as a *signal-to-interference power ratio.*”) with Fox, ¶¶0043 (“The radio measurements may include *received signal strength* . . .”), 0048 (“The radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qqual, *RSSI*, RSCP . . . etc.”), 0331 (“based on signal-to-noise ratio, *signal-to-interference plus noise ratio (SINR)*, signal-to-noise plus distortion ratio (SNDR)”).)

73. In my opinion, it also would have been obvious to try estimating link quality at a future location based on previous link quality measurements at that same location. A POSITA could well assume that link quality measurements at a location may be largely static over time. (See Jarvinen, ¶¶0016-17, 0019, 0039; Fox, ¶0303.) Link quality depends upon many factors, but some of those factors are unchanging: the location of mountains, trees, buildings as well as the base station itself. (*Id.*) Previous measurements of link quality would be useful to a POSITA to estimate, the best they can, what link quality might be at that same location sometime in the future. (See Jarvinen, ¶¶0035-66, Figs. 3, 5; Fox, ¶¶0022, 0043, 0048, Figs. 15A, 15B.) As a result, it would have been obvious for a POSITA to try modifying Jarvinen to include Fox’s link quality estimation method.

9.8.1.1 Additional References Confirm My Opinion

74. Other references from before the '868 Patent's claimed priority date confirm my opinion that a POSITA would have been motivated to combine Jarvinen with Fox's estimation of a future (or neighboring) link quality of a UE (or second UE) at a future (or neighboring) position based on stored information associated with the plurality of link qualities at the plurality of positionings of the UE.

75. For example, the 2006 article, "Exploring Spatial Correlation for Link Quality Estimation in Wireless Sensor Networks" ("Xu"), describes a weighted regression model that estimates link quality in wireless sensor networks. (*See* Xu, Abstract.) "Regression is a classic technique widely used for . . . prediction." (*Id.* at 3.) The technique used by the model, called "spatial correlation," involves a sensor node collecting link quality values between itself and neighboring sensor nodes "such that the quality of a link to a neighbor node can be estimated based on the quality of links to other nodes geographically close." (*See id.*, Abstract.) In my opinion, Xu's disclosure makes it obvious to try modifying Jarvinen to include Fox's link quality estimation method because Xu likewise relies on previous link quality measurements to estimate future or neighboring link quality and demonstrates that such an approach would be successful.

76. As a further example, the 1998 article, "Variable-rate adaptive trellis-coded QAM for high-bandwidth efficiency applications in Rayleigh fading

channels” (“Lau”), describes the rapid adaptation of modulation and coding algorithms for wireless systems based on channel states. (*See* Lau, Abstract.) The approach uses a linear model wherein “[p]ast channel states are fed back to the transmitter with delay [and c]urrent channel state is then predicted at the transmitter to decide on the appropriate modulation mode for the current symbol.” (*Id.*) In other words, the system assumed that past link quality measurements could be used to predict future link quality. In my opinion, a POSITA would have been motivated to combine Jarvinen and Fox because Lau likewise relies on previous link quality measurements to estimate future or neighboring link quality and demonstrates that such an approach would be successful.

9.9 Limitations 1[d], 24[d], 33[d] and 34[d]: Single-Reference Obviousness Under § 103

77. In my opinion, it would have been obvious for a person of ordinary skill to modify Jarvinen to estimate link quality at a given location in the future by evaluating the previously measured link quality at a given location (discussed at Sections 9.7 and 9.8).

78. This modification would be minimal because Jarvinen already assumes that the link quality previously measured and stored at a location will match the link quality at that location in the future. This assumption is at least implicit in Jarvinen because it discloses selecting Transmission Conditions based on Transmission

Properties (i.e., link quality) measured at a given location in the past. (See Section 9.7, Jarvinen, ¶¶0051-53 (“criterion may be to obtain the highest possible reception signal level with the lowest possible transmit signal level[,]” “the transmission signal levels included in the available transmission condition groups may be compared with *the reception signal levels included in the transmission property values*[,]” “The transmission condition group most suitable for the selected criterion may be selected in block 508 by comparing *the transmission property values* of the transmission condition groups.”), cl. 4 (*reading transmission property values* linked to *the geographical location associated with a predicted movement of the mobile terminal, selecting one of the transmission property values* according to the determined optimality criterion . . .”).) By selecting future Transmission Conditions at a future location based on previously measured Transmission Properties at that location, Jarvinen is assuming that “past is prologue” with regard to link quality.

79. The '868 Patent likewise makes this same assumption, and uses previously stored link quality information at a UE's estimated future location to “estimate a future link quality.” (See '868 Patent, 1:40-64 (“estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE *based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE*.”). See also '868 Patent, 24:46-54 (estimating different link qualities (830a, 830b) at different possible UE positions (860a, 860b)), 24:54-62

(estimating the UE's future link quality "based on the stored information associated with the plurality of LQs 803a, 830b at the plurality of positionings of the UE device 820.".)

80. And, like the '868 Patent, Jarvinen then acts on the assumption that the previously recorded link quality at a location would be a good estimate of the current link quality at that location. (Jarvinen, cl. 4 (reading transmission property values linked to the geographical location associated with a predicted movement of the mobile terminal, *selecting one of the transmission property values* according to the determined optimality criterion . . .").)

81. After estimating the UE's location, Jarvinen uses link quality to decide which of several Transmission Conditions to choose to best utilize the communications link when the UE arrives at that future location. (Jarvinen, cl. 1 ("taking action to change the transmission conditions of the communication link upon detecting, in the database, the transmission conditions providing a more optimal communication link").) The '868 Patent likewise acts upon its estimation of future link quality to improve communications between base station and UE. ('868 Patent, 26:51-57 ("the BS obtains a plurality of estimated future LQs of the plurality of UE devices and the scheduler assigns transmit modes to each of the plurality of UE devices based on the plurality of estimated future LQs . . .").)

82. Furthermore, Jarvinen explains that estimating future link quality in this manner is beneficial because it eliminates the need to remeasure link quality in real-time: “When provided with knowledge of data transmission properties (or quality measures of a communication link) obtainable with different transmission conditions from a given geographical location, one may select appropriate transmission conditions for a mobile terminal located in the geographical location or arriving shortly at the geographical location *with no need to measure properties of the radio channel environment and react to the changing environment.*” (Jarvinen, ¶0031.) The ’868 Patent likewise recognizes this benefit. (See ’868 Patent, 25:27-32, 26:45-51, 27:24-46.)

83. In view of the above, it is my opinion that it would have been obvious for a person of ordinary skill to modify Jarvinen to estimate a future link quality of the UE at the at least one future positioning by assuming that a previous link quality at a location will match a current link quality at that same location.

9.9.1 Additional References Confirm My Opinion

84. Other references from before the ’868 Patent’s claimed priority date confirm my opinion that it would have been obvious for a person of ordinary skill to modify Jarvinen to estimate a future link quality of the UE at the at least one future positioning by assuming that a previous link quality at a location will match a current link quality at that same location.

85. For example, Xu's disclosure of a technique that uses "spatial correlation" to estimate "the quality of a link to a neighbor node . . . based on the quality of links to other nodes geographically close" that were previously collected informs my opinion that it would have been obvious for a POSITA to modify Jarvinen to estimate a future link quality of the UE at the at least one future positioning by assuming that a previous link quality at a location will match a current link quality at that same location. (*See Xu, Abstract.*) This is because Xu demonstrates that such an assumption was common in the art.

86. Another example is Lau, which describes a linear model wherein "[p]ast channel states are fed back to the transmitter with delay [and c]urrent channel state is then predicted at the transmitter to decide on the appropriate modulation mode for the current symbol." (*See Lau, Abstract.*) In my opinion, a POSITA would have been motivated to modify Jarvinen to estimate a future link quality of the UE at the at least one future positioning by assuming that a previous link quality at a location will match a current link quality at that same location. This is because Lau also demonstrates that such an assumption was common in the art.

9.10 Claim 2: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs comprises one or more of a path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), channel quality indicator (CQI), channel state information (CQI), packet error rate (PER).

87. Claim 2 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses that the link qualities comprise at least path loss, shadowing, signal-to-interference ratio, packet error rate and channel quality indicator. (Jarvinen, ¶¶0002 (“The attenuation is typically caused by *path loss*, *shadowing*, and fading.”), 0017 (“*Shadowing* is superimposed on *path loss*[.]”), 0034 (“The reception level of the signal may be a *received signal strength indicator (RSSI)* . . . another communication link quality indicator may be measured, such as a *signal-to-interference power ratio*.”), 0062 (“The *communication quality indicator* may be, for example, a measured reception power level of a signal received from the mobile terminal and/or from the base station.”), 0067 (“the base station may monitor the *communication quality indicator* measured from signals received from the mobile terminal . . .”). See also Jarvinen at ¶¶0033 (“reception *signal strengths* or other *communication quality metrics* obtained from a plurality of geographical locations.”), 0039, 0052, cl. 8 (“the measured communication link

quality indicator is a measured level of the received signal”).) In my opinion, this limitation is met.

9.11 Claim 3: The method of claim 1, wherein at least one of the future LQ or the information associated with the plurality of LQs is associated with an uplink or downlink transmission.

88. Claim 3 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses that the future link quality information is associated with uplink and downlink transmissions. (Jarvinen, ¶¶0047 (“Naturally, the database may also be utilized in managing *downlink transmission*.”), 0072 (“Above, the utilization of the database in the selection of transmission conditions has been described for *uplink transmission*, but it may be utilized in the same way for *downlink transmission*.”). See also Jarvinen at ¶¶0041, 0055, 0073.) In my opinion, this limitation is met.

9.12 Claim 4: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a frequency band or a frequency channel.

89. Claim 4 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses that the link qualities are associated with a frequency band or a frequency channel. (Jarvinen, ¶¶0041 (“The transmission conditions may include radio system parameters, such as the *transmission*

frequency and a serving base station but also other conditions such as bearing of the mobile terminal and transmit power.”), 0042 (“The *transmission frequency* is a parameter known to the base station from a transmission protocol.”), 0061 (“The time window may be reset, i.e. the monitoring may be restarted, when the *transmission frequency is changed, because the radio channel properties are dependent on the transmission frequency*, and monitoring over different frequencies would provide unreliable results.”), 0072 (“For the downlink, the base station *transmission frequency* and the radio system may be changed[.]”), cls. 12, 31 (“the transmission conditions comprise at least one of the following: a transmission frequency . . .”). *See also* Jarvinen at 0055.) In my opinion, this limitation is met.

9.13 Claim 5: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a wireless communication technology.

90. Claim 5 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses that the link qualities are associated with a wireless communication technology. (Jarvinen, ¶¶0042 (“The base station may be a base station configured to communicate according to at least one of the following data transmission standards: GSM (Global System for Mobile Communications), UMTS (Universal Mobile Telecommunication System) based on W-CDMA

(Wideband Code Division Multiple Access) and/or OFDMA (Orthogonal Frequency Division Multiple Access) and SC-FDMA (Single Carrier Frequency Division Multiple Access), WLAN (Wireless Local Area Network).”), 0043 (“The transmit power level may be communicated from the mobile terminal to the base station, or it may be tracked with a transmit power control procedure utilized in many mobile telecommunication systems, including UMTS.”).) In my opinion, this limitation is met.

