UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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T-Mobile USA, Inc., AT&T Services Inc., AT&T Mobility LLC, AT&T Corp., Cellco Partnership d/b/a Verizon Wireless, Nokia of America Corporation, Ericsson Inc.
Petitioners

v.

Cobblestone Wireless, LLC,
Patent Owner

_____

Case IPR2024-00137
U.S. Patent No. 9,094,888

_____

DECLARATION OF JAMES A. PROCTOR IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF UNITED STATES PATENT NO. 9,094,888

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I, James A. Proctor, declare as follows:

I. INTRODUCTION

1. I have been retained by T-Mobile USA, Inc., AT&T Services Inc., AT&T Mobility LLC, AT&T Corp., Cellco Partnership d/b/a Verizon Wireless, Nokia of America Corporation, and Ericsson, Inc. ("Petitioners") as an independent expert consultant in this proceeding before the United States Patent and Trademark Office ("PTO") against Cobblestone Wireless, LLC ("Patent Owner") regarding U.S. Patent No. 9,094,888 ("the '888 Patent") (Ex. 1001).[1] I have been asked to submit this Declaration on behalf of Petitioners.

2. I have been asked to consider whether certain references disclose or render obvious the features recited in claims 9, 10, 12, 20, 21 and 23 ("the challenged claims") of the '888 patent. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art renders obvious all limitations of the challenged claims, as I discuss in detail below.

3. I am being compensated at a rate of $550 per hour for my work in this proceeding. My compensation is in no way contingent on the nature of my findings,

[1] Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the '888 patent.

the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

4. All of my opinions stated in this Declaration are based on my own personal knowledge and professional judgment. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

5. My background and expertise that qualify me as an expert are described in detail in my *Curriculum Vitae* attached as **Ex. 1229**, which further includes an accurate list of all publications authored by me in the previous 10 years and a list of all cases in which I testified as an expert at trial or by deposition during the previous 4 years. Below I have summarized those qualifications, as well as any other background and expertise relevant to the technical issues in this case:

6. My educational background includes a Bachelor of Science in Electrical Engineering (BSEE) from the University of Florida in 1991 and Master of Science in Electrical Engineering (MSEE) from the Georgia Institute of Technology ("Georgia Tech") in 1992 focusing on digital signal processing.

7. I have worked as an engineer and entrepreneur in the field of wireless communications for over 25 years and have been involved with various aspects of wireless communications for the duration of my career.

8. From 1986 to 1991, while at the University of Florida, I interned with Harris Corporation in various roles including mechanical design, software development, and digital design. From 1991 to 1992, while at Georgia Tech, I worked at the Georgia Tech Research Institute (GTRI) as a graduate research assistant, performing software development on classified government programs.

9. From 1993 to 1995, while working for Harris Corporation, I designed various cellular communication systems for voice, data, and tracking/location. Many of these systems I designed utilized advanced communications technologies, such as those utilized in the then-developing and future telecommunications (such as IS95, W-CDMA, and aspects of LTE).

10. From 1995 to 1998, I worked at Spectran in advanced development and technical marketing. At Spectrian, I interfaced with Nortel's and Qualcomm's product management and performed advanced technology development and systems analysis. In this role, I designed IS-95 CDMA and GSM base station power amplifiers and control electronics, and received several patents associated with advanced linearization techniques for the reduction of transmitted distortion. I note that the peak to average ratio of various waveforms was of particular concern in the design of the power amplifiers and associated linearization techniques with the designs I was involved with during my work at Spectrian.

11. From 1998 to 2002, I served as the Director of Strategic and Technical Marketing at Tantivy Communications, a venture capital-funded 3G cellular data and chip set company. At Tantivy, I helped to architect and standardize the I-CDMA Spread Spectrum Systems Air Interface Standard (T1P1.4). I also developed both wireless access terminals and base stations that complied with the standard. The base stations utilized various IP protocols, and interfaced with the wire line network utilizing IP over Ethernet. Additionally, I participated in and provided technical contributions to 3GPP/3GPP2 standardization efforts related to the development of CDMA2000 and 1xEV-DO. This work resulted in me being a named inventor on more than 150 pending or issued U.S. patents or applications.

12. From 2002 to 2007, as co-founder of WiDeFi, Inc., I served in various roles including President, CEO, CTO, and board member. As the CEO, my responsibilities included advanced development of platform technologies. I was a named inventor of wireless technology components, including a frequency translating TDD repeater, a same frequency repeater architecture for TDD/FDD-based systems, and physical layer multi-stream MIMO repeater technology. WiDeFi invented and pro-vided wireless home networking products based on WiFi and cellular technologies. While at WiDeFi, I was a named inventor on over 25 issued U.S. patents or patent applications.

13. From 2007 to 2009, I consulted as a principal engineer for Qualcomm Inc. as part of the acquisition of WiDeFi's technology. While at Qualcomm, I worked with its corporate R&D division and developed consumer 3G and 4G cellular coverage enhancement systems utilizing WiDeFi's baseband interference cancellation technologies. My responsibilities included working with international cellular operators on product requirements, detailed W-CDMA simulations, Long Term Evolution ("LTE") systems analysis, and participation in prototype product realization. I am currently a named inventor on roughly 45 issued U.S. patents or patent applications assigned to Qualcomm.

14. From 2010 to the present, I have served as managing director and co-founder of Proxicom Wireless, LLC, which has developed and continues to develop cloud-based, mobile social networking and mobile payments technology based upon the proximity and location of mobile devices. Proxicom currently holds twelve issued U.S. patents and multiple pending patent applications, of which I am a named inventor. Significant aspects of Proxicom's technology involve a mobile device's use of short range wireless technologies (802.11, near field communications, Bluetooth) in combination with cellular data links (3G/WCDMA or 4G/LTE, for example) to facilitate frictionless interactions via a wireless networked central cloud server.

15. Since 2007, I have also been the principal of Proctor Consulting, LLC. In this role, I have been a consultant relating to wired, wireless, and cellular communication and technologies, start-up companies and intellectual property. I have also been involved with numerous patent infringement, patent validity, and patent analysis assignments for public and private companies in the wired, wireless, and cellular networking industries.

16. Additionally, I have worked and consulted for both cellular infrastructure and device focused companies (Spectrian, Qualcomm, Fastback Networks), and defense contractors (Harris Corporation), where I developed covert-tracking and location technologies involving CDMA and smart-antenna technologies.

17. In various of the above-detailed roles, I have been responsible for the development of business plans, product development plans, product development budgets, and product bill of materials estimations. I have been responsible for numerous product development teams, including schedule and costs of the development process at various stages of my career. For example, at Tantivy Communications, I ran a joint development of I-CDMA cellular base stations in Seoul, Korea that were used in a field trial in that country. Additionally, as founder and CEO of WiDeFi, Inc., I was responsible for similar such activities, as required to raise venture capital funding and reporting to the board of directors.

18. I am currently a named inventor on more than 325 issued U.S. patents, and more than 700 international patent publications in total. A substantial portion of my work has focused on wireless communication systems and products. A number of these patents and patent applications are related to the subject matter of the patents asserted in this matter. For example, the following patents, for which I am a named inventor, are examples of some of my experience relevant to the subject matter of this declaration:

U.S. Patent No.	Title	Priority Date
6,100,843	"Adaptive antenna for use in same frequency networks"	Sept. 21, 1998
7,0,02,902	"Method and system for economical beam forming in a radio communication system"	Feb. 23, 2000
6,400,317	"Method and apparatus for antenna control in a communications network"	Feb. 2, 2001
9,974,116	"Handoff to base station having enhanced capabilities"	May 31, 2001
7,113,786	"Antenna adaptation to manage the active set to manipulate soft hand-off regions"	Mar. 8, 2002
7,911,993	"Method and apparatus for allowing soft handoff of a CDMA reverse link utilizing an orthogonal channel structure"	Nov. 20, 2003
8,027,642	"Transmission canceller for wireless local area network"	Apr. 6, 2004
7,787,408	"Wireless repeater with master/slave configuration"	May 19, 2006
11,443,344	"Efficient and secure communication using wireless service identifiers"	Sept. 8, 2008
8,477,665	"Method in a wireless repeater employing an antenna array for interference reduction"	July, 14, 2010
9,135,612	"Proximity detection, virtual detection, or location based triggering of the exchange of value and information"	Apr. 17, 2011

19. Based on my professional experience, I believe I am qualified to testify as an expert on matters related to the patent at issue.

20. I am currently consulting, working with and/or advising a number of companies and universities. For example, I currently serve on the external advisory board to the University of Florida's Electrical and Computer Engineering department. I also perform expert consulting work, research, and development in the area of wireless communications with Proctor Consulting and Proxicom wireless. Finally, I perform conceptual and product development in the medical device field with Genesis Medical Devices.

III. MATERIALS REVIEWED

21. The opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge.

22. In forming my opinions expressed in this Declaration, I also reviewed the following materials and information:

Exhibit No.	Description
1001	U.S. Patent No. 9,094,888 ("the '888 patent")
1002	Prosecution History of U.S. Patent No. 9,094,888
1003	U.S. Patent Publication No. 2006/0111149A1 ("Chitrapu")
1006	Expert Declaration of Benoist Sébire on the Prior Art Status of TS 36.300
1007	IBM International Technical Support Organization, *An Introduction to Wireless Communications*, 2d ed. (October 1995)
1008	Taylor, M.S. et al., *Internet Mobility: The CDPD Approach* (June 11, 1996)
1009	Steele et al., *GSM, cdmaOne and 3G Systems* (2001)

Exhibit No.	Description
1010	Sesia, S. et al., *LTE – The UMTS Long Term Evolution*, 2d ed. (2011)
1011	3GPP 23.401 V10.3.0 (March 2011)
1223	3GPP TS 36.300 V10.3.0
1229	*Curriculum Vita* of James Proctor

23. I also reviewed any other materials I refer to in this Declaration in support of my opinions.

24. My opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the claims and the specification of the ’888 patent at the time of the alleged invention.

IV. LEGAL STANDARDS

25. Petitioners’ attorneys have explained to me the legal standards that apply in this case. My understanding of those standards is described below. I am not an attorney, and I do not have formal training in the law regarding patents. I have used my understanding of the following legal principles set forth in this section in reaching my opinions.

26. I understand that, in this proceeding, Petitioners have the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Obviousness

27. I have been informed that a claim is invalid as obvious under 35 U.S.C. § 103 (pre-AIA) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the art. I have been informed that the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

28. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

29. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it,

either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, such a variation is likely unpatentable. For the same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

30. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

31. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

32. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. I have been informed that it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I am told that one way that subject matter can be proved obvious is by noting there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

33. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

34. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the

product was likely not accomplished by innovation but by using ordinary skill and common sense. I have been informed that, in such an instance, the fact that the combination was obvious to try may show that the combination was obvious.

35. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

36. I have been informed that, when determining whether a claimed invention is obvious, any "secondary considerations" of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;

- the invention taught away from the technical direction followed by those skilled in the art;

- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;
- the invention achieves results unexpected to those skilled in the art;
- copying of the invention by competitors as distinguished from their independent development
- unsuccessful attempts by those skilled in the art to make the invention;
- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

37. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-

obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

B. Claim Construction

38. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the '888 patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

39. I have been informed that in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation

because such reliance indicates use of the preamble to define, in part, the claimed invention.

V. PERSON OF ORDINARY SKILL IN THE ART AND THE TIME OF THE ALLEGED INVENTION

40. I have been asked to assume that the ’888 patent is entitled to its earliest alleged priority date of April 29, 2011. S*ee* Ex. 1001, Face, item (22) (“PCT Filed” section).

41. Based on the materials and information I have reviewed and based on my experience in the technical areas relevant to the ’888 patent, a person of ordinary skill in the art at the time of the alleged invention of the ’888 patent would have had at least a bachelor’s degree in electrical engineering, computer engineering, computer science, physics, or the equivalent, and at least two years of experience working in the field. Relevant working experience would include experience with cellular telecommunications and networking, radio-access network architectures, protocols and signal propagation, and including handovers in wireless networks. More education can supplement practical experience and vice versa. Based on my knowledge and experience, including as discussed above in Section II, I was a person of ordinary skill in the art as of April 29, 2011, and can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

42. I myself had these capabilities at the time of the alleged invention of the ’888 patent.

VI. TECHNICAL BACKGROUND

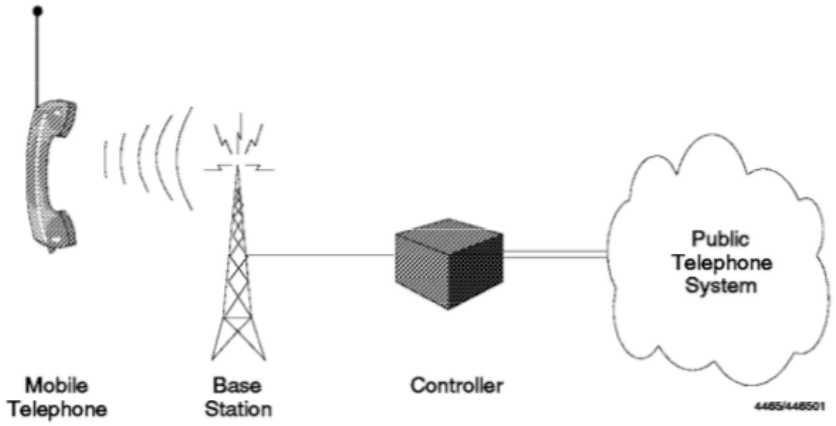
43. Below, I present a brief overview of certain technical concepts and features that would have been known to a person of ordinary skill in the art prior to and at the time of the earliest alleged priority date of the ’888 patent. The technical concepts and features that I describe in this Technical Background section reflect the state of the art that a person of ordinary skill in the art would have had knowledge of and would have understood prior to and at the time of the alleged invention of the ’888 patent. I rely on, and incorporate as applicable (even if not expressly mentioned below in Section IX) the following disclosures to support my opinions in this Declaration, including those opinions relating to how the prior art discloses and/or suggests the challenged claims of the ’888 patent and how (and why) a person of ordinary skill in the art would have been motivated to consider and combine the disclosures and suggestions from one or more prior art references.

A. A Brief History of Cellular Mobile Communications

44. The first mobile telephone system was deployed in St. Louis in 1946, having a 50 mile coverage range. This service was deployed in 25 states within the following year. *See* Ex. 1007 at 6. This system used a number of base stations, each

having a frequency modulated transmitter, and was connected to the wired telephone network using a controller.

Ex. 1007, Fig. 1.



45. This system was replaced in the 1960s with a system called the "Improved Mobile Telephone Systems" (IMTS), and was a precursor to the so-called cellular service. Ex. 1007 at 6. It used a larger number of smaller cells operating at lower power to increase the capacity of the system. Additionally, the system provided for a number of channels per base station.

46. Every cellular system must apportion some amount of over-the-air resources for user terminals, like cell phones, for some period of time to transmit communications to a base station. This communications link from user terminal to base station is referred to as the "uplink," or "reverse link" (while the communications link from base station to user terminal is referred to as the "downlink," or "Forward link"):

Ex. 1008 at 20.

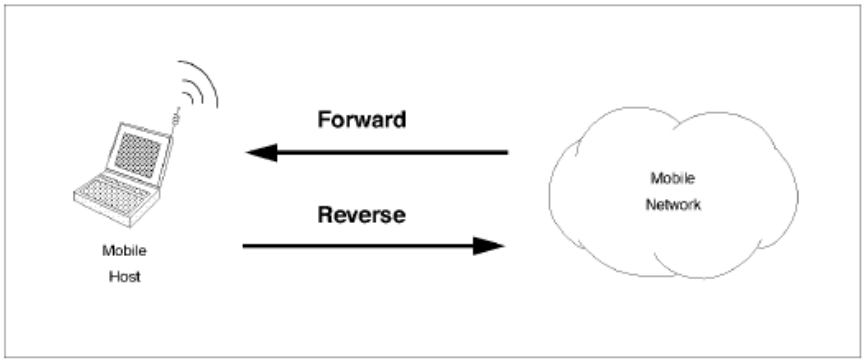


Figure 0.11: Directions of Mobile Transmission

47. Cellular mobile voice and/or data devices additionally must perform control operations with the cellular networks. These control operation may be grouped into some general categories: Radio Resource Management, Mobility Management, and Service (or Session) Management.

Ex. 1008 at 28.

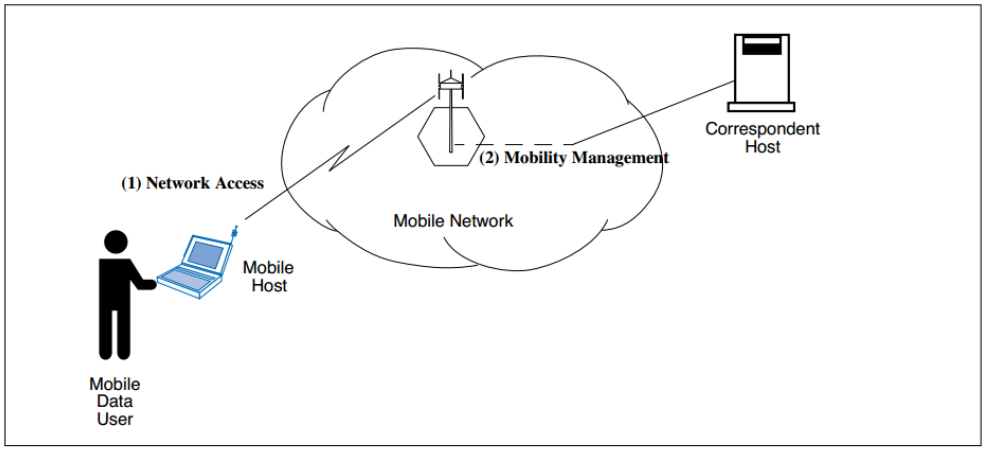


Figure 1.5: Two Basic Aspects of Mobile Communications

48. Radio Resource Management is typically concerned with assuring proper (effective and efficient) use of the RF medium and is part of accessing the mobile network. Ex. 1008 at 43. In many standards Radio Resource Management involves the mobile device exchanging messages and transmissions directly with the base station, or the controller of the base station. The radio resource control functions may include aspects of handover.

> **Radio resource management functions** Allocation and maintenance of radio communication channels are provided by these functions. The GSM radio resources are dynamically shared between the circuit mode and GPRS. The GPRS radio resource management is concerned with the allocation and release of timeslots for a GPRS channel; monitoring GPRS channel utilization; congestion control; and the distribution of GPRS channel configuration information that is broadcast on the common control channels.

Ex. 1009 at 418.

49. Mobility Management provides for the ability to send and receive communication wherever a mobile device is located. This category sometimes is referred to as, or otherwise includes, location management. Furthermore, Mobility Management involves the handover of a mobile device between cells (to be discussed in more detail below), depending upon the system. At the least, it includes

the location management aspects related to changing the point of attachment within one or more radio access networks.

50. Service or Session Management provides for access to services within the radio access network. For example, in prior art cellular systems such as GSM (Global System for Mobile communications), GPRS (General Packet Radio Services), and UMTS (Universal Mobile Telecommunications System), services or sessions are invoked that are distinct from Mobility Management registration and authentication, and are related to a user device connecting and disconnecting from services within the network. For example, in GSM, connection management involves circuit-switched call control, so-called supplemental services, and SMS (short messaging services). The services connection management functions generally must determine which services the user (*e.g.*, based on the user's subscriber identification module (SIM)) is authorized to receive, and perform accounting and charging of the user related to use of those services. In GPRS and UMTS, access to circuit-switched voice connections and access to packet data services are invoked separately. In LTE, all communications are packet based both voice and data.

B. Cellular Network Planning

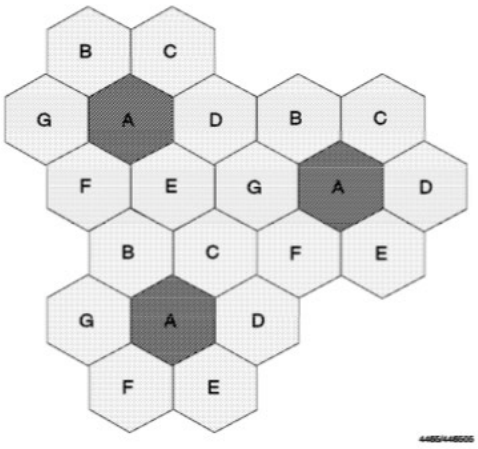
51. In early cellular systems (1G and 2G), to avoid interference between the signals of adjacent base stations and wireless phones within the coverage areas

of those base stations, the reuse of the same channels within the adjacent coverage areas was not allowed. Rather, the system required skipping at least one base station's use of a given channel, prior to the reuse of that same channel. Ex. 1007 at 6. This approach become known as a "frequency reuse pattern."

52. One early system cellular system was developed by Bell Laboratories in the 1970s and deployed in Chicago, beginning in 1979. Ex. 1007 at 6. This system was referred to as the "Advance Mobile Telephone System" (AMPS). There were similar variants deployed in other countries shortly following the development of AMPS.

53. An example of an early frequency reuse pattern is depicted in the following figure.

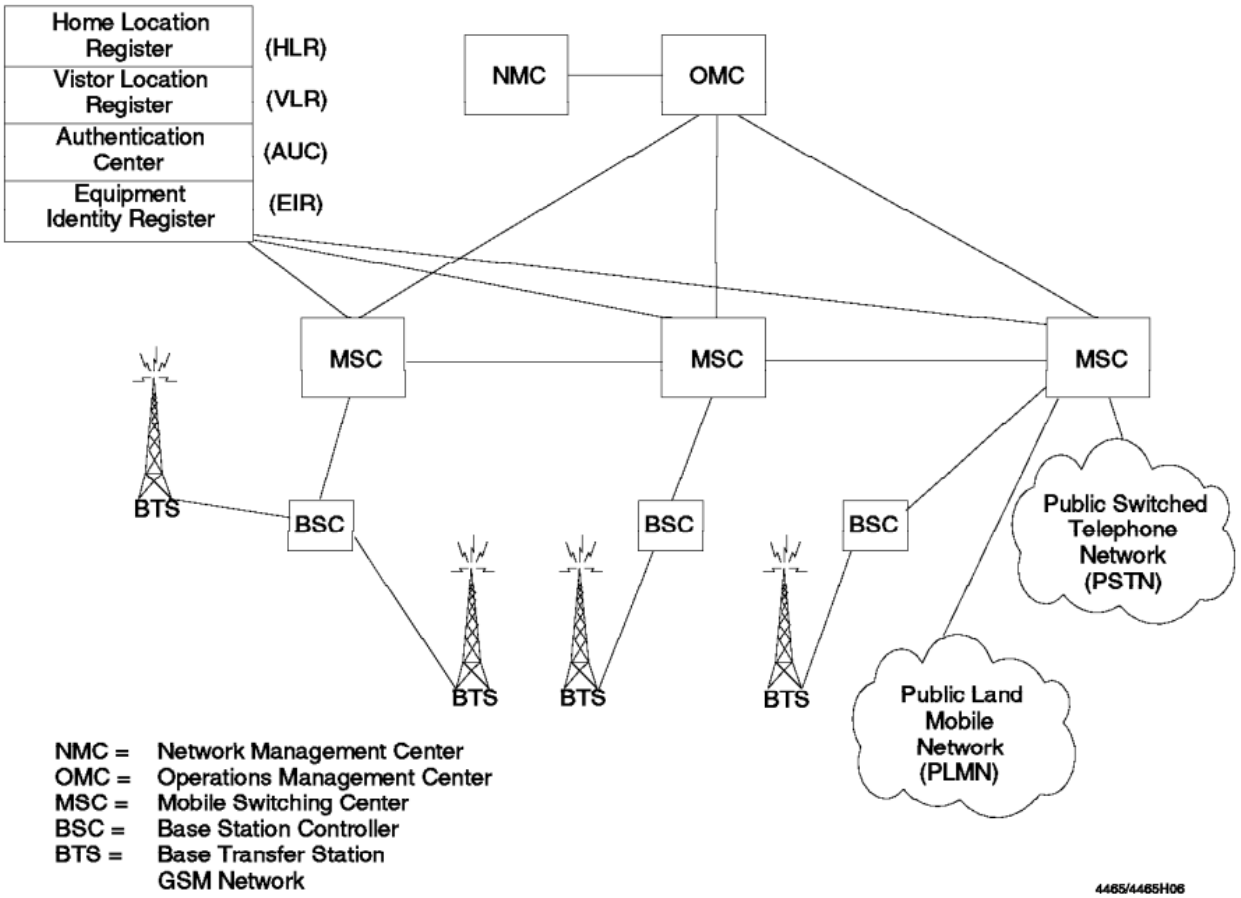
Ex. 1007 at 7 (Fig. 2).



54. Referring to the above figure, the letters in each "cell" represent a different subset of the available channels of operation of a cellular system. One can

readily see that no two adjacent cells have the same sets of assigned operating frequency channels, thus reducing the interference between the cells. The AMPs system included a "mobile switching center" or MSC to allow for the transfer of a call form one cell to the next as a mobile phone traverses the cells. This is referred to as a handoff or handover. AMPS was referred to as a first generation system (1G).

Ex. 1007 at 42 (Fig. 14).



C. Cellular Standards and Standards Development Organizations

55. A standards setting organization (or standards development organization ("SDO")) is any organization whose primary activity is producing technical standards to address the needs of companies that want to implement that technology. In particular, telecommunication SDOs promote cooperative standards for telecommunications equipment and systems through standards development, which provide manufacturers and vendors with a universal approach to develop products and compete in the marketplace.