9.14 Claim 6: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a link partner of the UE.

91. Claim 6 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses that the link qualities are associated with a link partner of the UE (e.g., a base station). (Jarvinen, ¶¶0062 (“The communication quality indicator may be, for example, a measured reception power level of a signal received from the mobile terminal and/or from *the base station*.”), 0067 (“Additionally, *the base station* may monitor the communication quality indicator measured from signals received from the mobile terminal within a determined time window . . .”), 0073 (“The database may also be stored in both *the base station* and the mobile terminal. The updates of the database may be

communicated from the base station to the mobile terminal.”).) In my opinion, this limitation is met.

9.15 Claim 7: The method of claim 1, wherein a link quality positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated future positioning or the estimated future LQ.

92. Claim 7 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. As discussed above at Section 9.3, it is my opinion that Jarvinen also discloses that the link quality positioning information stored in its database includes at least one of the determined plurality of link qualities (“Transmission Properties”), the stored information, the estimated future positioning (“Geographical Location”) or the estimated future link quality (“Transmission Properties”). (*See also* Jarvinen, ¶¶0034-36, Figs. 3, 4.) In my opinion, this limitation is met.

9.16 Claim 8: The method of claim 7, wherein the UE obtains at least a portion of the link quality positioning information from a link partner or wherein the UE communicates the at least the portion of the link quality positioning information to the link partner.

93. Claim 8 is dependent upon Claim 7, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.15. In addition, it is my opinion that Jarvinen also discloses that the UE obtains link quality positioning information from a link partner or the UE communicates link quality positioning information to the link partner. For example, Jarvinen discloses the UE

and a link partner (e.g., base station) transmitting signal information to one another. (Jarvinen, ¶0034 (“Transmission of *the signaling information related to the geographical information* may be defined in a communication protocol used in the communication between the mobile terminal and *the base station.*”), 0067 (“Furthermore, the mobile terminal may monitor *the communication quality indicator measured from a signal received from the base station*, as described above, and transmit the communication quality indicator periodically to the base station”). *See also* Jarvinen at ¶¶0048, 0065, cls. 5, 25.) Jarvinen also discloses the base station and UE cooperatively communicating the link quality positioning information with one another, depending on which of the two nodes maintains the database:

In the description above, the base station measured and stored the database in a memory unit of a radio access network. Alternatively, the database may be stored in a memory unit of the mobile terminal. The measurements may still be carried out by the base station *but the base station may inform the mobile terminal of the measurement results*, and the mobile terminal may add the results (and other transmission property values), the transmission conditions, and the geographical location values to the database stored in the memory unit of the mobile terminal. Of course, the database may be stored in both the mobile terminal and the radio network

(Jarvinen, ¶0045.) In my opinion, this limitation is met.

9.17 Claim 9: The method of claim 7, further comprising determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information.

94. Claim 9 is dependent upon Claim 7, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.15. In addition, it is my opinion that Jarvinen also discloses determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information – for example, monitoring the user’s usage of a UE (e.g., on what bearing the UE is positioned) as part of evaluating link quality. (Jarvinen, ¶¶0017 (“a user of the mobile terminal may cause shadowing when talking on the phone such that the user’s head is located between the mobile terminal and a base station communicating with the mobile terminal.”), 0043 (“The bearing of the mobile terminal during the transmission may be determined by motion sensors or a compass provided in the mobile terminal. . . . the mobile terminal is able to determine its bearing with respect to the base station.”), 0054, 0058 (“the mobile terminal may instruct the user of the mobile terminal to change the bearing of the mobile terminal towards the base station of a radio system indicated in the transmission condition group selected in block 508.”), cls. 12, 31.) Alternatively, Jarvinen teaches using the UE’s location, which is based on usage, to determine and

store link quality information. (See Section 9.3.) In my opinion, this limitation is met.

9.18 Claim 10: The method of claim 9, wherein the UE usage information comprises UE information indicating one or more of a user handheld mode, a hands-free mode, a speaker phone mode, a car Bluetooth mode, a headset Bluetooth mode.

95. Claim 10 is dependent upon Claim 9, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.15 and 9.17. In addition, it is my opinion that Jarvinen explains that the system uses UE usage information to detect whether a UE is being used in handheld mode, and needs to be reoriented to establish a better link quality. (Jarvinen, ¶0058 (“*the mobile terminal may give instructions to turn the backside of the mobile terminal, i.e. the side opposite to a side typically pressed against the user’s head during a phone call, towards the base station.*” This may be carried out in order to prevent the user’s head from causing a shadowing effect.”). See also Section 9.3, cls. 15, 35.) Jarvinen’s disclosed system also determines whether a UE is being used in a car or hands-free mode. (Jarvinen, ¶0071 (“The radio system may profile the mobile terminals according to their speeds into fixed, pedestrian, and *vehicular mobile terminals*, or according to their current location.”).) In my opinion, this limitation is met.

9.19 Claim 11: The method of claim 7, further comprising determining a UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information.

96. Claim 11 is dependent upon Claim 7, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.15. In addition, it is my opinion that Jarvinen also discloses determining UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information. (Jarvinen, ¶¶0039 (“The database may be updated constantly with new data to adapt the database to *changes in the radio environments* related to different geographical locations. . . . The *radio environment* may have changed due to newly constructed buildings[.]”), 0062 (“Several factors may affect the actual transmission properties with given transmission conditions. Such factors include *season of the year, weather, traffic*, etc.”). *See also* Jarvinen at ¶¶0058-59.) In my opinion, this limitation is met.

9.20 Claim 12: The method of claim 11, wherein the UE environment information comprises information associated to one or more of a traffic load, a network load, an interference, time of day, whether [sic] information, day of year, season.

97. Claim 12 is dependent upon Claim 11, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.15 and 9.19. In addition, it is my opinion that Jarvinen also discloses UE environment information

that includes “season of the year, weather, traffic, etc.” (Jarvinen, ¶0062.) In my opinion, this limitation is met.

9.21 Claim 13: The method of claim 11, wherein the UE environment information comprises information associated with surrounding objects or information associated with a user of the UE.

98. Claim 13 is dependent upon Claim 11, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.15, 9.19. In addition, it is my opinion that Jarvinen also discloses UE environment information that includes “*changes in the radio environments* related to different geographical locations. . . . The *radio environment* may have changed due to newly constructed buildings, for example.” (Jarvinen, ¶0039.) As discussed in Section 9.19, Jarvinen also discloses UE environment information associated with a user of the UE. In my opinion, this limitation is met.

9.22 Claim 14: The method of claim 13, wherein the information associated with the user of the UE includes positioning of the user of the UE or positioning of the user of the UE relative to the UE.

99. Claim 14 is dependent upon Claim 13, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.15, 9.19 and 9.21. As discussed in Sections 9.3 and 9.21, it is my opinion that Jarvinen discloses environment information associated with the user’s positioning relative to the UE. In my opinion, this limitation is met.

9.23 Claim 15: The method of claim 11, further comprising assisting determining the UE environment information using sensors of the UE.

100. Claim 15 is dependent upon Claim 11, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.15 and 9.19. In addition, it is my opinion that Jarvinen also discloses determining UE environment information using sensors of the UE. (Jarvinen, ¶¶0029 (“The positioning device 208 may be configured to monitor the geographical location of the mobile terminal in real time by communicating with one or more satellites of a satellite positioning system, such as *GPS, assisted GPS (A-GPS), or Galileo*. Other alternatives for tracking the location and the movement of the mobile terminal include providing *motion sensors* in the positioning device 208 . . .”), 0043 (“The bearing of the mobile terminal during the transmission may be determined by *motion sensors or a compass* provided in the mobile terminal.”), cls. 20, 38.) In my opinion, this limitation is met.

9.24 Claim 16: The method of claim 1, further comprising allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future LQ.

101. Claim 16 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future

link quality. (Jarvinen, ¶¶0054 (“action is taken in block 510 to ***change the transmission conditions of the mobile terminal*** to ones corresponding to the transmission condition group selected in block 508. . . . With respect to the exemplary transmission conditions listed above, i.e. ***transmission frequency***, serving base station, transmit power, and bearing of the mobile terminal, . . .”), 0055 (“the mobile terminal may communicate with a base station currently communicating with the mobile terminal ***about a change of transmission frequency***.”), 0078 (“In other words, regular handover and ***radio resource management operations*** may be used together with the embodiments of the invention.”). See also *id.* at ¶¶0005 (“taking action to ***change the transmission conditions of the communication link*** upon detecting, in the database, transmission conditions providing a more optimal communication link . . .”), 0006-9, 0072 (“For the downlink, ***the base station transmission frequency and the radio system may be changed*** similarly to that described above with respect to the uplink.”), Fig. 5 (Block 510 (“Take Action to Change Transmission Parameters”)), cls. 12, 13, 31, 32.) In my opinion, this limitation is met.

9.25 Claim 17: The method of claim 1, further comprising selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future LQ.

102. Claim 17 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future link quality. (Jarvinen, ¶¶0005 (“taking action to *change the transmission conditions of the communication link* upon detecting, in the database, transmission conditions providing a more optimal communication link . . . ”), 0054 (“action is taken in block 510 to change the transmission conditions of the mobile terminal to ones corresponding to the transmission condition group selected in block 508. . . . With respect to the exemplary *transmission conditions listed above, i.e. transmission frequency, serving base station, transmit power, and bearing of the mobile terminal*, a change of each of these parameters will be described next.”), 0060 (“The improvement in the radio channel may be utilized in a number of different ways. For example, a *transmit power level of the mobile terminal may be lowered* in order to save the battery and prolong the operational duration of the mobile terminal, and/or *a data rate may be increased* to provide a faster

communication link between the mobile terminal and the base station.”), cls. 12, 13, 31, 32.) In my opinion, this limitation is met.

9.26 Claim 18: The method of claim 17, wherein the transmission mode comprises one or more of a modulation, a code, a modulation and coding scheme (MCS), a multiple input multiple output (MIMO) mode, a beamforming parameter, a transmit power.

103. Claim 18 is dependent upon Claim 17, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.25. In addition, it is my opinion that Jarvinen also discloses a transmission mode comprising modulation and coding scheme and transmit power. (Jarvinen, ¶¶0002 (“*Transmit power control* is a known scheme to combat all types of attenuation. *Modulation and coding schemes* may also be changed according to radio channel properties . . .”), 0041 (“The transmission conditions may include radio system parameters, such as the transmission frequency and a serving base station but also other conditions such as bearing of the mobile terminal and *transmit power*.”), 0054 (“With respect to the exemplary transmission conditions listed above, i.e. transmission frequency, serving base station, *transmit power*, and bearing of the mobile terminal, a change of each of these parameters will be described next.”), 0060 (“a *transmit power* level of the mobile terminal may be lowered in order to save the battery and prolong the operational duration of the mobile terminal[.]”).) In my opinion, this limitation is met.