56. The 3rd Generation Partnership Project ("3GPP") is a widespread SDO that is responsible for creating specifications that define 3GPP technologies:

Ex. 1010 at 3 (Fig. 1.1)

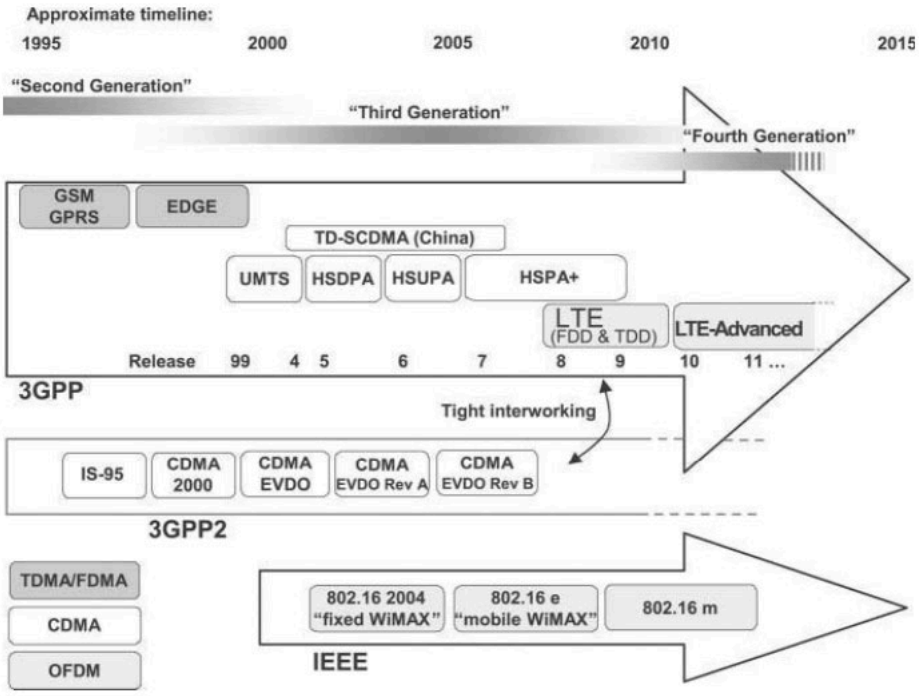


Figure 1.1: Approximate timeline of the mobile communications standards landscape.

57. Each generation of cellular system included handoff both within each radio access technology, but also between different radio access technologies as explained in more detail below. As one example, 3GPP defines a network capable of supporting interoperability with each generation of technology defined within that organization (between UMTS (3G) as LTE (4G) for example depicted below).

Ex. 1010 at 39 (Fig. 2.10)

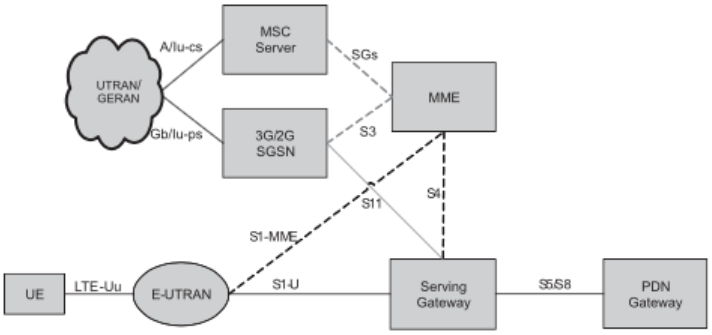


Figure 2.10: Architecture for 3G UMTS interworking.

58. For example, the above figure depicts a LTE Core network interoperating with the LTE RAN and the previous generations networks (GSM and W-CDMA) to support handover. *See also* Ex. 1011, Fig. 4.2.1-1.

D. Basic Handover

59. At the time the ’888 Patent was filed, a POSITA would have known that cellular network operators had deployed multiple types of networks in the United States.

60. For example, networks operating according to the Third Generation (3G) standards, such as Universal Mobile Telecommunications System (UMTS) and CDMA2000, had been deployed in the United States for almost a decade, and US network operators had also widely deployed networks operating according to Fourth Generation (4G) standards, such as Long Term Evolution or LTE.

61. For a wireless device (also known as user equipment or UE), handover (also referred to as "handoff" in some systems) ensures that a UE can maintain an ongoing communication session while moving between different cells or coverage areas.

62. Examples of handover procedures are implemented in every major cellular technology, including GSM, UMTS, and 4G LTE. These handover processes were standardized by 3GPP (3rd Generation Partnership Project) and have been widely implemented in 3G and 4G networks. As discussed above, the 3GPP is a standards-setting organization that releases technical specifications (TS) that cover cellular telecommunications technologies.

E. Types of Handover

63. The following provides examples of the types of handover procedures available in the prior art LTE standard and that would have been known to a POSITA.

64. **Intra-RAT Handover.** An intra-RAT handover is a type of handover where a UE is handed off from a base station to another base station that are operating using the same radio access technology (or RAT). In one example of an intra-RAT handover, intra-LTE handover, a UE is handed off from one base station (referred to as an eNodeB) within an LTE network to another base station within the

same LTE network. During this handover, an on-going connection with the LTE network is maintained.

Ex. 1010, Fig. 2.19; *see also* Ex. 1223, Fig. 10.1.2.1.1-1.

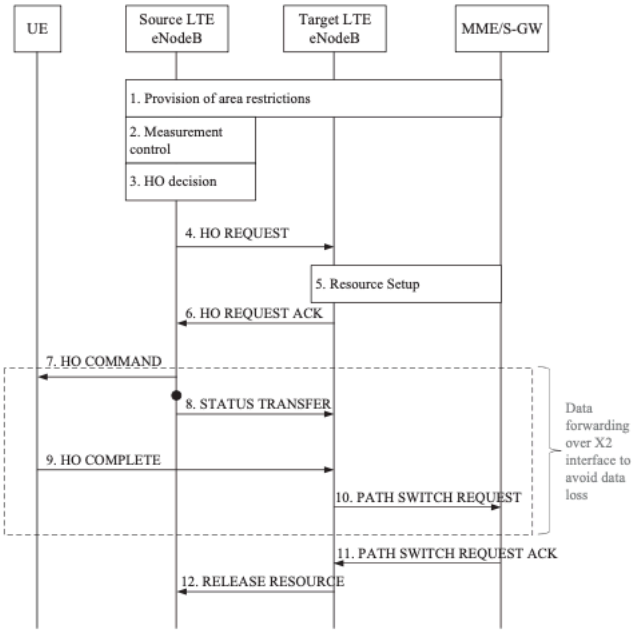


Figure 2.19: X2-based handover procedure.

65. **Inter-RAT handover.** In this type of handover, a UE is handed off from a base station operating according to one type of RAT (*e.g.*, 4G LTE) to a base station operating according to a different type of RAT (*e.g.*, 3G UMTS). The ability to perform inter-RAT handovers was fundamental to the operation of cellular devices prior to the '888 Patent. A POSITA would have known that, prior to the '888 Patent, network operators in the United States typically operated multiple networks. For example, in 2011, network operators had a robust 3G network throughout the United States and had started to build 4G networks on top of the 3G

networks in major metropolitan cities. As result, a POSITA would have known that UEs in 2011 were often compatible with 3G and 4G networks. This concept is known as "backward compatibility."

66. A POSITA would have recognized that as a UE moved in and out of certain coverage areas (*e.g.*, entering or leaving a city with 4G coverage), the UE would move between 4G and 3G coverage. In order to ensure seamless service, (*e.g.*, prevent dropped calls) and in order to ensure UEs were receiving the highest level of service (*e.g.*, moving the UE to 4G service when it became available), the UE must have capable of handover between the different 3G and 4G wireless networks using the standardized inter-RAT handover procedure.

VII. THE '888 PATENT

A. Description of the '888 Patent's Specification

67. The '888 Patent is titled, "Wireless Handoff Between Wireless Networks" and discloses methods, apparatuses and systems to facilitate wireless device handoff between a first and second wireless network. Ex. 1001, 3:27-30. Figure 1A below illustrates the concepts from the '888 Patent.

Ex. 1001, Fig. 1A (annotated)

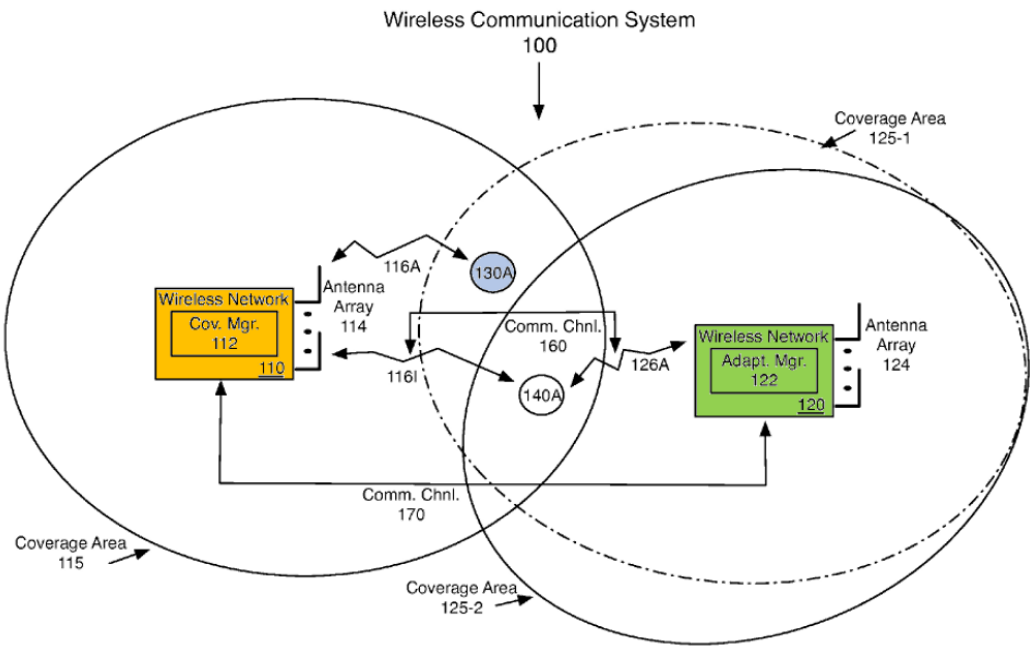


FIG. 1A

68. As shown above in orange and green respectively, there are two wireless networks (also referred to as base stations, *see* Ex. 1001, 4:30-32) labeled 110 and 120, shown. The wireless devices (*e.g.*, UEs) labeled 130A (for example) are shown in blue.

69. The wireless device (UE) is connected to the source network and will be handed off to the target network. The claims label the source network as the "second wireless network" and the target network as the "first wireless network."

Ex. 1001, Fig. 1A (annotated)

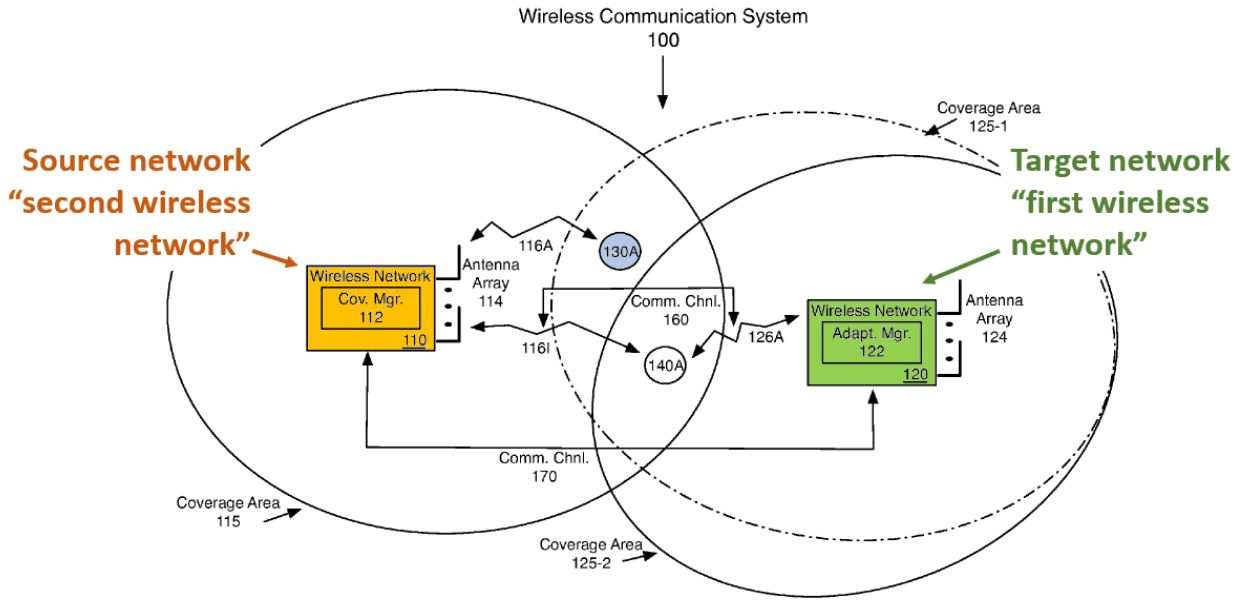


FIG. 1A

70. The wireless network 120 (in green) has two potential "coverage areas" 125-2 (shown by a solid line in the figure above) and 125-1 (shown by a dashed line in the figure above). These two coverage areas are illustrated below in cross stripes:

Ex. 1001, Fig. 1A (annotated)

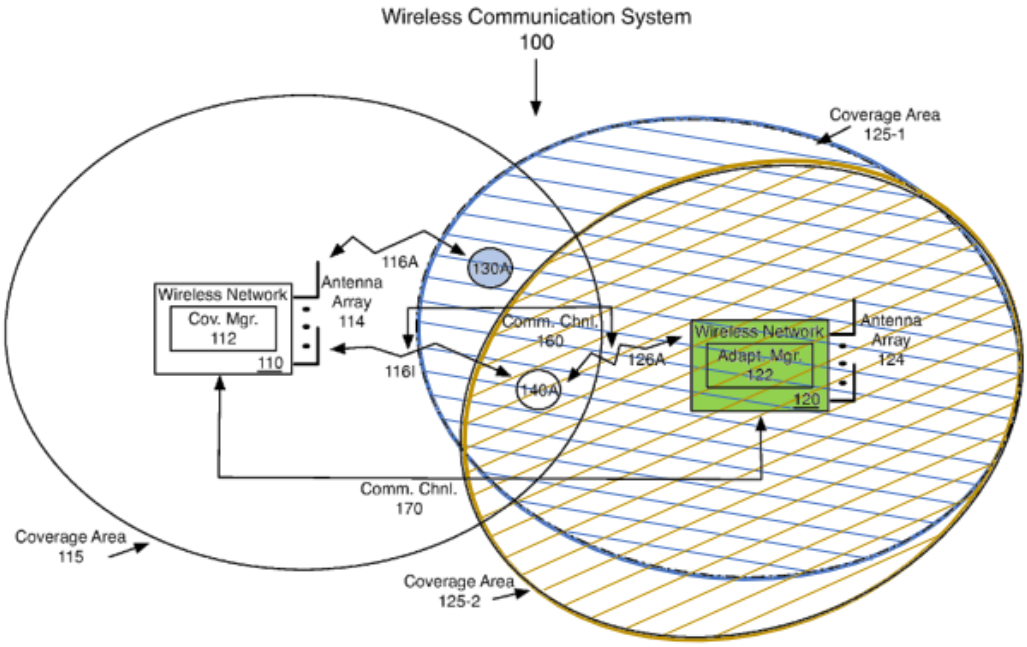


FIG. 1A

71. In Figure 1A, the target wireless network is operating with coverage area 125-2 (in orange). UE 130A (shown in blue) is not covered by coverage area 125-2 (in orange). Ex. 1001, 5:35-38. To facilitate the handover, the '888 Patent describes that the target network must adapt its coverage area to 125-1 (in blue cross stripes) to cover the UE 130A. To adapt its coverage area, the '888 Patent describes adapting one or more beams of an antenna array to match coverage area 125-1.

72. To aid in this process, the '888 Patent then describes how network managers (*e.g.*, "coverage manager 112" and "adaption manager 122") negotiate and exchange information such as "coverage maps" so that "coverage manager 112 may

be configured to determine that wireless device 130A . . . may be *capable* of being covered by wireless network 120 based at least on the coverage map." Ex. 1001, 6:1-5 (emphasis added).

73. Based on the negotiation, the source wireless network 110 (the "second" wireless network of the claims) determines that the target wireless network 120 is capable of covering UE 130A and transmits a handoff request to wireless network 120 (the "first" wireless network of the claims). Ex. 1001, 6:22-24. From there, "adaption manager 122 of wireless network 120" may "receive the handoff request and determine whether to adapt antenna array 124 to facilitate coverage of wireless device 130A." Ex. 1001, 6:26-31.

B. The '888 Patent's Prosecution History

74. I have reviewed the '888 patent's prosecution history. The '888 Patent claims priority to PCT/US2011/034470, which was filed on April 29, 2011. A non-final rejection was issued by the US patent office on June 19th, 2013 rejecting all claims based upon prior art reference Siomina (U.S. Patent Publication No. 2012/0149430). On September 19th, 2013 the applicant amended independent claims and provided remarks in response to the rejection. A final rejection was issued on January 3rd, 2014, again rejecting all claims. The applicant then responded on February 14th, 2014 after which an examiners amendment was entered and a Notice

of Allowance was issued on March 18, 2015. The '888 Patent issued on July 28, 2015.

VIII. SUMMARY OF THE PRIOR ART

A. Chitrapu

75. U.S. Patent Publication No. 2006/0111149 A1 ("Chitrapu") is titled "System and Method Utilizing Dynamic Beam Forming for Wireless Communication Signals."

76. Chitrapu was published on May 25, 2006. Ex. 1003, Face. Chitrapu was thus published more than a year before the '888 Patent was filed.

77. Chitrapu discloses a beaming forming method used to dynamically shape cell coverage in conjunction with a "smart" handover method. Ex. 1003, ¶¶[0008]-[0011].

78. Chitrapu starts by describing how prior art networks without dynamically shaped coverage areas effectuate a handover. Chitrapu explains how, in conventional networks, "the geographic area covered by a base station is commonly referred to as a cell" and each "base station has its antenna system selectively physically located to provide coverage over a specific portion of the total geographic area." Ex. 1003, ¶[0006]. Chitrapu then explains how in conventional systems, each base station's transmissions beams have strictly defined coverage

areas with a portion of overlap with an adjacent base station. Ex. 1003, ¶[0071]. I have highlighted these coverage areas in prior art Figure 1B below.

Ex. 1003, Fig. 1B (annotated)

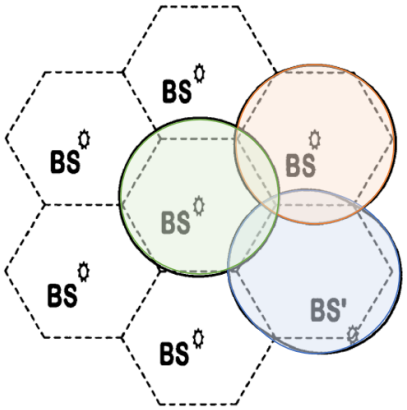


FIG. 1B
(PRIOR ART)

79. As explained, this conventional "overlap of beam coverage enables 'handover' of a communication being conducted by a mobile UE from one base station to another as the mobile UE travels from one cell to another." Ex. 1003, ¶[0008].

80. Chitrapu discloses two changes to the prior art to improve on the prior art: (i) dynamically shaping a cell, and (ii) "smart handover" used to dynamically shape the cell.

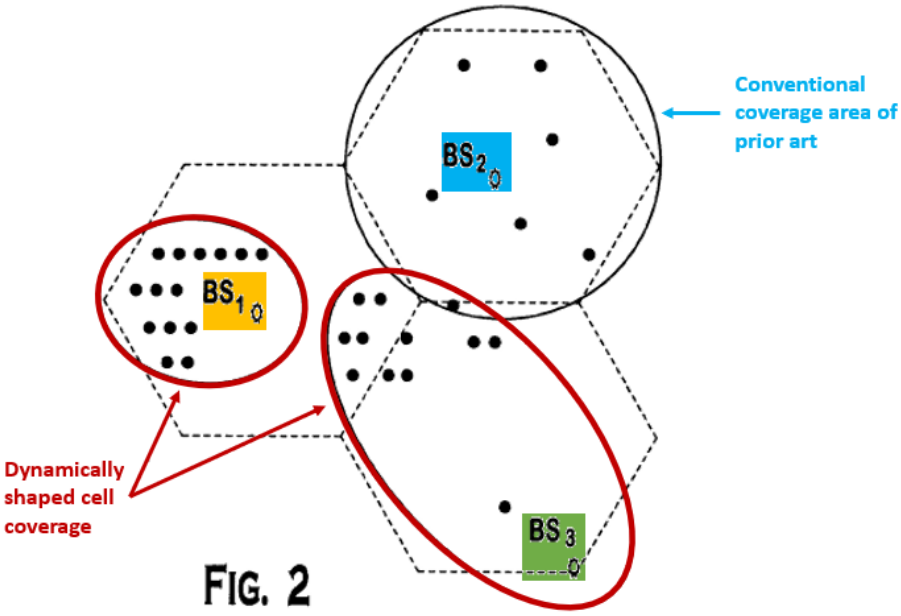
1. Dynamic Shaping Cell Coverage

81. In the first concept, Chitrapu discloses dynamically shaping a cell instead of maintaining strict coverage areas. Chitrapu states "in lieu of maintaining

strictly defined coverage areas, the present invention employs *dynamic shaping of cell coverage*." Ex. 1003, ¶[0071] (emphasis added). To dynamically shape cell coverage, the network acquires a UEs geographical position through GPS or other known methods. Ex. 1003, ¶[0082]. A beam forming calculation step then occurs based on location data of targeted UEs. Ex. 1003, ¶[0083]. The beam is then formed to produce a selectively sized and directed RF beam which covers the UE's position as reflected by its geolocation data. Ex. 1003, ¶[0006], ¶[0013], ¶[0030] ("A set of directed beams of base station RF communication signals for the UEs is formed based on the calculated beam forming criteria such that for each said UE a directed beam having RF communication signals for that UE encompasses the estimated location of that UE. The process is repeated based on selected criteria to dynamically reconfigure base station transmission beams.").

82. As a result, "two or more neighboring cells can negotiate and redefine the area covered by each base station in a manner that is more optimal to all of the cells taken together." Ex. 1003, ¶[0074]. This is illustrated in Figure 2:

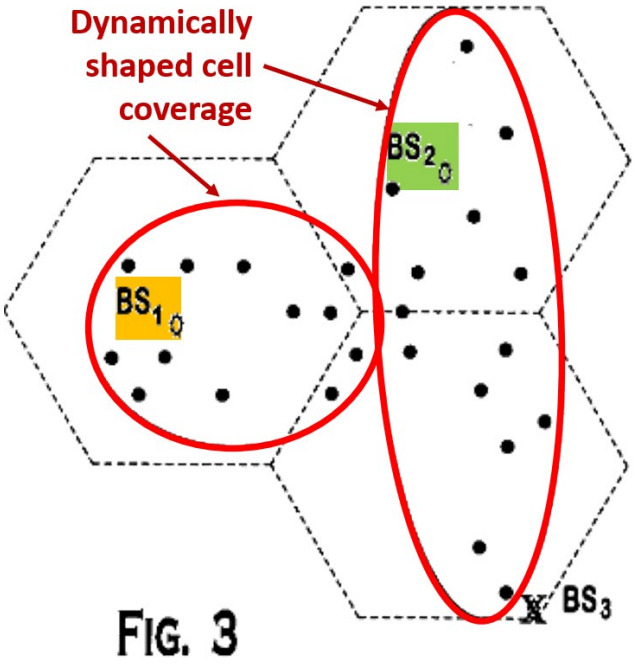
Ex. 1003, Fig. 2 (annotated)



83. In Figure 2 (annotated above), Chitrapu discloses a concentration of users around BS1 (shown in orange). Due to this concentration, BS1 and BS3 (adjacent to BS1) negotiate and dynamically change their coverage areas (shown in red) to accommodate the concentration of users. Ex. 1003, ¶[0075]. In particular, BS3 extends its beams to cover UEs that otherwise would not be covered because they are in the coverage area of BS1. Ex. 1003, ¶[0075].

84. A second example is shown in Figure 3:

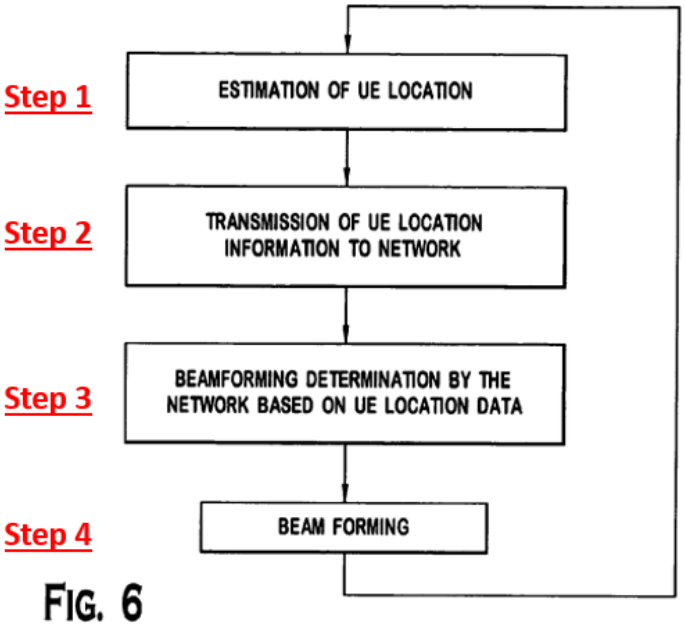
Ex. 1003, Fig. 3 (annotated)



85. In Figure 3 (annotated above), Chitrapu discloses a situation where BS3 has suffered a failure. When BS3 fails, BS1 and BS2 are used to transmit a selectively shaped and directed beam to facilitate the coverage and radio resources for the users in the area normally served by base station BS3. Ex. 1003, ¶[0075]. Figures 2 and 3 above illustrate the improvement of Chitrapu's disclosure of base stations that can dynamically adjust their coverage area based on network conditions over the conventional coverage area in the prior art.

86. The process for dynamic shaping of cell coverage is shown in Figure 6.

Ex. 1003, Fig. 6 (annotated)



87. Pointing to Figure 6, Chitrapu provides that:

> The first step consists of determination of location and/or locations of the targeted UE and/or UEs. This is preferably achieved by using well known techniques including: 1) UE based techniques, such as GPS based methods; 2) Network based triangulation methods, such as methods based on Time Difference of Arrival (TDOA), Angle of Arrival (AOA); 3) hybrid methods involving both the UE and the Network.

Ex. 1003, ¶[0082].

88. In step two, the network is then made aware of the location data for each UE by "an exchange of appropriately designed messages between the UE and the Network." Ex. 1003, ¶[0082].

89. In step three, "the network determines the characteristics of the beam forming in order to serve the targeted UE(s) in a manner deemed appropriate and/or optimal by the network." Ex. 1003, ¶[0083].

90. Finally, "the beam is formed based on decision process to produce a selectively sized and directed RF beam which covers the UE's position as reflected by its geolocation data" Ex. 1003, ¶[0083]. The same or similar step was discussed in relation to Fig. 4 as well, "[o]nce the negotiation process is completed, the base stations refocus their transmitted RF signals to provide the beams for the UEs which are determined during the negotiation process." Ex. 1003, ¶[0079].

2. Smart Handover

91. In order to achieve the above scenario for UEs with ongoing communications, the second concept in Chitrapu discloses a "smart" handover that hands over the connection using (i) UE location information (*e.g.*, geographical position), (ii) beam forming capabilities of neighboring cells, and (iii) a negotiation between base stations that determines the handover and beam shape of the various base stations after the handover. Ex. 1003, ¶[0011]; Ex. 1003, ¶¶[0105]-[0107].

92. Figures 8 shows the smart handover. In Figure 8 (annotated below), the UE is communicating with a source BS1 (in orange) and moving toward an adjacent target base station BS2 (in green).

Ex. 1003, Fig. 8 (annotated)

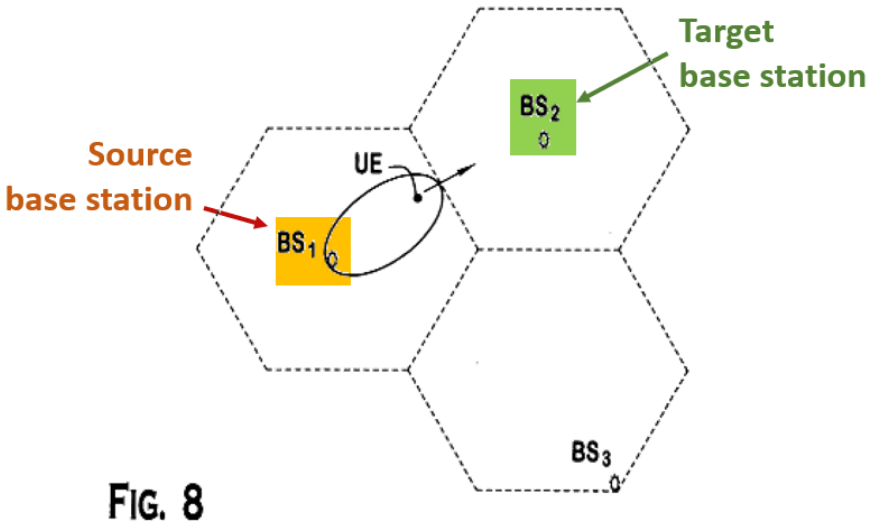


FIG. 8

93. In Figure 9 (shown below), each of the candidate cells BS1, BS2, and BS4 "negotiate" the handover of a UE by "communicat[ing] among themselves . . . regarding the availability of RF resources and any other considerations relevant to supporting the UE under consideration." Ex. 1003, ¶[0106].

Ex. 1003, Fig. 9

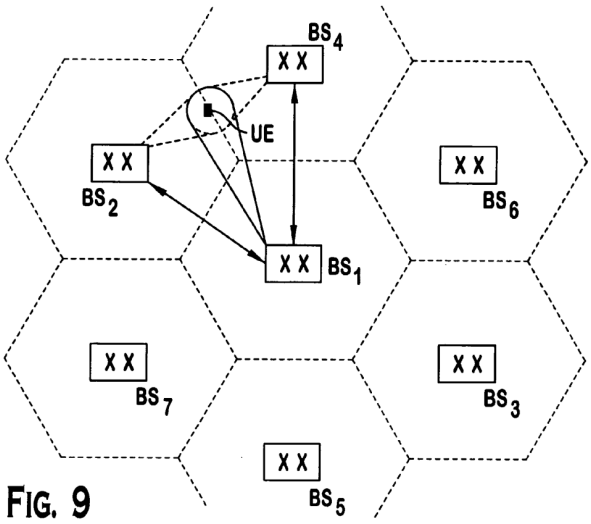
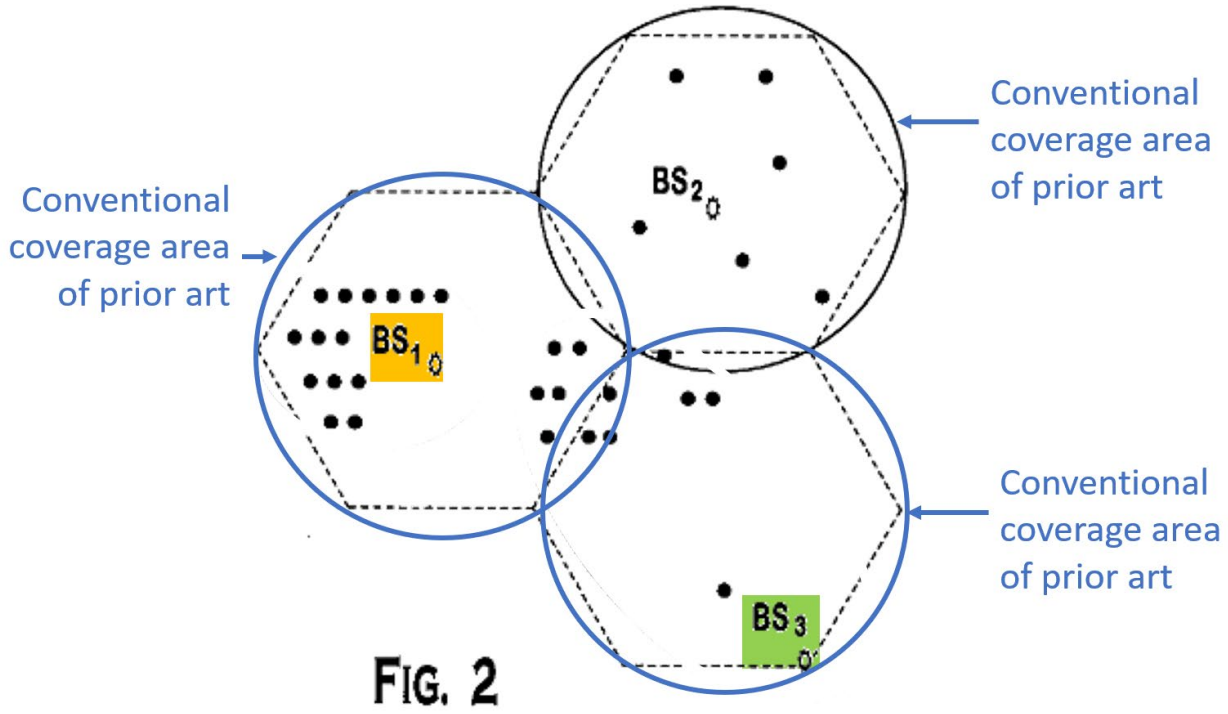


FIG. 9

94. Chitrapu discloses that the source base station makes the decision to perform the handover and selects the beams of the target cells to cover the UEs. Chitrapu states: "[T]he serving base station determines which base stations are to be involved and proceeds with the negotiation process to select[] a preferred beam allocation pattern for all of the involved base stations." Ex. 1003, ¶[0109]. Chitrapu confirms the serving (source) base station selects the beam by stating, "[w]here a handover is to occur, the new serving based station will first implement the selected beams determined for it and acquire the UE communication, before the original serving base station implements its new beam pattern." Ex. 1003, ¶[0109]. Fig. 10 discloses a similar process but where the network determined not to do a handover from BS1 to BS2.

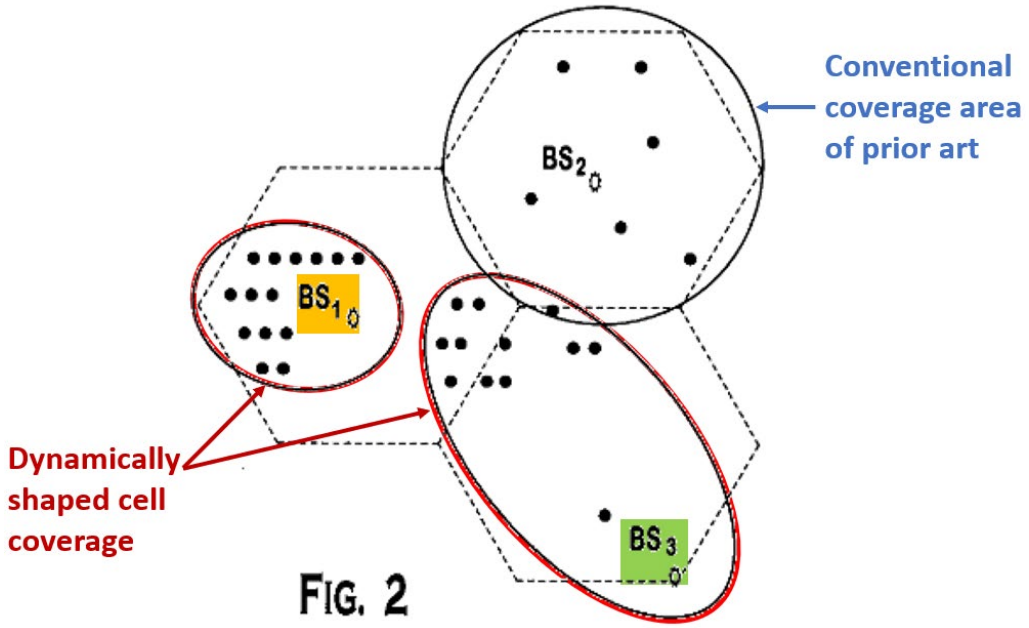
95. Below, I annotate Figure 2 to show how the coverage area of the base stations in Chitrapu changes during a smart handover. First, I removed the dynamically shaped coverage area of Figure 2 for BS1 and BS3 and replaced it with the conventional coverage area of the prior art (as shown, *e.g.*, in Figure 1B & for BS2 in Fig. 2).

Ex. 1003, Fig. 2 (annotated with dynamic coverage removed and conventional coverage shown)



96. After the smart handover negotiation process described above, the dynamic coverage area results in the network adapting the beams to manage the concentration of users around BS1. The dynamically shaped cell coverage after the negotiation process of BS1 and BS3 are shown in red in Figure 2 annotated below.

Ex. 1003, Fig. 2 (annotated with dynamic coverage highlighted in red)



97. Comparing the two annotated figures shows how the coverage area of BS1 and BS3 dynamically change in conjunction with the smart handover process discussed above. Chitrapu discloses that a "triggering event" for performing a smart handover may include "UE signal quality deterioration, serving base station load and changes in service needs of the UE." Ex. 1003, ¶[0108].

98. While the specific messages used to "negotiate" and "execute" the base stations are not directly stated in Chitrapu, Chitrapu discloses that its systems are constructed in accordance with "specifications of the 3rd Generation Partnership Program (3GPP)." Ex. 1003, ¶[0007]. I have discussed prior art 3GPP handover above in Section VI, and provided additional detail associated with prior art Ex. 1223 (3GPP TS 36.300).