9.27 Claim 19: The method of claim 1, further comprising obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time.

104. Claim 19 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. As discussed above in Section 9.5, it is my opinion that Jarvinen discloses obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time. (See Jarvinen, cls. 2, 22.) In my opinion, this limitation is met.

9.28 Claim 20: The method of claim 1, further comprising a second plurality of positionings wherein the second plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of LQs based on the second plurality of positionings.

105. Claim 20 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. As discussed above in Section 9.3, it is my opinion that Jarvinen's database includes positioning information related to more than one UE. (See Jarvinen, ¶0036.) Moreover, the method disclosed in Jarvinen may review several positionings stored in the database before making a determination. (Jarvinen, ¶0041 ("One or more of the above-mentioned transmission conditions may be stored in a transmission condition group of a transmission condition set associated with a given geographical location.")). Jarvinen therefore discloses a second plurality of positionings wherein the second

plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of link qualities based on the second plurality of positionings. In my opinion, this limitation is met.

9.29 Claim 21: The method of claim 20, further comprising allocating a resource block (RB) to a UE link based on the estimated second plurality of LQs.

106. Claim 21 is dependent upon Claim 20, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.28. In addition, it is my opinion that Jarvinen discloses that “*radio resource management operations* may be used together with the embodiments of the invention[,]” giving as an example, “management of the transmission conditions may be performed within the scope of available resources (for example available frequencies allocated to a base station).” (Jarvinen, ¶0078.) These resource allocations include resource blocks. In my opinion, this limitation is met.

9.29.1 Claim 21: Obvious by Jarvinen in View of Fox Under 35 U.S.C. § 103

107. In my opinion, Claim 21 is taught or suggested in Jarvinen in view of Fox. A POSITA would have been motivated to combine Fox with Jarvinen for the reasons set forth in Section 9.8.1. After estimating a UE’s link quality at a future (or neighboring) location, Fox further discloses allocating a resource block (RB) to a UE link based on the estimated second plurality of link qualities because Fox allocates the most optimal radio resources, including resource blocks, to the UE

based on its estimated link qualities. (Fox, ¶¶0022 (the controller can “control *the transmission of data between the radio access network and that mobile terminal at the calculated location* in dependence thereon.”), 0566 (“The radio resource allocation may be defined for a type of application or user—the *pre-allocated resource blocks* or Codes, or Timeslots.”), 0583 (“The radio resource allocation may be defined for a type of application or user, by allocating particular *resource blocks*, codes or time slots.”). *See also* Jarvinen, ¶ 0578 (“Resource Blocks in LTE”).)

9.29.1.1 Additional References Confirm My Opinion

108. Other references from before the '868 Patent's claimed priority date confirm my opinion that a POSITA would have been motivated to combine Jarvinen with Fox's allocation of a resource block (RB) to a UE link based on the estimated second plurality of link qualities.

109. For example, the 2009 thesis, “Dynamic Radio Resource management in 3GPP LTE” (“Hussain”), discloses that resource blocks are a type of radio resource. (See Hussain, 26 (“*Radio resource scheduling is a process in which resource blocks are distributed among the UEs*. Before the eNodeB can assign the modulation technique and coding rate to an UE, *based on the transmission channel condition, it must be assigned radio resource blocks*.”).) Accordingly, it is my opinion that a POSITA would have been motivated to combine Jarvinen with Fox's allocation of a resource block (RB) to a UE link based on the estimated second

plurality of link qualities for a wireless transmission because Hussain demonstrates that such a combination would be possible and successful.

9.29.2 Claim 21: Single-reference Obviousness Under § 103

110. In my opinion, because a person of ordinary skill in the art would understand that the resources available in a telecommunications network, which Jarvinen expressly references, would include resource blocks – or blocks of time on a frequency channel – it would have been obvious to modify Jarvinen to include “allocating a resource block (RB) to a UE link.”

9.29.2.1 Additional References Confirm My Opinion

111. Other references from before the '868 Patent's claimed priority date confirm my view that it would have been obvious for a person of ordinary skill in the art to modify Jarvinen to include “allocating a resource block (RB) to a UE link.”

112. For example, Hussain's disclosure that resource blocks are a type of radio resource further supports my opinion that it would have been obvious for a POSITA to modify Jarvinen to include “allocating a resource block (RB) to a UE link.” (See Hussain, 26 (“***Radio resource scheduling is a process in which resource blocks are distributed among the UEs.*** Before the eNodeB can assign the modulation technique and coding rate to an UE, ***based on the transmission channel condition, it must be assigned radio resource blocks.***”).) This is because Hussain

shows that a POSITA would have known that resource blocks are a well-known type of radio resource.

9.30 Claim 22: The method of claim 1, wherein the plurality of positionings is constrained to a physical area.

113. Claim 22 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses the plurality of positionings being constrained to a physical area. (Jarvinen, ¶0050 (“The *geographical location (a limited area)* the mobile terminal will be entering next is predicted in block 504 . . .”), cls. 17, 36.) In my opinion, this limitation is met.

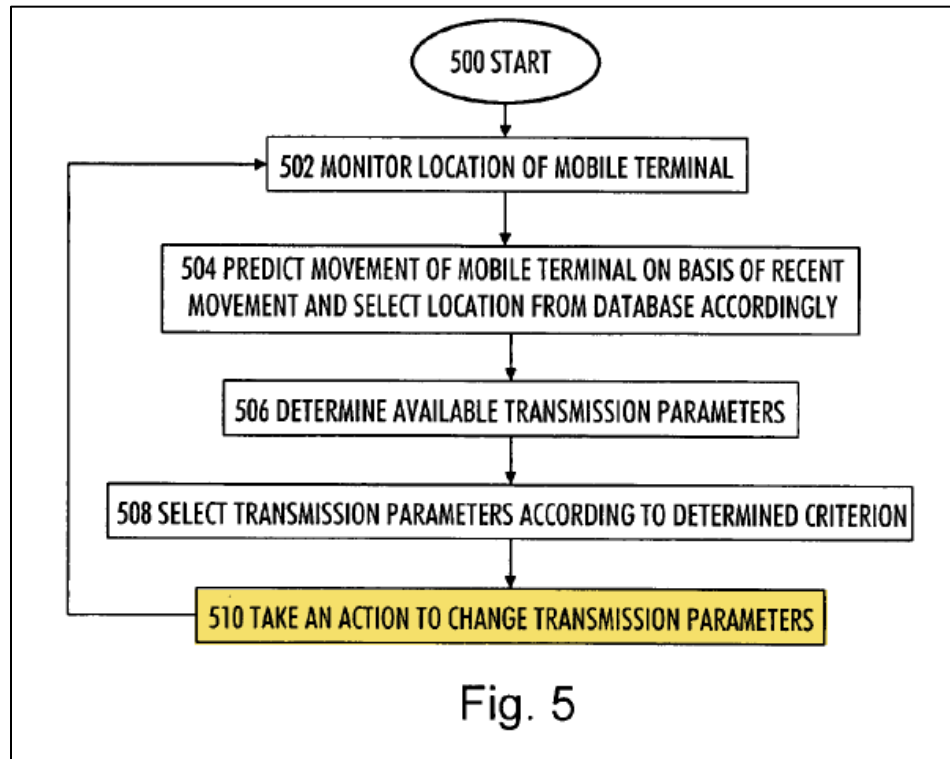
9.31 Claim 23: The method of claim 1, wherein at least one of the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an accuracy, a deformation, a velocity, an acceleration.

114. Claim 23 is dependent upon Claim 1, all limitations of which are disclosed in Jarvinen, in my opinion as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses the the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an accuracy, a deformation, a velocity, an acceleration. (Jarvinen, ¶¶0029 (“Other alternatives for tracking the location and the movement of the mobile terminal include providing *motion sensors* in the positioning device 208 . . .”), 0050 (“The geographical location (a limited area) the mobile terminal will be entering

next is predicted in block 504, for example, *by extrapolating the latest movement of the mobile terminal*[.]”), 0071 (“A radio system may also give profiles to mobile terminals within a radio access network of the radio system *on the basis of the movement of the mobile terminals*. The radio system may profile the mobile terminals *according to their speeds* into fixed, pedestrian, and vehicular mobile terminals[.]”).) In my opinion, this limitation is met.

9.32 Claim 25: The method of claim 24, further comprising adjusting or changing a configuration of the UE based on the one or more neighboring LQs.

115. Claim 25 is dependent upon Claim 24, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses adjusting or changing a configuration of the UE based on the one or more neighboring link qualities. Block 510 of Figure 5 shows the UE changing its transmission parameters after evaluating neighboring link qualities at Blocks 504, 506 and 508:



(Jarvinen, ¶¶0049, 0050, 0051, 0052, 0053, 0054 (“action is taken in block 510 to change the transmission conditions of the mobile terminal to ones corresponding to the transmission condition group selected in block 508”). *See also* Jarvinen at ¶¶0005-9, 0058-64, 0072, 0075, cls. 1, 2, 13, 14, 21, 22, 32-34, 36, 39, 40.) In my opinion, this limitation is met.

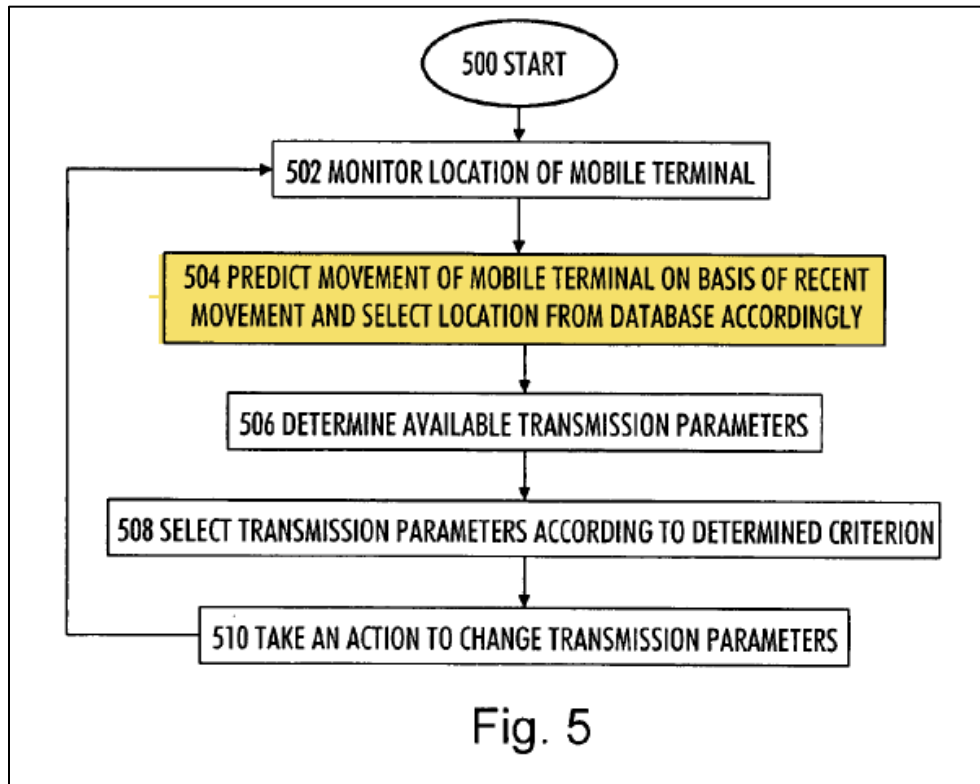
9.33 Claim 26: The method of claim 24, further comprising presenting the one or more neighboring LQs of the UE at the at least one neighboring positioning.