B. 3GPP TS 36.300 (Ex. 1223)

99. By the time of the '888 Patent in 2011, various handover concepts were well-known in the art. Through the development of 2G (e.g. GSM), 3G (e.g. WCDMA), and 4G (e.g. LTE) technical specifications (TS), different types of handover were developed and standardized by 3GPP. The handover procedures and the corresponding details associated with those procedures were described in technical specifications (TS) published by 3GPP.

100. A POSITA would have been aware of the relevant and current 3GPP technical specifications. A POSITA would have used the 3GPP specifications as a resource for designing a handset or base station compliant with the relevant standard.

101. TS 36.300 V10.3.0 ("TS 36.300") is a technical specification produced by 3GPP that provides an overview and overall description of the Evolved Universal Terrestrial Radio Access Network's (E-UTRAN) radio interface protocol architecture. Ex. 1223 at 18-19. The specification is part of Fourth Generation (4G) specifications, also known as Long Term Evolution (LTE) specifications.

102. Section 10 of TS 36.300 describes mobility procedures. Ex. 1223 at 60. This section describes various types of handovers. Ex. 1223 at 60.

103. Section 10.1.2 describes intra-LTE handover. Ex. 1223 at 61-62. Intra-LTE handover is a type of intra-RAT handover between base stations within the same LTE network. Ex. 1223 at 60-62.

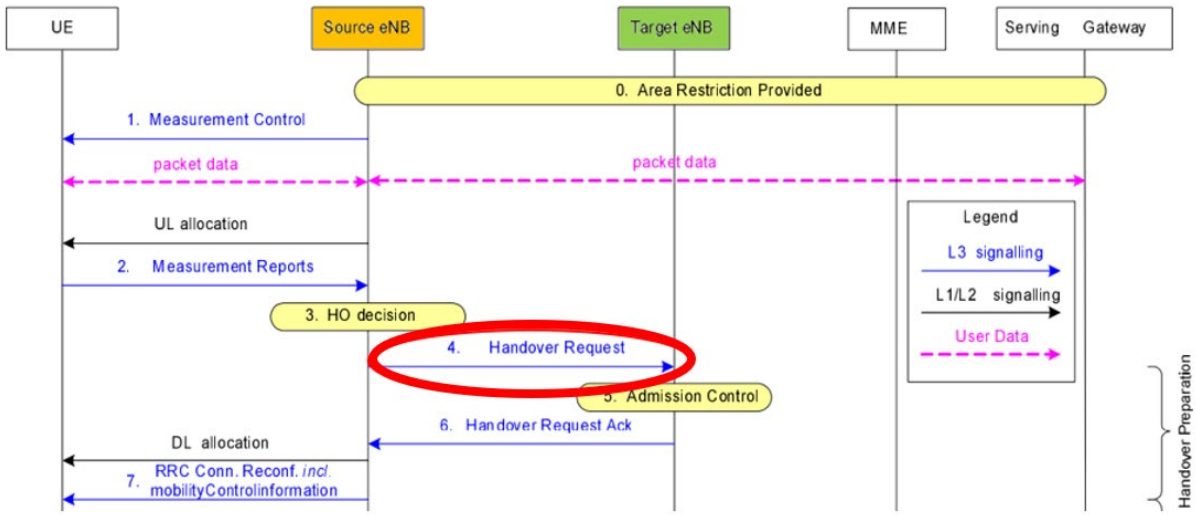
104. Section 10.2.2 describes Inter-RAT handover. Ex. 1223 at 77. Inter-RAT handover is between base stations in different wireless networks that use a different type of radio access technology, such as a 4G LTE networks and 3G UMTS networks. Ex. 1223 at 77.

105. TS 36.300 states that "[s]imilar handover procedure should apply for both Inter RAT Handover and intra-LTE Handover." Ex. 1223 at 77. Thus, a POSITA would have understood that the details of handover described in Section 10.1.2 also apply to Inter-RAT handover.

106. Figure 10.1.2.1.1-1 is the signal flow diagram. There, handover is illustrated in three phases: Handover Preparation, Handover Execution, and Handover Completion.

107. *First*, the "Handover Preparation" phase is shown below:

Ex. 1223, Fig. 10.1.2.1.1-1 (partial and annotated)



108. In messages 1 and 2, the UE and source base station (in orange) exchange measurement control and report messages. Ex. 1223 at 63-64. These messages provide the source base station with the conditions of the signal. Ex. 1223 at 63-64.

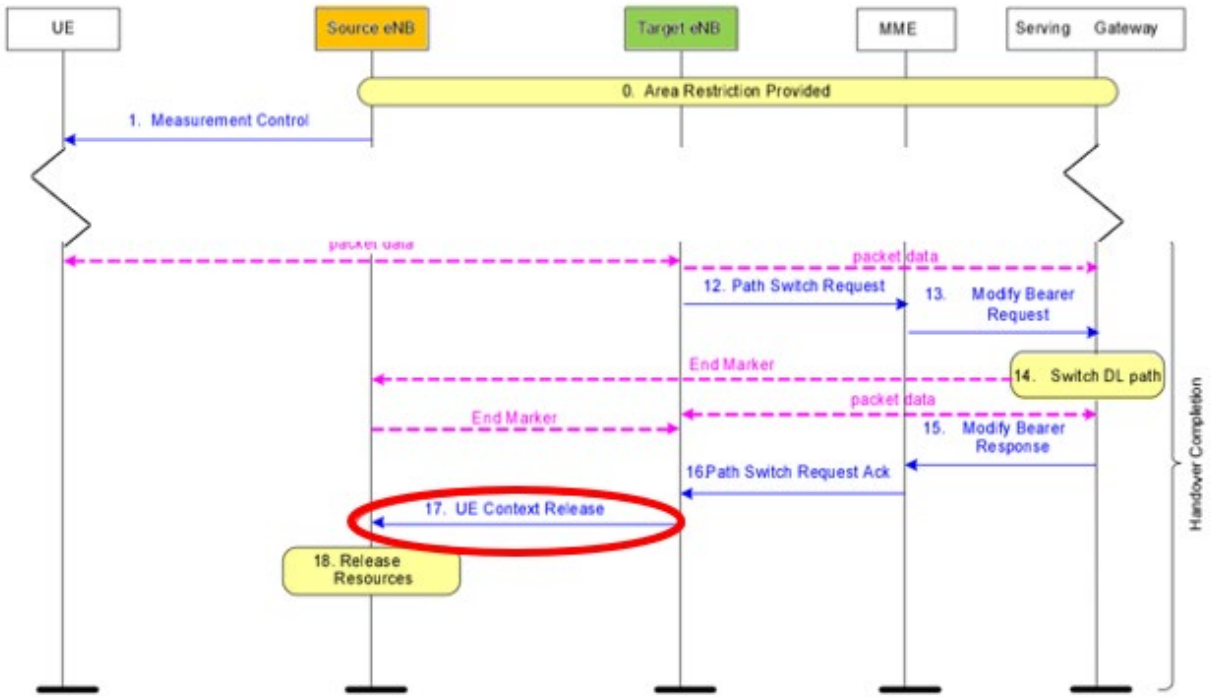
109. In step 3 (the yellow oval titled "HO Decision"), the "[s]ource eNB makes decision based on MEASUREMENT REPORT and RRM information to hand off UE." Ex. 1223 at 63-64.

110. In message 4 (circled in red and titled "Handover Request"), the "source eNB issues a HANDOVER REQUEST message to the target eNB [in green] passing necessary information to prepare the HO at the target side." Ex. 1223 at 63-64.

111. Second, the "Handover Execution" phase (not illustrated above) takes place, where the UE detaches from the old cell and synchronizes to a new cell. Ex. 1223 at 63-64.

112. Third, the "Handover Completion" phase is illustrated below.

Ex. 1223, Fig. 10.1.2.1.1-1 (partial and annotated)



113. In the Handover Completion phase at message 17 (titled "UE Context Release" and circled in red), the "the target eNB informs success of HO to source eNB and triggers the release of resources by the source eNB." Ex. 1223 at 65. Further, TS 36.300 explicitly discloses the use of handover to effect a "load balancing" operation between different cells or networks, and to meet the QoS needs of a particular UE's current session:

> "Load balancing [LB] has the task to handle uneven distribution of the traffic load over multiple cells. The purpose of LB is thus to influence the load distribution in such a manner that radio resources remain highly utilized and the QoS of in-progress sessions are maintained to the extent possible and call dropping probabilities are kept sufficiently small. LB algorithms may result in hand-over or cell reselection decisions with the purpose of redistribute [sic] traffic from highly loaded cells to underutilized cells. LB is located in the eNB."

Ex. 1223 at 120. Such load balancing is taught as including "functionality for inter-RAT load balancing for idle and connected mode UEs." Ex. 1223 at 120.

C. Motivation to Combine

114. A POSITA would have been motivated to combine Chitrapu with TS 36.300 with a reasonable expectation of success at the time of the '888 Patent.

115. Chitrapu discloses a "smart handover" mechanism that uses a "negotiation" and "execution" to implement a method to dynamically change cell coverage. Ex. 1003, ¶[0074]; Ex. 1003, Fig. 11. A POSITA implementing the concepts from Chitrapu would have understood that a negotiation and execution of handover involves standardized messages between base stations. This is described in paragraph [0082] of Chitrapu: "This process consists of an exchange of appropriately designed messages between UE and the Network." Ex. 1003, ¶[0082].

116. LTE was the current technology being deployed in the United States at the time of the ’888 Patent. Therefore, a POSITA would have been motivated to look to the LTE specifications, such as to TS 36.300, for details concerning the messages to implement the method of Chitrapu.

117. A POSITA would have expected to succeed in such a combination because 3GPP TS 36.300 describes the handover techniques for the LTE standard, and Chitrapu explicitly suggests a POSITA look to 3GPP standards because its states its “[s]ystems [are] constructed in accordance with current specifications of the 3rd Generation Partnership Program (3GPP),” such as TS 36.300. Ex. 1003, ¶[0007].

118. A POSITA looking at Chitrapu would have looked to TS 36.300 for additional reasons.

119. One reason is that TS 36.300 specifies the methods for several different types of handover. Chitrapu does not limit its smart handover to any specific type of handover. A POSITA looking for a source to identify the types of handover that were in the art would have looked to TS 36.300, and POSITA would have understood that handovers can either be Inter-RAT or Intra-RAT. Given that TS 36.300 states that a similar procedure is implemented for the two types of handovers, a POSITA would have expected to succeed in combining Chitrapu’s smart handover with TS 36.300 and arrived at the Inter-RAT handover described in the ’888 Patent.

120. Second, TS 36.300 provides greater detail of the description of the steps of handover than is described in Chitrapu. Chitrapu discloses negotiating and executing a handover in accordance with the 3GPP standards. Ex. 1003, ¶[0074]. Figure 11 illustrates the general process for conducting smart handover.

Ex. 1003, Fig. 11 (annotated)

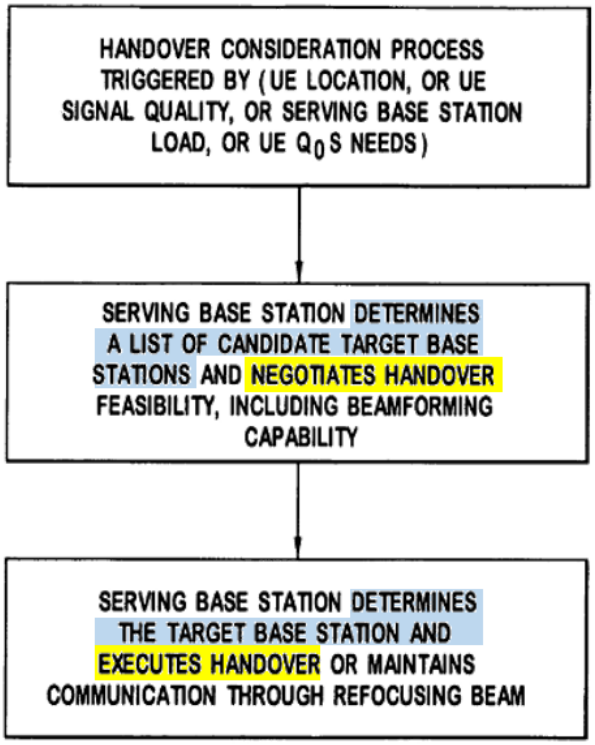


FIG. 11

121. In Figure 11, the "serving" base station (i) determines the candidate target base stations (step 2), (ii) negotiates handover between candidate base stations (step 2), (iii) determines the target base station (step 3), and (iv) executes the handover (step 3).