116. Claim 26 is dependent upon Claim 24, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses presenting the one or more neighboring (i.e., nearby) link qualities of the UE at the at least one neighboring positioning by

teaching that the user of the UE could be presented with an alternative bearing for the UE to improve link quality. (Jarvinen, ¶¶0058 (“If the current bearing of the mobile terminal differs from that indicated in the selected transmission condition group, *the mobile terminal may instruct the user of the mobile terminal to change the bearing* of the mobile terminal towards the base station of a radio system indicated in the transmission condition group selected in block 508.”), 0059 (“The instructions on changing the bearing of the mobile terminal may be *provided through the user interface of the mobile terminal*.”). See also Jarvinen at ¶¶0005-9, 0049-54, 0058-64, 0072, 0075, Fig. 5, cls. 14, 15, 33, 34.) In my opinion, this limitation is met.

9.34 Claim 27: The method of claim 24, further comprising selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring LQs.

117. Claim 27 is dependent upon Claim 24, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. In addition, it is my opinion that Jarvinen also discloses selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring link qualities. As discussed in Section 9.33 and shown in Figure 5, Jarvinen discloses selecting a position from its database:



(Jarvinen, Fig. 5.) This position is one of several neighboring positions where link quality would be best, and Jarvinen discloses instructing the user to move to such a position. (Jarvinen, ¶0058 (“the mobile terminal may instruct the user of the mobile terminal to change the bearing of the mobile terminal towards the base station of a radio system indicated in the transmission condition group selected in block 508.”)). *See also* Jarvinen at 0059, Fig. 5, cls. 14, 15, 33, 34.) In my opinion, this limitation is met.

9.35 Claim 28: The method of claim 27, further comprising presenting the selected candidate positioning to a user of the UE.

118. Claim 28 is dependent upon Claim 27, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.34. As

discussed in Section 9.33, it is my opinion that Jarvinen also discloses presenting the selected candidate positioning to a user of the UE. In my opinion, this limitation is met.

9.36 Claim 29: The method of claim 24, wherein a link quality neighboring positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated at least a positioning of the UE, the determined at least one neighboring positioning, or the one or more neighboring LQs.

119. Claim 29 is dependent upon Claim 24, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9. As discussed in Sections 9.3-9.6, it is my opinion that Jarvinen also discloses a link quality neighboring positioning information that includes at least one of the determined plurality of link qualities, the stored information, the estimated at least a positioning of the UE, the determined at least one neighboring positioning, or the one or more neighboring link qualities. In my opinion, this limitation is met.

9.37 Claim 30: The method of claim 29, further comprising determining a UE environment information, wherein at least a portion of the link quality neighboring positioning information is based on the UE environment information.

120. Claim 30 is dependent upon Claim 29, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9 and 9.36. As discussed in Section 9.19, it is my opinion that Jarvinen also discloses determining UE environment information, wherein at least a portion of the link quality

neighboring positioning information is based on the UE environment information.

In my opinion, this limitation is met.

9.38 Claim 31: The method of claim 30, the UE environment information comprises information associated with a user of the UE.

121. Claim 31 is dependent upon Claim 30, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.36 and 9.37.

As discussed in Section 9.21, it is my opinion that Jarvinen also discloses the UE environment information comprises information associated with a user of the UE.

In my opinion, this limitation is met.

9.39 Claim 32: The method of claim 30, further comprising selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning and a user positioning relative to the UE.

122. Claim 32 is dependent upon Claim 30, all limitations of which are disclosed in Jarvinen, in my opinion, as discussed in Sections 9.1-9.9, 9.36 and 9.37.

As discussed in Sections 9.3, 9.17, 9.21, it is my opinion that Jarvinen discloses selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning (e.g., geographic location) and a user positioning relative to the UE (e.g., bearing). In my opinion, this limitation is met.

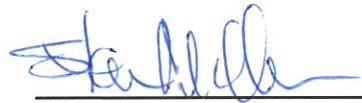
DECLARATION OF STAN MCCLELLAN IN SUPPORT OF
IPR PETITION FOR U.S. PATENT NO. 9,094,868

10. Conclusion

123. For the reasons discussed in detail above, it is my opinion that all of the Challenged Claims are invalid in view of the prior art.

124. I reserve the right to supplement my opinions in the future to respond to any arguments or positions that the Patent Owner may raise, taking account of new information as it becomes available to me.

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


Stan McClellan

Dated: September 18, 2024

Exhibit A

(Curriculum Vitae)

Stan A. McClellan, Ph.D.
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601 University Drive
San Marcos, TX 78666
(512) 245-2314

Home address:
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Chesterfield, VA 23838
(214) 476-5583

OBJECTIVE

The development of technologies & programs related to the efficient & secure creation, transmission, storage, and processing of information including design & optimization of systems which produce or use information, such as:

- Strategic Management of Intellectual Property
- Convergence of “Smart” Technologies & Business Models
- University / Industry Collaboration & Innovation
- Optimization of Computer / Network Architectures & Protocols
- Dynamic & Software-Defined Networks
- Signal/Image Processing, incl. Data Acquisition & Processing
- Novel Approaches to Cybersecurity for Systems & Data

SECTION/PAGE CROSS-REFERENCE

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COVER LETTER / SUMMARY

This document is a career summary, description of work experience, list of presentations, publications, and funding summary, as well as references. It is essentially a cover letter combined with a CV.

My career has ventured between academic and industrial pursuits. As such, I have experienced the responsibilities of holding **leadership positions**, the privileges of working on **significant projects**, and the excitement of participating as an **academic researcher** and **technology entrepreneur**. Throughout these activities, I have maintained an active role in **professional service** as well as **consultancy**. These items are summarized below.

I have **primary expertise** in topics related to speech/image processing, distributed & autonomous system architecture, and optimization of IP-based networks under Quality of Service constraints. These areas include contemporary “*marketecture*” concepts such as the “Internet of Things” and “Smart Grid/Smart City” initiatives. I have authored many technical publications and US/International patents on these topics. I am often invited to contribute to well-known multidisciplinary reference volumes, and have published topical books or chapters in books including:

- *Smart Cities in Application: Healthcare, Policy, & Innovation* (Springer, 2019)
- *The Smart Grid as an Application Development Platform* (Artech House, 2018)
- *Smart Cities: Applications, Technologies, Standards, & Driving Factors* (Springer)
- *Advances in Computers* (Elsevier)
- *The IEEE/CRC Electrical Engineering Handbook* (IEEE Press)
- *The Encyclopedias of Electrical & Electronics Engineering* (Wiley)
- *Lecture Notes in Pure & Applied Mathematics* (Marcel Dekker)
- *Medicine Meets Virtual Reality: Global Healthcare Grid* (IOS Press)

Currently, I am the **Director** of a large-scale partnership with Jacobs Technology Group and NASA’s Johnson Space Center (JSC). The **JSC Engineering, Technology and Science Program (JETS)** provides multidisciplinary facilities and expertise to design, implement, test, and analyze technologies & applications with direct bearing on space flight and extraterrestrial reconnaissance. The JETS program creates fully-loaded revenue exceeding \$1M/yr and involves multiple students, faculty, and NASA experts in relevant projects.

As **co-Director** of the Texas State University (TXST) “**Connected Infrastructure**” **initiative for Education, Demonstration, and Research (CIEDAR)** (2019-2023), I engaged with industry partners to recruit members, define projects, and manage outcomes for a value-driven, multi-disciplinary consortium. The CIEDAR Consortium is a research, development, and demonstration testbed facility associated with the university’s small business and startup company incubator, and is funded via appropriation from the State of Texas for long-term workforce development, economic stimulation, and technology validation.

The **JETS Program** and the **CIEDAR Consortium** have implications in several market verticals and social imperatives, including “*Smart*” and “*Connected*” devices, systems, applications, and other contemporary engineering issues in modern society as well as space exploration. These imperatives include energy & water management, “Internet of Things”

implementations in various areas (e.g. agriculture and endangered species), technology optimization for municipal applications, and reconciliation of the “digital divide.”

As **Professor** (2008-2023) and **Director** (2013-2018) of the Ingram School of Engineering at TXST, I performed typical research, teaching, and academic administrative duties, including:

- Managing & mentoring academic & technical personnel, including tenure-track faculty members in Electrical, Computer, Industrial, Manufacturing, and Civil Engineering,
- Overseeing departmental budgets, expenditures, & endowments, and developing new academic buildings & research facilities,
- Directing the development & implementation of new academic programs at the graduate and undergraduate levels,
- Cultivating value-driven industrial partnerships, and developing relationships between multi-disciplinary programs to enhance research outcomes.

Previously, I held **executive leadership positions** in companies large and small. These positions were primarily focused on the high-tech computer networking, telecommunications and aerospace & defense sectors. A few previous leadership positions have included:

- Distinguished Technologist & Technical Director (Hewlett Packard/Compaq)
- Chief Technology Officer & Co-Founder (Power Tagging Technologies)
- Chief Architect & Vice President of Business Development (ZNYX Networks)
- Lead Systems Engineer & Principal Investigator (General Dynamics)

Throughout my career, I’ve been privileged to participate in several **significant projects**. These activities span vertical markets including aerospace & defense programs, medical electronics & automation systems, development of new academic programs, and successful launch of a startup company in the “Smart Grid” space. A few of the more interesting projects include:

- Developed & successfully commercialized a revolutionary approach to Smart Grid communication, asset control, geolocation, & distributed voltage optimization to enable resilient power management for “Smart Cities” (\$20M+ startup investment).
- Designed two robotic imaging & diagnostic appliances for remote, intra-operative surgical consultation & automated cancer diagnostics with real-time doctor-in-the-loop control; and managed full clinical trials for both systems (\$3M+ research funding).
- Flight tested & improved the Digital Terrain System for the AFTI/F-16 fighter aircraft to enhance situational awareness & enable automated maneuvers during pilot blackout (\$7M+ program funding).
- Developed real-time 3D flight simulators using reconnaissance imagery, photogrammetric techniques, and measured/derived elevation data to enhance pilot training (\$10M+ program funding)
- Created architectural concept & managed design & construction of multidisciplinary *Engineering & Science Building* named “Ingram Hall” (\$120M construction envelope).

- Architected & deployed large-scale telecom networks & systems conforming with industry standards, including a regional implementation of *Internet2*.
- Designed & implemented an innovative, multidisciplinary graduate program combining Engineering, Science, Business, & Applied Arts (\$7M+ budget).

As an **academic researcher**, I have successfully obtained and managed over \$30M in grants & contracts from federal entities including the National Science Foundation (NSF), the National Institutes of Health (NIH), the National Institute of Science & Technology (NIST), and the National Aeronautics & Space Administration (NASA). I have also secured substantial funding from commercial partners including Cisco Systems, Agilent Technologies, Texas Instruments, Jacobs Engineering, 3Com, Bellsouth Telecommunications. Additionally, I have facilitated and secured donations from corporate partners in the form of financial support for research and in-kind equipment & software in excess of \$3M.

As a **technology entrepreneur**, I have secured over \$20M in equity and startup funding from industrial sources including Dominion/VDI, Lockheed/AstroLink, and others, as well as federal sources including NSF and NIH Small Business Innovations Research programs (SBIR). I have also participated in the acquisition of over \$10M+ in debt-equity financing from private venture firms.

As an active **professional consultant**, I have provided technology & business consulting services for entities including Dominion Virginia Power, Verizon, Amazon, T-Mobile, Bank of America, AT&T Mobility, Alcatel-Lucent, American Express, Research In Motion, F5 Networks, Nortel Networks, Bellsouth Telecommunications, and LSU Medical Center, among many others.

I am active in **professional service**, and have served on numerous conference and industry program advisory boards, or have developed sessions/tracks at well-known international conferences. Recent conferences and programs include The Energy Thought Summit, IEEE Global Communications Conference (GLOBECOM), IEEE Int'l Conference on Communications (ICC), IEEE GreenTech, IEEE Smart City Summit, Ethernet Technology Summit, Server Design Summit, Int'l Conference on Digital Telecom (ICDT), and the IEEE Computer & Communications Workshop.

EDUCATION

- 8/95 **Doctor of Philosophy** Texas A&M University
Electrical Engineering College Station, TX
- Thesis* “Variable Rate Speech Coding Using Subband Measures of Spectral Flatness”
Advisor Dr. J. D. Gibson
GPA 3.9/4.0
- 5/91 **Master of Science** Texas A&M University
Electrical Engineering College Station, TX
- Thesis* “Data Compression Using Inverted Block Codes”
Advisor Dr. J. D. Gibson
GPA 3.5/4.0
- 5/86 **Bachelor of Science** Texas A&M University
Electrical Engineering College Station, TX
- GPA* 3.7/4.0 (*magna cum laude*)

PROFESSIONAL EXPERIENCE

- 2014–now JETS I/II PROGRAM *Director*
TEXAS STATE UNIVERSITY

Key Accomplishments:

- Developed & managed relationship and large-scale research funding program with Jacobs Engineering and NASA’s Johnson Space Center (JSC).
- Established TXST as a “JETS Partner” organization for JETS-I (2014–2022) and JETS-II (2022–), supporting NASA’s Johnson Space Center for critical engineering, technology and science outcomes.
- Secured over \$25M in program funding via multiple Task Orders

- 2019–2023 CONNECTED INFRASTRUCTURE PROGRAM *co-Director*
TEXAS STATE UNIVERSITY

Key Accomplishments:

- Developed relationships with key industry partners, establishing “Smart City” research & development facilities.
- Developed & managed FCC-licensed private 5G/LTE wireless network to support research activities (WL2XMD), including threat detection and cybersecurity.
- Managed regional, highly secure LoRaWAN wireless network for low-rate, real-time data collection in multiple projects.

- 2013–2018 INGRAM SCHOOL OF ENGINEERING *School Director*
TEXAS STATE UNIVERSITY

Key Accomplishments:

- Created long-term vision, program & operational plans for the Ingram School
- Managed specification & design of new Engineering & Science Building “Ingram Hall” (\$120M+, 160k asf).
- Administered operating budget (\$500k+/yr) and endowment accounts (\$250k+/yr).
- Developed & implemented hiring plans & staffing structure for academic programs and support staff.

Academic Programs:

- Launched & managed interdisciplinary graduate program “Master of Science, Major in Engineering” (five-year budget \$7M+).
- Spearheaded development of Civil/Environmental Engineering undergraduate & graduate programs (five-year budget \$25M+) incl. “Infrastructure Research Lab” (\$15M+, 25k asf)
- Spearheaded development of campus-wide Cooperative Education Program.
- Managed initial & continuing ABET/EAC accreditation for four undergraduate programs (Electrical, Computer, Industrial, Manufacturing Engineering).

2013–2023 INGRAM SCHOOL OF ENGINEERING
TEXAS STATE UNIVERSITY

Professor

Research:

- Developed “Smart Grid” technologies for registration & management of devices on the electrical distribution grid.
- Developed performance enhancements for Internet transport protocols & packet handling based on signal processing and Machine Learning (ML).
- Performed testing and evaluation for advanced network functions, including virtualized and containerized applications, cybersecurity, as well as “Internet of Things” (IoT) architectures and related technologies.
- Performed in-depth performance evaluation and cybersecurity testing of data security technologies via Machine Learning and Artificial Intelligence (ML/AI).

Academic & Service:

- Member, University Intellectual Property Committee (2009–).
- Faculty Senator, College of Science & Engineering (2012, 2019–2022).
- Instructor of Record for undergraduate & graduate courses, including *Electronic Devices* (EE 3350 & lab), *Computer Networks* (EE 4372/5372 & lab), *Digital Signal Processing* (EE 4377/5377 & lab), *Telecommunications* (EE 4376/5376 & lab), *Sr. Design* (EE 4390/4391).
- Conference session organizer and moderator (*IEEE ICC*, *IEEE Globecom*, *IEEE Computer Workshop*, *Digital 360 Summit*, *Ethernet Summit*, *Intl. Conf. Digital Telecom*, *Intl. Congress Sci. Tech. Appl. Services*, etc.)

2008–2013 INGRAM SCHOOL OF ENGINEERING
TEXAS STATE UNIVERSITY

Assoc. Director/Professor

Administration – Developed new graduate program “Master of Science, Major in Engineering.” Developed ABET Self-Study Reports for initial accreditation of Electrical

Engineering and Computer Engineering programs.

Research – Investigated Smart Grid systems and advanced technologies for broadband networking. Developed novel MAC/PHY layer for low-frequency power line communication. Developed performance enhancements for IP transport protocols.

2008–2010 POWER TAGGING TECHNOLOGIES, INC. *Chief Technology Officer & co-Founder*
BOULDER, CO

Corporate Governance – Member, Board of Directors (4/08–4/11). Evaluated / reviewed all corporate documents drafted by legal team. Oversight of stock valuation & strategic allocations. Recruitment of investors, capital, & technology partners.

Engineering Management – Managed Intellectual Property portfolio & patent strategy. Conceived, developed, & managed product architecture & system roadmap. Hired & trained engineering staff. Tasked & evaluated individual & group assignments. Evaluated competing technologies, products, & standards.

Product Architecture – Developed technologies & comprehensive product strategy for scalable, low-bandwidth Smart Grid communication system based on an OFDM(A) MAC/PHY layer, dynamic addressing derived from IPv6, & system / element management constructs based on CIM. Developed prototype systems, software, & signal processing technologies for development & manufacturing handoff.

Business Development – Authored proposals for successful federal grants (NSF SBIR Phase I & II). Initiated strategic, mutually beneficial relationships with business partners and prospective customers. Represented company interests in tradeshow, conferences, industry forums, etc.

2006–2008 ZNYX NETWORKS, INC. *Chief Architect, Systems & Solutions*
FREMONT, CA

Product Architecture – Defined product & system architectures including ATCA, μ TCA, and heterogeneous subsystems for highly secure networks. Worked with system-level software for highly scalable encryption (IPsec) & distributed, network-based processing applications. Evaluated embedded technologies incl. network processors, forwarding accelerators, transport system-on-chip devices, etc. Developed comprehensive deployment strategy for IPv6 including cybersecurity appliances & technologies.

Business Development – Created new business opportunities via a “pull strategy” with expansion markets. Prepared/presented business plans, and supporting materials for recruitment of expansion capital. Initiated strategic, mutually beneficial relationships with business partners and prospective customers.

Strategic Marketing – Authored technical publications, white papers, etc. to promote “best of breed” industry recognition. Participated in industry/trade show panels. Acted as Intel Embedded Communications Alliance (ICA/ECA) liaison.

2006–2006 SBE, INC. *Principal Architect / Director Applications Engineering*

SAN RAMON, CA

Product Strategy – Evaluated existing/future products for viability. Composed technical literature & marketing collateral for DSP, iSCSI, and other embedded communications products.

Business Development – Engaged with customers to determine integration of products in next generation systems. Principal Solution Architect for customer qualification and solution proposal/delivery.

2000–2006 HEWLETT-PACKARD *Distinguished Technologist / Technical Director*
PLANO, TX

Principal Solution Architect – Technical Lead for development of carrier-grade servers based on Intel IA-32/64 NEBS systems and carrier-grade Linux (OSDL/CGL). Principal Architect for development of ATCA (PICMG 3.x) product strategy & development program (\$20M+). Technical Lead for transport subsystem, manageability subsystem, and high-availability architecture of HP's ATCA product line. Composed/evaluated RFI/RFP/RFQ material for comprehensive outsourcing of ATCA subsystems.

Business Development – Technical liaison for China, Japan, Korea, and Asia-Pacific region as well as large customers in Europe and the Americas. Negotiated complex interaction between outsourced components, legacy technologies, and new development involving several internal product organizations and senior staff of potential customers. Participated in multiple large-system bid responses (\$100M+).

Wireless Systems – Managed advanced development teams to analyze & specify media subsystem, radio access, intrusion detection/prevention, & application server systems of wireless telephony networks. Evaluated broadband wireless technologies for homeland security.

Technology Futures – Evaluated IETF initiatives (SIGTRAN, SIP) & monitored other standards organizations and industry forums (3GPP/2, SAF, DMTF, PICMG, NPF) to determine immediate & long term implications. Co-editor of SAF/HPI B.01.01 specification. Subject Matter Expert in corporate program to evaluate potential acquisitions.

1995–2002 ELECTRICAL & COMPUTER ENGINEERING *Asst./Assoc. Professor*
THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Academic – Taught Graduate Courses, incl. *Random Variables & Processes, Advanced Comm, Digital Comm, Digital Signal Proc., Image Proc., Info Theory, Real-time Signal Proc.*. Taught Undergraduate Courses, incl. *Advanced Engr. Math, Electrical Networks, Intermed. Microproc., Sr. Design.*

Telepathology – Developed *TelePath* digital imaging system for real-time, remote diagnosis of microscopic tissue segments during intra-operative anatomic pathology sessions. Designed & implemented novel segmentation, compression, & transmission algorithms for pathology specimen images to ensure diagnostic quality.

VoIP Testing – Created VIPER testbed network for real-time, end-to-end subjective evaluation of voice over IP (VoIP) technologies.

Internet2 – Principal Investigator for proposal, design, & implementation of Internet2 network (NSF vBNS).

1989–1995 ELECTRICAL ENGINEERING
TEXAS A&M UNIVERSITY

Lecturer & Research Asst.