122. Chitrapu describes a "negotiation" and "execution" at a high level and describes that the procedure is completed by exchanging messages. Ex. 1003, ¶[0082]. TS 36.300 describes the implementation details, including the specific messages associated with that implementation, that were known in the art. Thus, a POSITA looking at Chitrapu's disclosure would have immediately identified the problem that the specific implementation messages are not disclosed and would have expected to succeed in implementing handover using the standardized messages of TS 36.300.

123. To understand the implementation of the messages in the "negotiate" and "execute" steps of Chitrapu's handover, a POSITA reading this disclosure would have looked to those 3GPP standards for the handover messages, as Chitrapu discloses its systems are constructed in accordance with "specifications of the 3rd Generation Partnership Program (3GPP)." Ex. 1003, ¶[0007]. 3GPP TS 36.300 provides the messages, including specifically a handover request message, a UE context release message, and a handover acknowledgement. Ex. 1223 at Fig.10.1.2.1.1-1. A POSITA would have had a reasonable expectation of success in implementing Chitrapu's negotiation with TS 36.300 because Chitrapu specifically identifies these standards.

124. In addition, a POSITA would have been motivated to combine Chitrapu and TS 36.300 because Chitrapu and TS 36.300 are analogous art to the '888 patent.

Chitrapu recognizes and solves the same problem as the '888 patent where communication degradation can occur due to changing service demands and coverage of mobile UEs in a network, and traffic load on the networks themselves. Ex. 1003, ¶[0011]. For example, Chitrapu discloses that a "triggering event" for performing a smart handover may include "UE signal quality deterioration, serving base station load and changes in service needs of the UE." Ex. 1003, ¶[0108]. TS 36.300 also provides handover solutions for changing network conditions and service needs, resulting in inter-RAT handover. *See* Ex. 1223 at 120. Thus, it would have been reasonable for a POSITA to consider Chitrapu and TS 36.300 in order to solve the handover challenges during changing and overlapping sectors of coverage that the '888 patent is directed to solving.

125. Finally, a POSITA would have known that Chitrapu's smart handover procedure would need to be modified to be implemented in a live network. Specifically, a POSITA would have understood that, in order to perform the step in Chitrapu's handover process wherein the "serving base station determines a list of candidate target base stations and negotiates handover feasibility including beamforming feasibility," the serving base station must determine whether candidate UEs are currently covered by a base station's beams, or capable of being covered if Chitrapu's dynamic cell shaping is applied, by that base station's beams if the UEs are not currently covered. Ex. 1003, Fig. 11, ¶[0109]. Thus, prior to the "execut[ion]"

step of the handover process, the beam forming pattern of the target base station is performed. Ex. 1003, Fig. 11, ¶[0109]. In order to execute the handover process of Chitrapu, a POSITA would have understood to look to the 3GPP standardized handover procedures to determine how to communicate the beamforming pattern information to the target base station.

IX. GROUND 1: *CHITRAPU* IN VIEW OF TS 36.300 RENDERS OBVIOUS CLAIMS 9, 10, 12, 20, 21 AND 23 OF THE '888 PATENT.

126. Chitrapu in view of TS 36.300 renders obvious claims 9, 10, 12, 20, 21 and 23 of the '888 patent.

A. Independent claim 9

[9.pre]: A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

127. To the extent the preamble is limiting, Chitrapu in combination with TS.36.300 renders obvious this claim limitation.

128. Chitrapu discloses a method for "smart handover" using dynamic cell coverage and TS 36.300 discloses two wireless networks on which it would have been obvious for the handover to take place. Ex. 1003, ¶[0011]; Ex. 1223 at 77.

129. Figure 8 illustrates smart handover using dynamic cell coverage. The source network contains BS1 (in the "second wireless network" of the claim limitation in orange below) and the target network contains BS2 (in the "first wireless network" of the claim limitation in green below).

Ex. 1003, Fig. 8 (annotated)

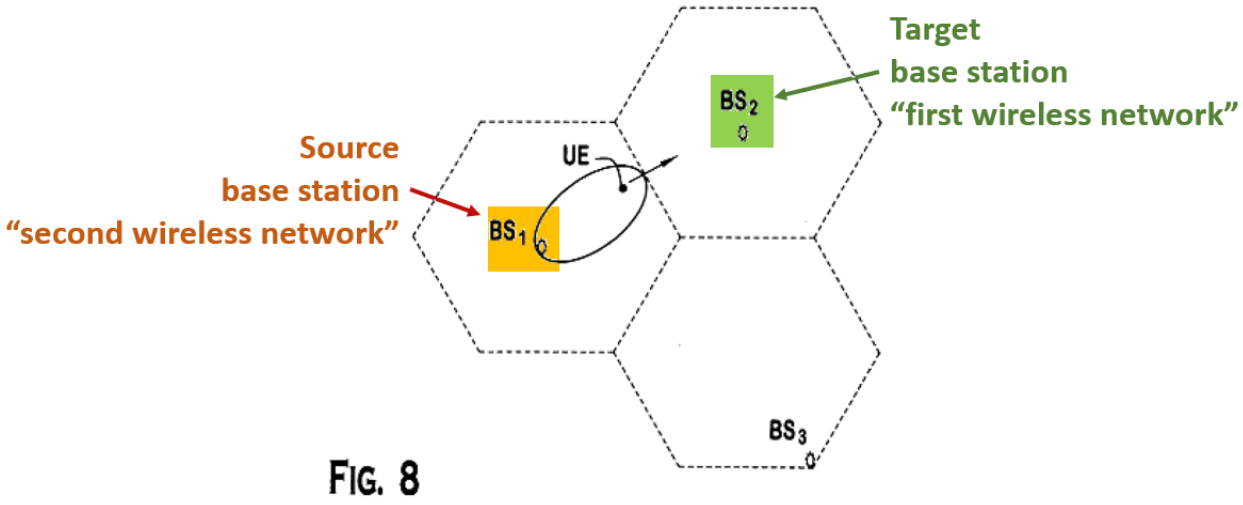


FIG. 8

130. Chitrapu does not explicitly disclose that BS1 and BS2 are in different wireless networks. However, a POSITA would have understood that Chitrapu does not limit BS1 and BS2 to the same network either. Ex. 1003, ¶[0009] (disclosing that BS1 and BS2 could be "*other types of antenna systems*." (emphasis added)). A POSITA reading Chitrapu would have understood that its "smart handover" disclosure could apply to any of the limited types of handover known in the art.

131. It would have been obvious to a POSITA to use the smart handover of Chitrapu for Inter-RAT handover for a number of reasons.

132. First, 3GPP standards disclosed a standardized Inter-RAT handover between 3G and 4G networks at the time of the '888 Patent. Chitrapu discloses 3G network and the use of nodeBs, but explicitly discloses that its systems are described in conjunction with the 3GPP standards Ex. 1003, ¶[0007]; Ex. 1223 at 76.

133. There are a limited number of types of handovers. Handovers are either Inter-RAT or Intra-RAT. TS 36.300 explicitly discloses that the handover flows are generally the same regardless of whether the handover is an Inter-RAT handover or an Intra-RAT handover. Ex. 1223 at 78 ("[S]imilar handover procedure should apply for both Inter RAT Handover and intra-LTE Handover."). Accordingly, a POSITA would have been motivated to design Chitrapu's smart handover to be applicable to both Intra-RAT and Inter-RAT handover.

134. Second, a POSITA would have known about the real-world use of multiple, layered networks that require the use of inter-RAT handover. In the United States at the time of the '888 Patent, carriers had multiple networks with different RATs (*e.g.*, 2G, 3G, and 4G networks). A POSITA would have understood that UEs must move between those different RATs to ensure calls are not dropped. As another reason, Inter-RAT handover would be used so that UEs could connect to the highest level of service (*e.g.*, 4G) for UEs capable of operating on both 3G and 4G networks. Those UEs would have been handed over between the different wireless networks using the well-known, standardized Inter-RAT procedure from 3GPP. This would have further motivated a POSITA to look to the inter-RAT handover procedure.

135. Thus, a POSITA reading Chitrapu in light of TS 36.300 would at least find it obvious that Chitrapu's disclosure of "smart" handover would have included inter-RAT handover between different types of wireless networks.

[9.a]: receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network

136. Chitrapu in combination with TS 36.300 discloses this claim limitation, which consists of two parts: (i) receiving a handoff request from the second wireless network, and (ii) the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network. Each part is described below.

(i) "receiving a handoff request from the second wireless network"

137. Chitrapu in combination with TS 36.300 discloses a first wireless network (target network) receiving a handover from a second wireless network (source network). Chitrapu discloses negotiating and executing a handover in accordance with the 3GPP standards. Ex. 1003, ¶¶ [0007], [0074].

138. Figure 11 illustrates the general process for conducting smart handover.

Ex. 1003, Fig. 11 (annotated)

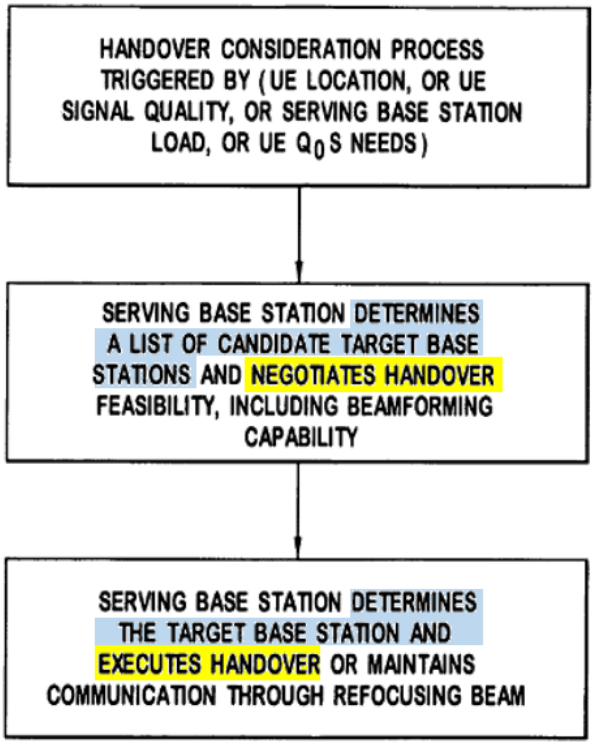


FIG. 11

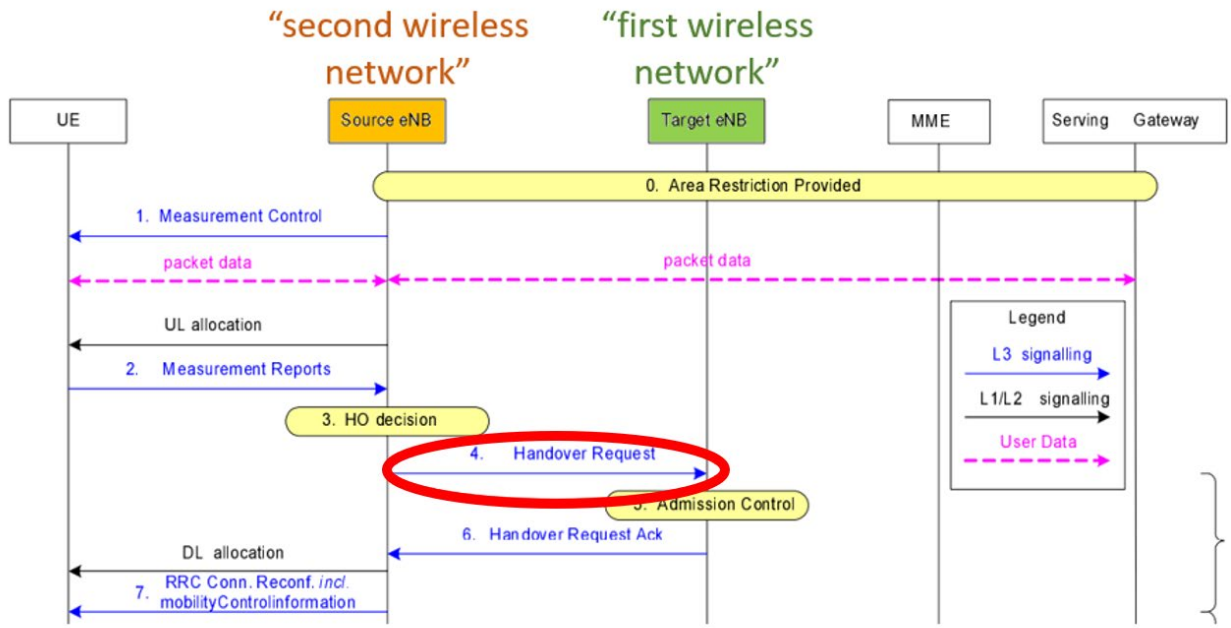
139. In Figure 11, the "serving" base station (i) determines the candidate target base stations (step 2), (ii) negotiates handover between candidate base stations (step 2), (iii) determines the target base station (step 3), and (iv) executes the handover (step 3). The "serving" base station is in the "second wireless network" of the claim limitation.