Developed sub-2kbps CELP speech codec using compound VQ for pitch and spectral coefficients. Developed variable-rate lag-dependent VQ for pitch coefficients (LIVQ) & entropy-driven VQ for spectral coefficients (split-band LSPVQ). Taught undergraduate courses incl. *Digital Systems Design* and *Electrical Circuits and Instrumentation*.

1988–1989 GENERAL DYNAMICS, FORT WORTH DIVISION
FT. WORTH, TX

Lead Systems Engineer

Principal Investigator for \$6M research project to flight-test and verify the operation of an embedded Digital Terrain System (DTS) on the AFTI/F-16 testbed aircraft. Designed software package for data reduction and post-flight analysis of telemetry data for various aircraft subsystems.

1986–1988 LTV AEROSPACE AND DEFENSE COMPANY
GRAND PRAIRIE, TX

Systems Engineer

Software, architecture, & algorithm development for system to process reconnaissance imagery and 3-dimensional elevation database to simulate low-altitude flight.

RECENT CONSULTANCIES (Legal)

1. **Inter Partes Review of U.S. Patent 9,094,868** (2024–)
Parties: T-Mobile, AT&T, Verizon, Ericsson, Nokia v. Headwaters Partners II, LLC
Venue: Patent & Trial Appeal Board, USPTO, Alexandria VA
Law Firm: Holland & Knight, LLP for Plaintiff
Role: Expert Witness (Inter Partes Review)
Issue: Wireless Link Estimation (9,094,868)
Status: Petition & Declaration
2. **Inter Partes Review of U.S. Patent 9,413,502** (2024–)
Parties: T-Mobile, AT&T, Verizon, Ericsson, Nokia v. Headwaters Partners II, LLC
Venue: Patent & Trial Appeal Board, USPTO, Alexandria VA
Law Firm: Holland & Knight, LLP for Plaintiff
Role: Expert Witness (Inter Partes Review)
Issue: Wireless Backhaul via User Equipment (9,413,502)
Status: Petition & Declaration
3. **Civil Action No. 1:22-CV-01820** (2024–)
Parties: Daniel Alholm, et.al. v. Vrdolyak Law Group, LLC
Venue: US District Court, Northern District of Illinois
Law Firm: Spragens Law, PLC for Plaintiff
Role: Expert Witness (Asterisk System)
Issue: Allegation of illegally recorded calls
Status: Investigation, Expert Report, **Deposition**
4. **Civil Action No. 6:20-CV-00142-ADA** (2024)
Parties: UNM Rainforest Innovations v. ASUSTek Computer, Inc
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: The Shore Firm / Randolph Square IP / Offor-Evans LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: WiFi frame structures (8,265,096)
Status: Investigation, Expert Report
5. **Civil Action No. 6:21-cv-00672** (2022–2024)
Parties: VOIP-PAL.com Inc. v. Verizon, et.al.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Venable for Defendant
Role: Expert Witness (Invalidity)
Issue: Mobile telecommunications gateway (8,630,234 & 10,880,721)
Status: Investigation, Expert Report, **Deposition**, Summary Judgement
6. **Civil Action No. 6:21-cv-00668** (2022–2023)
Parties: VOIP-PAL.com Inc. v. Amazon, et.al.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Fisch Sigler for Defendant
Role: Expert Witness (Invalidity)
Issue: Mobile telecommunications gateway (8,630,234 & 10,880,721)
Status: Investigation, Expert Report, **Deposition**, Summary Judgement
7. **Civil Action No. 6:21-cv-00674** (2022)
Parties: VOIP-PAL.com Inc. v. T-Mobile USA, et.al.

- Venue:* US District Court, Western District of Texas, Waco Division
Law Firm: Perkins Coie for Defendant
Role: Expert Witness (Invalidity)
Issue: Mobile telecommunications gateway (8,630,234 & 10,880,721)
Status: Investigation, Expert Report, Summary Judgement
8. **Civil Action No. 2:22-cv-00276** (2022–)
Parties: Orckit Corporation v. Cisco Systems, Inc.
Venue: US District Court, Eastern District of Texas, Marshall Division
Law Firm: Kobre & Kim for Plaintiff
Role: Expert Witness (Infringement)
Issue: LAG (7,545,740), MPLS (8,830,821), DPI (10,652,111), DCH (6,680,904)
Status: Expert Report, Deposition, Paused for IPR
9. **Civil Action No. 2:21-CV-394-JRG** (2022)
Parties: Parus Holdings v. Bank of America/Charles Schwab
Venue: US District Court, Eastern District of Texas, Marshall Division
Law Firm: Perkins Coie for Defendant
Role: Expert Witness (Invalidity)
Issue: Interactive Voice Response Systems (7,327,723)
Status: Investigation, Expert Report, Settled
10. **Civil Action No. 6:20-CV-01152-ADA** (2022)
Parties: Daedalus Blue v. Microsoft
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Bunsow DeMory, LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Computing Systems (8,381,209)
Status: Investigation, Expert Report, IPR
11. **File No. 5157.00001** (2022–)
Parties: G. Van Brunt v. Midea Products, et.al.
Venue: (unassigned)
Law Firm: Clemente Mueller for Plaintiff
Role: Expert Witness (Wrongful Injury)
Issue: Evaluation & Testing of Space Heater
Status: Investigation, Expert Report
12. **McCullers v. Sunbeam** (2022–)
Parties: McCullers v. Sunbeam, et.al.
Venue: (unassigned)
Law Firm: Adams Cross LLC for Plaintiff
Role: Expert Witness (Wrongful Injury)
Issue: Evaluation & Testing of Heating Pad
Status: Investigation, Expert Report
13. **Post Grant Review of U.S. Patent 11,134,041 (PGR2022-0050)** (2022–)
Parties: Shenzhen Svakom Technology Co., Ltd v. Danxiao Information Technology Ltd
Venue: Patent & Trial Appeal Board, USPTO, Alexandria VA
Law Firm: Orrick Herrington & Sutcliffe (and) Bochner, LLP for Plaintiff
Role: Expert Witness (Post Grant Review)
Issue: Remote Interactive Technologies (11,134,041)
Status: Expert Report

14. **Civil Action No. 6-20-cv-00493-ADA** (2022–2023)
Parties: WSOU Investments, LLC dba Brazos Licensing v. ZTE
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Kasowitz, Benson, Torres LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Bandwidth extension of an audio signal (9,294,060)
Status: Code Review, Expert Report
15. **Civil Action No. 6-20-cv-00480-ADA** (2022–2023)
Parties: WSOU Investments, LLC dba Brazos Licensing v. VMware Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Kasowitz, Benson, Torres LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Preventing Congestion in Load-Balancing Networks (7,539,133)
Status: Code Review, Expert Report, **Deposition**, **Testimony**
16. **Civil Action No. 6-20-cv-00481-ADA** (2022–2023)
Parties: WSOU Investments, LLC dba Brazos Licensing v. VMware Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Kasowitz, Benson, Torres LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Code Review – Optimizing Latencies in Cloud Systems (9,164,800)
Status: Expert Report, **Deposition**, **Testimony**
17. **Civil Action No. 6-20-cv-00486-ADA** (2022–2023)
Parties: WSOU Investments, LLC dba Brazos Licensing v. VMware Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Kasowitz, Benson, Torres LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Monitoring Performance of a Scheduler (7,092,360)
Status: Code Review, Expert Report, **Deposition**, **Testimony**
18. **Civil Action No. 2:18-cv-00156** (2022–2024)
Parties: William Scott Taylor; WPEM, LLC; and W2W, LLC v. SOTI, Inc.
Venue: US District Court, Eastern District of Texas, Marshall Division
Law Firm: Kassab Law Group for Plaintiff
Role: Expert Witness (Infringement, Legal Malpractice)
Issue: Telematics Platform (9,148,762)
Status: Expert Report
19. **Cause No. 2021-47914** (2022–2024)
Parties: Ultra Communications Corp. v. PeaTalk Corp, Phillip Nguyen & Thu-Nga Vu
Venue: District Court, 152nd Judicial District, Harris County TX
Law Firm: Hendershot Cowart, PC for Plaintiff
Role: Expert Witness, Technical Investigation (Fraud)
Issue: 5G Communication Technology
Status: Technical Investigation & Discovery, Expert Report
20. **Civil Action 1:21-00534-MN-CJB** (2021–2022)
Parties: BearBox LLC & Austin Storms v. Lancium LLC, M.T. McNamara, & R.E. Cline
Venue: US District Court, District of Delaware
Law Firm: Marshall, Gerstein & Borun LLP for Plaintiff

Role: Expert Witness (Infringement, Legal Malpractice)
Issue: Bitcoin Mining & Energy Arbitrage Platform (10,608,433)
Status: Code Review, Expert Report, **Deposition**, **Testimony**

21. **Civil Action 6:20-cv-00454-ADA** (2021–2022)

Parties: WSOU Investments, LLC dba Brazos Licensing v. Microsoft Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Susman Godfrey LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Code Review & Evaluation of Service Trend Estimation (7,366,160)
Status: Expert Report, **Deposition**

22. **Civil Action 6:20-cv-00461-ADA** (2021–2022)

Parties: WSOU Investments, LLC dba Brazos Licensing v. Microsoft Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Susman Godfrey LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Highly Available AAA Function (7,106,702)
Status: Code Review, Expert Report, **Deposition**

23. **Civil Action 6:20-cv-00465-ADA** (2021–2022)

Parties: WSOU Investments, LLC dba Brazos Licensing v. Microsoft Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Susman Godfrey LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Packet Loss Estimation Algorithm (8,274,902)
Status: Code Review, Expert Report, **Deposition**

24. **Civil Action 6:20-cv-00458-ADA** (2021–2022)

Parties: WSOU Investments, LLC dba Brazos Licensing v. Microsoft Corp.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: Susman Godfrey LLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Packet Call Routing System (7,388,868)
Status: Code Review, Expert Report

25. **Civil Action 4:19-cv-00263-ALM** (2019–2021)

Parties: Debra Nelson v. Sunbeam Products, Inc. dba Jarden Consumer Solutions
Venue: US District Court, Eastern District of Texas, Sherman Division
Law Firm: Callahan Law Firm for Plaintiff
Role: Expert Witness (Liability / Electrical Appliance)
Issue: Design Evaluation of Space Heater in Wrongful Injury Case
Status: Expert Report, **Deposition**, **Testimony** / Verdict for Plaintiff

26. **Civil Action 20-0007-RGA** (2020–2021)

Parties: Synkcloud Technologies, Inc. v. Microsoft Corp.
Venue: US District Court, District of Delaware
Law Firm: Devlin Law Firm for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Platform
Status: Code Review, Expert Report, Claim Charts

27. **Civil Action 19-1360-RGA** (2020–2021)

- Parties:* Synkloud Technologies, Inc. v. HP, Inc.
Venue: US District Court, District of Delaware
Law Firm: Devlin Law Firm for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Platform
Status: Code Review, Expert Report, Claim Charts
28. **Civil Action 6:19-cv-00525-ADA** (2019–2020)
Parties: Synkloud Technologies, Inc. v. Dropbox, Inc.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: OneLLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Platform
Status: Code Review, Expert Report, Claim Charts
29. **Civil Action 6:19-cv-00526-ADA** (2019–2020)
Parties: Synkloud Technologies, Inc. v. Dropbox, Inc.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: OneLLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Platform
Status: Code Review, Expert Report, Claim Charts
30. **Civil Action 6:19-cv-00527-ADA** (2020–2021)
Parties: Synkloud Technologies, Inc. v. Adobe, Inc.
Venue: US District Court, Western District of Texas, Waco Division
Law Firm: OneLLP for Plaintiff
Role: Expert Witness (Infringement)
Issue: Cloud Platform
Status: Code Review, Expert Report, Claim Charts
31. **A.Salas-DeLeon v. Cargill/CCSGroup** (2019–2020)
Parties: A.Salas-DeLeon v. Cargill/CCSGroup
Venue: On-site investigation at Cargill facility in Kansas
Law Firm: Kherker Garcia Fass Hawley, LLP for Plaintiff
Role: Expert Witness (Workplace Liability / Industrial Accident)
Issue: Investigation of electrocution in Grain Silo
Status: Investigation, Expert Report
32. **Inter Partes Review of U.S. Patent 9,477,961** (2017–2018)
Parties: American Express Global Business Travel v. Charter Solutions, Intl
Venue: Patent & Trial Appeal Board, USPTO, Alexandria VA
Law Firm: K & L Gates, LLP for Plaintiff
Role: Expert Witness (Inter Partes Review)
Issue: Travel Management System & Location-Based Services (9,477,961)
Status: Petition & Declaration
33. **Case No. 2:16-cv-00082-JRG** (2016–2017)
Parties: St. Lawrence Communications v. Joint Defense Group / AT&T
Venue: US District Court, Eastern District of Texas, Marshall Division
Law Firm: Norton Rose Fulbright for Defendant
Role: Expert Witness (Infringement)

Issue: Voice Processing Algorithms for Networked Speech

Status: Investigation, Expert Report

34. **Case No. 6:13-CV-00638-RWS** (2014–2016)

Parties: Acquis, LLC v. Alcatel-Lucent, Inc.

Venue: US District Court, Eastern District of Texas, Tyler Division

Law Firm: Quinn Emanuel Urquhart & Sullivan, LLP for Defendant

Role: Expert Witness (Invalidity, Infringement)

Issue: Modular Computer Architecture

Status: Claim Charts, Expert Report

35. **Case No. 5:12-cv-02574 EJD (PSG)** (2013–2014)

Parties: Neustar/Quova v. F5 Networks

Venue: US District Court, Northern District of California, San Jose Division

Law Firm: K & L Gates, LLP for Defendant

Role: Expert Witness, Breach of Contract

Issue: Breach of Contract, Localization via DNS Pre-Processing

Status: Expert Report, **Deposition**

36. **Plaintiff v. HP/Sun/Dell** (2014)

Parties: HP/Sun/Dell v. Charles River Associates

Venue: US District Court, District of Delaware

Law Firm: Charles River Associates for Plaintiff

Role: Expert Witness (Infringement)

Issue: Blade Servers, System Architecture and Standards

Status: Investigation, Expert Report

37. **Case No. 1:2012cv00386** (2012–2013)

Parties: Research in Motion, Ltd v. Graphics Properties Holdings

Venue: US District Court, District of Delaware

Law Firm: Fish & Richardson for Defendant

Role: Expert Consultant (Infringement)

Issue: Computer Architecture

Status: Investigation, Expert Report

RECENT CONSULTANCIES (Technical)

- *Client:* Sertainty Corporation (2022–)
Activity: Technical Advisory Board
- *Client:* Williams Hart Boundas Easterby, LLP (2019)
Activity: Investigation / Liability / Electrical Appliance
- *Client:* Gerson Lehman Group Council of Advisors (2000–present)
Activity: Various matters including legal and market consulting
- *Client:* National Science Foundation (2000–present)
Activity: Reviewer & Panelist, SBIR Program
- *Client:* Department of Defense (2016 – 2021)
Activity: Reviewer, DoD SMART Program

PATENTS & INTELLECTUAL PROPERTY

- **Texas State (2008 – present)**

- *Inventor / Assignee:* S. McClellan, W. Peng, & E. Gonzalez / Texas State University
Title: Optimization of retransmission timeout boundary
Number & Status: USPTO 10,404,562 – Issued Sep. 2019
- *Inventor / Assignee:* S. McClellan / Texas State University
Title: Suppression of interference in power and communication signals
Number & Status: USPTO 9,876,516 – Issued Jan. 2018
- *Inventor / Assignee:* J. LoPorto & S. McClellan / Power Tagging Technologies
Title: Intelligent power system and methods for its application
Number & Status: USPTO 8,519,832 – Issued Aug. 2013
- *Inventor / Assignee:* J. Shima & S. McClellan / Texas State University
Title: Location mapping of grid devices via features of current disturbances
Number & Status: PCT/US2015/014603 – Filed Feb. 2015

- **HP/Compaq (2000 – 2008)**

- *Inventor / Assignee:* S. McClellan / Hewlett Packard
Title: Active path selection for SCTP
Number & Status: USPTO 7,193,971 – Issued Mar. 2007
- *Inventor / Assignee:* S. McClellan & R. Reeves / Hewlett Packard
Title: Fault-tolerant associations for IP transport protocols
Number & Status: USPTO 7,111,035 – Issued Sep. 2006
- *Inventor / Assignee:* S. McClellan / Hewlett Packard
Title: Wireless network and methods for communicating in a wireless network
Number & Status: 10/453,957 – Filed Jun. 2004
- *Inventor / Assignee:* S. McClellan / Hewlett Packard
Title: Wireless network and methods for data encryption and decryption in a wireless network
Number & Status: 10/453,946 – Filed Jun. 2003
- *Inventor / Assignee:* S. McClellan & M. Montz / Hewlett Packard
Title: Wireless packet routing for minimal delay and simplification of packet routing
Number & Status: 10/178,139 – Filed Jun. 2002
- *Inventor / Assignee:* S. McClellan / Hewlett Packard
Title: Network configuration management with proximity keys
Number & Status: 10/036,143 – Filed Dec. 2001

- **UAB (1995 – 2000)**

- *Inventor / Assignee:* S. McClellan, et.al / Bellsouth Telecommunications
Title: Digital telepathology imaging system programmed for identifying image regions of potential interest and anticipating sequence of image acquisition
Number & Status: WIPO WO/1999/030264A1 – Issued Jun. 1999
- *Inventor / Assignee:* S. McClellan, et.al. / Bellsouth Telecommunications
Title: Digital telepathology imaging system with bandwidth optimization & virtual focusing
Number & Status: WIPO WO/1999/013360A2 – Issued Mar. 1999
- *Inventor / Assignee:* G. Grimes, S. McClellan, G. Vaughn / Bellsouth Telecommunications
Title: Bandwidth optimization for a digital telepathology imaging system
Number & Status: 08/926,795 – Filed Sep. 1997
- *Inventor / Assignee:* S. McClellan, et.al. / Bellsouth Telecommunications
Title: Digital telepathology imaging system
Number & Status: 08/926,699 – Filed Sep. 1997

ACADEMIC GRANTS & CONTRACTS**• Texas State (2008 – 2023)**

- *Amount (Date):* \$1,000,000 (2022–)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “JETS Program Management”
Description: Provide oversight of the JETS contract with TXST
- *Amount (Date):* \$800,000 (2014–2022)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “JETS Program Management”
Description: Provide oversight of the JETS contract with TXST
- *Amount (Date):* \$199,000 (2024–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Support for the Astromaterials Research & Exploration Science Directorate (ARES)”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$200,000 (2022–2024)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Support for the Astromaterials Research & Exploration Science Directorate (ARES)”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$200,000 (2022–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Support for the Astromaterials Research & Exploration Science Directorate (ARES)”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$450,000 (2021–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Photogrammetric Processing for Intl Space Station”
Description: Program support for Intl Space Station and related NASA missions
- *Amount (Date):* \$500,000 (2021–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Genomic Analysis of Microbial Populations via Bioinformatics”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$137,541 (2021–2023)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Infrared Characterization of Terrain Elements”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$400,000 (2021–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “3D Human Tissue Assemblies to Model Disease”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$259,521 (2021)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Technical Expertise for Multispectral & Hyperspectral Data”
Description: Planetary science support for NASA missions
- *Amount (Date):* \$233,481 (2021)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Software Design & Test for NASA Missions”
Description: Program technical support for NASA missions

- *Amount (Date)*: \$771,362 (2016–2020)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Curation of Astromaterials from NASA Missions”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$1,328,733 (2015–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Earth Observation Imaging & Remote Sensing via Satellite”
Description: Program support for NASA Earth observation imaging and remote sensing
- *Amount (Date)*: \$1,000,000 (2019–present)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Planetary Environment Simulation”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$600,000 (2019–2022)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Detection of Carbon-Based Compounds in Astromaterials”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$541,031 (2015–2017)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Mission Planning & Support”
Description: Mission planning and support for the Office of the CTO
- *Amount (Date)*: \$176,666 (2015–2016)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Topics in High-Energy Physics”
Description: Topics in high-energy Physics & Chemistry
- *Amount (Date)*: \$38,636 (2018–2020)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Microrobotics for Astromaterials”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$11,750 (2019)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Microrobotics for Astromaterials”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$50,665 (2017–2018)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Remote Sensing for JSC Lab Management”
Description: Program support for Johnson Space Center
- *Amount (Date)*: \$30,240 (2017–2018)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Microrobotics for Astromaterials Curation”
Description: Planetary science support for NASA missions
- *Amount (Date)*: \$45,042 (2017–2018)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)
Title: “Remote Sensing for JSC Lab Management”
Description: Program support for Johnson Space Center
- *Amount (Date)*: \$8,000 (2014–2015)
Sponsor: JSC Engineering, Technology, and Science (JETS-I/II)

Title: “Advanced Avionics for Exploration”

Description: Program support for Johnson Space Center

- \$122,000. “Virtual Environment Performance.” ZNYX Networks. 2012–2014. PI.
- \$50,000. “Next Generation System Architecture.” ZNYX Networks. 2010–2011. PI.
- \$16,000. “Smart Grid Metering System.” Texas State University Research Enhancement Program (REP). 2011. co-PI.
- \$16,000. “Smart Grid System Evaluation.” Power Tagging Technologies. 2010. PI.
- \$150,000. “CC4: Applications in Signal Processing.” Texas Instruments. 2009. PI.
- \$25,000. “Communications Education & Research.” Agilent Technologies . 2009. PI.
- \$20,000. “TWACS System Evaluation.” Dominion Virginia Power. 2009. PI.

● **Prior (1995 – 2001)**

- \$75,000. “VIPER: Voice over IP Environment for Research.” Cisco Systems. 2000-2001. PI.
- \$10,000. “Per-Hop Behaviors & QoS.” National Science Foundation (NSF). 2000. PI.
- \$25,890. “Remote Data Retrieval/Repository.” Alabama Power Company. 1999-2000. PI.
- \$10,000. “Robotic Gross Specimen System.” National Science Foundation (NSF). 1999. PI.
- \$425,172. “ASMI Exchange Network.” American Sports Medicine Institute (ASMI). 1999-2000. co-PI.
- \$31,131. “ATM QoS with Oversubscription.” Network Equipment Technologies (N.E.T.). 1999-2000. PI.
- \$25,000. “Analysis of Internet2 DiffServ Architecture.” Bellsouth Telecom. 1999-2000. PI.
- \$50,000. “Network-Based Distributed Healthcare.” Advanced Technology Institute (ATI). 1999. co-PI.
- \$945,000. “High Performance Connection for Research Universities in Alabama.” National Science Foundation (NSF). 1998-2000. co-PI.
- \$1,156,983. “Infrastructure for Regional Connection to Internet2.” National Science Foundation (NSF). 1998-2001. co-PI.
- \$100,000. “Leading Edge Campus Networks for Internet2.” 3Com. 1998. PI.
- \$100,000. “Gigabit Routing Technology for Internet2.” Torrent Networking. 1998. PI.
- \$200,000. “National Information Infrastructure: Applications of the Dynamic Anatomic Telepathology Imaging System.” BellSouth Telecom & National Institute of Standards & Technology (NIST). 1998-1999. co-PI.
- \$603,500. “Healthcare Info. Technology Enabling Community Care (HITECC): Collaborative Computing for Telepathology (COLLAB).” BellSouth Telecom & National Institute of Standards & Technology (NIST). 1995-1998. co-PI.
- \$7,800. “Analysis of Perceptual Impact in the Progressive Transmission of Pathology Images.” Southeastern Center for Electrical Engineering Education (SCEEE). 1996-1997. PI.
- \$14,410. “Topics in Random Processes.” BellSouth Telecom. 1996-1997. PI.
- \$3,000. “Improving the Performance of the 4800 bits/sec Federal Standard Voice Compression Algorithm.” Univ. Alabama-Birmingham Graduate School. 1995-1996. PI.
- \$553,740. “Anatomic Telepathology Applications Research.” BellSouth Telecom. 1995-1997. co-PI.

OTHER SIGNIFICANT FUNDING

- *Amount:* \$11,000,000 (cap)
Sponsor: Jacobs Engineering / Clear Lake Group
Description: “JSC Engineering, Technology, and Science (JETS-2),” Task Order subcontract supporting NASA/Johnson Space Center, Principal (2022–)
- *Amount:* \$11,000,000 (cap)
Sponsor: Jacobs Engineering / Clear Lake Group
Description: “JSC Engineering, Technology, and Science (JETS-1),” Task Order subcontract supporting NASA/Johnson Space Center, Principal (2014–2022)
- *Amount:* \$5,000,000 (multiple additional tranches of \$2M+ ea.)
Sponsor: Dominion Virginia Power
Description: “Equity Funding for Power Tagging Technologies, Inc.,” Industry equity for startup in Smart Grid, co-Founder & Chief Technology Officer (2009–2011)
- *Amount:* \$2,500,000 (multiple additional tranches of \$1M+ ea.)
Sponsor: Lockheed Martin / AstroLink Technologies
Description: “Equity Funding for Power Tagging Technologies, Inc.,” Industry equity for startup in Smart Grid, co-Founder & Chief Technology Officer (2010–2011)
- *Amount:* \$500,000
Sponsor: National Science Foundation (NSF)
Description: “Power Tagging Grid Intelligence for 21st Century Energy Applications,” SBIR Phase II grant to Power Tagging Technologies, Principal Author & Sr. Personnel (2020–2011)
- *Amount:* \$150,000
Sponsor: National Science Foundation (NSF)
Description: “Power Tagging Grid Intelligence for 21st Century Energy Applications,” SBIR Phase I grant to Power Tagging Technologies, Principal Author & Sr. Personnel (2020–2011)
- *Amount:* \$100,000
Sponsor: National Institutes of Health (NIH)
Description: “Robotic Tele-mammography System,” SBIR Phase I grant to startup in health technologies, Principal Author & Sr. Personnel (1998-1999)

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- [1] S. McClellan, Ed., *Data, Security, and Trust in Smart Cities*. Springer, July 2024.
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SELECTED PUBLICATIONS – Magazines & Journals

- [1] B. Thapa, B. Sharma, and S. McClellan, "Intelligent cipher transfer object for IoT data security," *Int. J. Adv. in Networks and Services*, vol. 16, no. 3 & 4, pp. 90–105, Jan. 2023, ISSN: 1942-2644.
- [2] K. Thapa, S. McClellan, and D. Valles, "Supervised machine learning in inter-level, ultra-low frequency power line communications," *Int. J. Adv. in Telecom.*, vol. 14, no. 3 & 4, pp. 51–69, Dec. 2021, ISSN: 1942-2601.
- [3] S. McClellan, D. Valles, and G. Koutitas, "Dynamic voltage optimization based on in-band sensors and machine learning," *Applied Sciences*, vol. 9, iss. 14, no. 2902, July 2019, <https://doi.org/10.3390/app9142902>.
- [4] D. Valles and S. McClellan, "Using machine learning to optimize Linux networking," *Linux Journal*, pp. 128–138, May 2019.
- [5] W. Forfang, E. Gonzalez, S. McClellan, and V. Viswanathan, "A VAD/VOX algorithm for amateur radio applications," *Int. J. Adv. in Telecom.*, vol. 7, no. 1 & 2, pp. 34 – 44, June 2014, ISSN: 1942-2601.
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SELECTED PUBLICATIONS – Conferences & Symposia

- [1] B. Thapa, B. Sharma, and S. McClellan, "Comparative performance of TCP and MQTT," in *Proc. 18th Int'l Conf. on Digital Telecomm.*, Venice, Italy, Apr. 2023, pp. 10–14, ISSN: 2308-3964, ISBN: 978-1-68558-034-6.
- [2] S. McClellan, "Identity, security, and data provenance," in *Proc. IARIA Annual Congress on Frontiers in Science, Technology, Services, and Applications*, Nice, France, July 2022.
- [3] K. Thapa and S. McClellan, "An evaluation of neural network performance using complex-valued input data," in *Proc. 16th Int'l Conf. on Digital Telecomm.*, Porto, Portugal, Apr. 2021, pp. 27–31, ISSN: 2308-3964, ISBN: 978-1-61208-835-8.
- [4] K. Thapa, S. McClellan, and D. Valles, "Supervised machine learning in digital power line communications," in *Proc. 16th Int'l Conf. on Digital Telecomm.*, Porto, Portugal, Apr. 2021, pp. 16–21, ISSN: 2308-3964, ISBN: 978-1-61208-835-8.
- [5] V. Lokesh, K. Thapa, and S. McClellan, "Remote filesystem event notification and processing for distributed systems," in *Proc. 16th Int'l Conf. on Digital Telecomm.*, Porto, Portugal, Apr. 2021, pp. 22–26, ISSN: 2308-3964, ISBN: 978-1-61208-835-8.
- [6] B. Dasgupta, D. Valles, and S. McClellan, "Estimating TCP RTT with LSTM neural networks," in *Proc. 2019 World Congress in Comp. Sci., Comp. Eng., & Appl. Comp. – The 21st Int'l Conf. on Artificial Intelligence (CSCE-ICAI'19)*, Las Vegas, NV, Aug. 2019.
- [7] —, "A K-Means algorithm approach for classifying wireless signal loss using RTT and bandwidth," in *Proc. IEEE 9th Info. Tech., Electr. and Mobile Comm. Conf. (IEMCON)*, Vancouver, Canada, Nov. 2018.
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- [11] —, "Bandwidth as a service: Transport layer bandwidth guarantees for cloud environments," in *Proc. 7th Int'l Conf. on ICT Convergence (ICTC'16)*, Jeju Island, Korea, Oct. 2016.

- [12] E. Gonzalez, S. McClellan, and W. Peng, "RTomin as a balancing parameter between fast retransmissions and timeouts with in the Stream Control Transmission Protocol (SCTP)," in *Proc. 2nd Int'l Conf. on Systems and Informatics (ICSAI)*, Shanghai, China, Nov. 2014.
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- [16] S. McClellan, "IP transport protocols and VMs," in *Proc. Ethernet Technology Summit'13*, Santa Clara, CA, Apr. 2013.
- [17] —, "Designing the private cloud: Practical aspects of virtualization," in *Proc. Server Design Summit'12*, Santa Clara, CA, Nov. 2012.
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- [2] "Data Security and Trustworthiness in the Smart City," Digital 360 Summit (D360S), Sep. 2024.
- [3] "Applications of Machine Learning and Artificial Intelligence in Modern Networks," Special Presentation: 16th Int'l Conf. on Digital Telecomm., Apr. 2021.
- [4] "Connected Infrastructure: Innovations in Education, Demonstration, and Applied Research," Keynote: 16th Int'l Conf. on Digital Telecomm., Apr. 2021.
- [5] "Smart Grid Security," SRC/DOE Decadal Workshop on Security, Aug. 2020.
- [6] "Smart Networks," Digital 360 Summit (D360S), Aug. 2020.
- [7] "Disruptive Technologies Towards the Smart City," IEEE Global Communications Conf. (GLOBECOM'2019), Dec. 2019.
- [8] "Smart Cities: Transportation & Mobility," IEEE Smart City Summit 2019, Nov. 2019.
- [9] "The future of food innovation: Is it in smart cities or the circular economy?" Food & Tech Austin, Apr. 2019.
- [10] "Intelligent Grid Management Interface," Savannah River National Lab, May 2018.
- [11] "5G: Backbone of the Smart City," IEEE GreenTech 2018, Apr. 2018.
- [12] "Smart City Applications," IEEE GreenTech 2018, Apr. 2018.
- [13] "Smart City, Smart State, Texas State," 2017 Smart City Summit, June 2017.
- [14] "The Smart Grid as an Application Deployment Platform," IEEE Global Communications Conf. (GLOBECOM'2014), Dec. 2014.
- [15] "Machine to Machine Communications," Energy Thought Summit (ETS'14), Mar. 2014.

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- [17] “Cyber Security & Threat Management for the Smart Grid,” IEEE Int’l Conf. on Communications (ICC’2012), June 2012.
- [18] “Open Standard Blade Servers,” 18th IEEE Real Time Conf., June 2012.
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- [21] “Smart Grid Standards, Technologies, and Applications,” IEEE Global Communications Conf. (GLOBECOM’2011), Dec. 2011.
- [22] “System Scaling & Networking,” Server Design Summit, Nov. 2011.
- [23] “Standards, Technologies, and Platforms for Emerging Smart Grid Deployments,” IEEE Int’l Conf. on Communications (ICC’2011), June 2011.
- [24] “Advances in 40 & 100 Gbps Ethernet,” Ethernet Technology Summit, Feb. 2011.
- [25] “Smart Grids, Electric Vehicles, & Mobile Load/Source Technology,” 24th IEEE Computer & Communications Workshop (CCW’2010), Oct. 2010.
- [26] “Security & Network Management in Emerging Smart Grid deployments,” 24th IEEE Computer & Communications Workshop (CCW’2010), Oct. 2010.