140. A POSITA reading this disclosure would have understood that "negotiating" and "executing" a handover means the base stations exchange a series of messages. This is also described in Chitrapu at paragraph [0082]. Chitrapu

discloses its systems are constructed in accordance with "specifications of the 3rd Generation Partnership Program (3GPP)." Ex. 1003, ¶[0007]. A POSITA looking to understand those messages would have looked to those 3GPP standards for the handover messages.

141. 3GPP TS 36.300 provides the messages, including specifically the "handover request" message of the claim limitation. Figure 10.1.2.1.1-1 of TS 36.300 discloses the handover request message (message 4, in red circle) from the source base station to the target base station.

Ex. 1223 at Fig. 10.1.2.1.1-1 (partial and annotated)



142. Figure 10.1.2.1.1-1 is a generic call flow, but TS 36.300 discloses that a similar handover request message is sent in Inter-RAT handover. Ex. 1223 at 76.

Specifically, Section 10.2.2 is directed to Inter-RAT handover and specifically describes how the "handover procedure should apply for both Inter RAT Handover and intra-LTE Handover." Ex. 1223 at 77.

143. Thus, reading Chitrapu in conjunction with TS 36.300, it would have been obvious to a POSITA that Chitrapu's smart handover could include a receiving a handoff request from the second wireless network.

(ii) "the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network"

144. Chitrapu in combination with TS 36.300 renders obvious that the source (second) base station determines that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network.

145. First, Chitrapu discloses that the source base station is charged with determining the beam for the target base station during a smart handover. Ex. 1003, ¶[0109]. Chitrapu states "the serving base station determines which base stations are to be involved and proceeds with the negotiation process *to select[] a preferred beam allocation pattern for all of the involved base stations*." Ex. 1003, ¶[0109]. Chitrapu likewise states the target base "station will first implement the selected beams *determined for it.*" Ex. 1003, ¶[0109]. This is shown in Figure 11.

Ex. 1003, Fig. 11

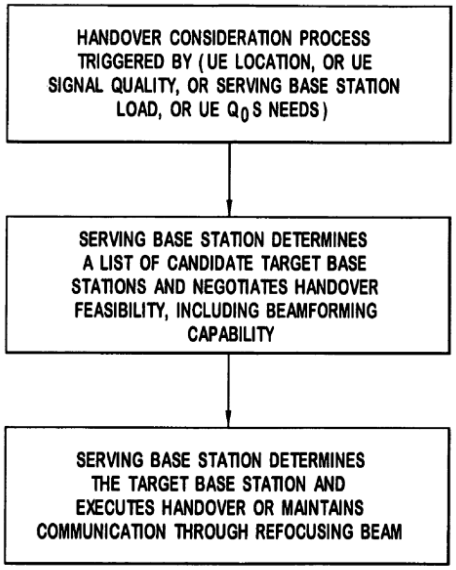


FIG. 11

146. In the first step of Figure 11, the handover consideration process is triggered by, for example, UE location of signal quality. Ex. 1003, Fig. 11. Based on those parameters that trigger the handover process, the serving base station in the second step of Figure 11 determines the list of possible target base stations and negotiates handover feasibility, which equates to the capability of the target base station to cover the UE to be handed over, as well as beamforming capability of the target base station. Ex. 1003, Fig. 11; Ex. 1003, ¶[0109]. Based on these determinations made by the serving base station selects the target base station and executes a handover to that target base station. Ex. 1003, Fig. 11; Ex. 1003, ¶[0109].

147. Second, in order to determine the beams for the target base station, Chitrapu discloses that the source base station (i) acquires the UE locations, (ii)

acquires the beamforming capabilities of the adjacent base stations, and (iii) determines the beams for the target base station to cover the UE. This is shown in steps 2, 3, and 4 in Figure 6.

Ex. 1003, Fig. 6 (annotated)

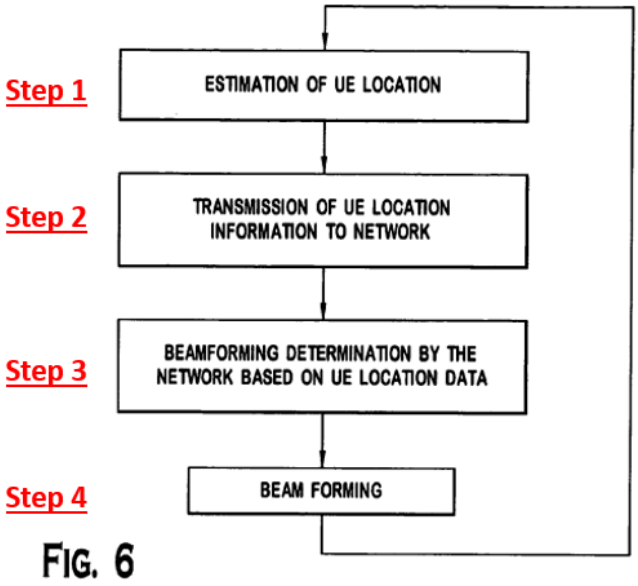


FIG. 6

148. Chitrapu also describes the negotiation process as follows:

"The negotiation process, after being initiated by a triggering event, preferably entails [i] evaluating all of the UE location data for UEs communicating with the particular base stations and [ii] matching them with a set of beam patterns available to the particular base stations which provide a more even service distribution of the UEs with the same or lower signal to noise ratio (SNR)."

Ex. 1003, ¶[0079].

149. Chitrapu provides that the "first step [in Figure 6] consists of determination of location and/or locations of the targeted UE," which "is preferably achieved by using well known techniques including . . . such as GPS based methods." Ex. 1003, ¶[0082]. In step two, the network is then made aware of the locations date for each UE by "an exchange of appropriately designed messages between the UE and the network." Ex. 1003, ¶[0082]. In step three, "the network determines the characteristics of the beam forming in order to serve the targeted UE(s) in a manner deemed appropriate and/or optimal by the network." Ex. 1003, ¶[0083].

150. As a result, "[o]nce the negotiation process is completed, the base stations refocus their transmitted RF signals to provide the beams for the UEs which are determined during the negotiation process." Ex. 1003, ¶[0083].

151. A POSITA would have understood that through this process, the target base station adjusts its beams to cover UEs that were not previously covered but selected by the source base station to be covered after handover.

152. I illustrate this concept using Figure 2. First, I have removed the dynamically shaped coverage area. This is shown below:

Ex. 1003, Fig. 2 (annotated to remove dynamically shaped coverage area)

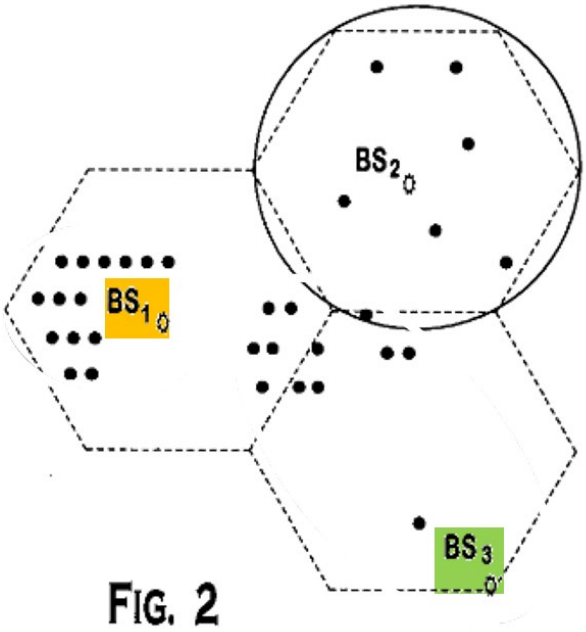


FIG. 2

153. Next, I've added in the conventional coverage area of the prior art (as shown, for example, in Figure 1B):

Ex. 1003, Fig. 2 (annotated)

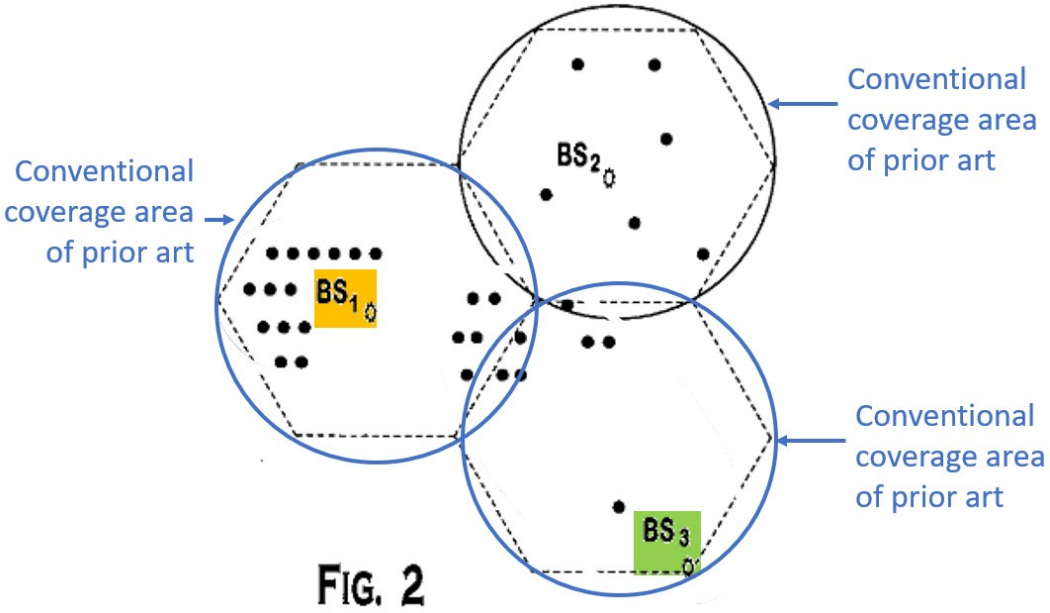


FIG. 2

154. In the figure below, I have next put a red box around UEs that are not covered by BS3 before the dynamically shaped coverage process is deployed.

Ex. 1003, Fig. 2 (annotated)

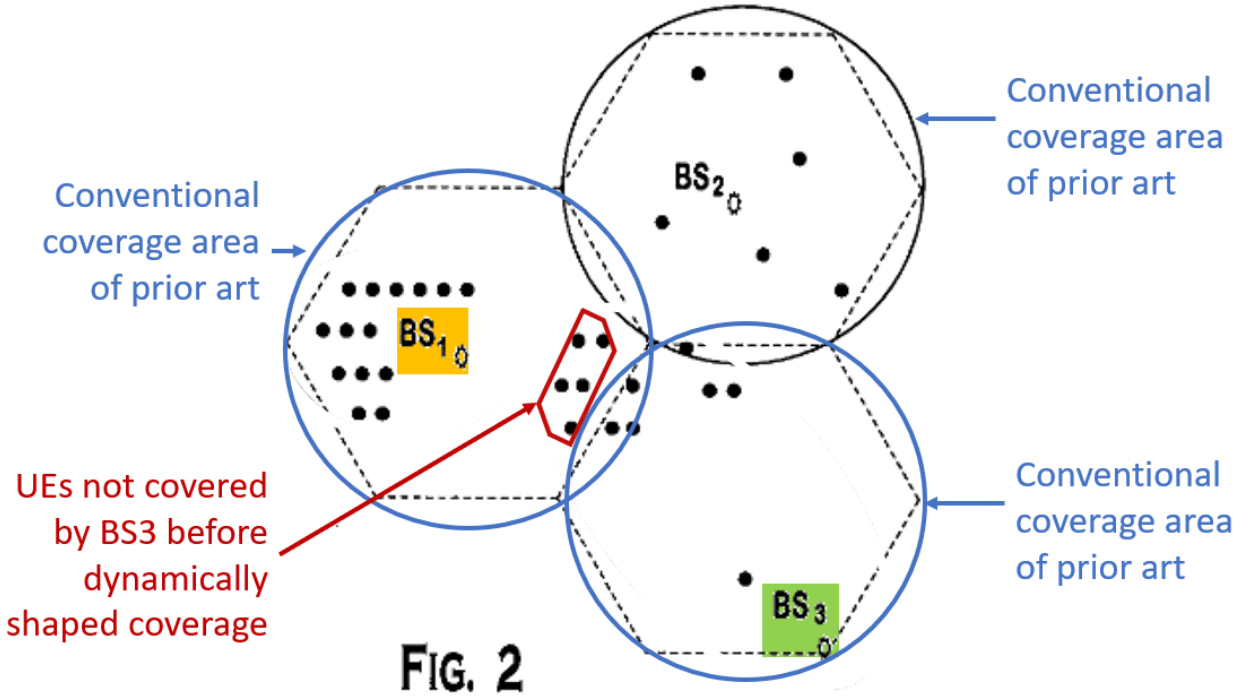


FIG. 2

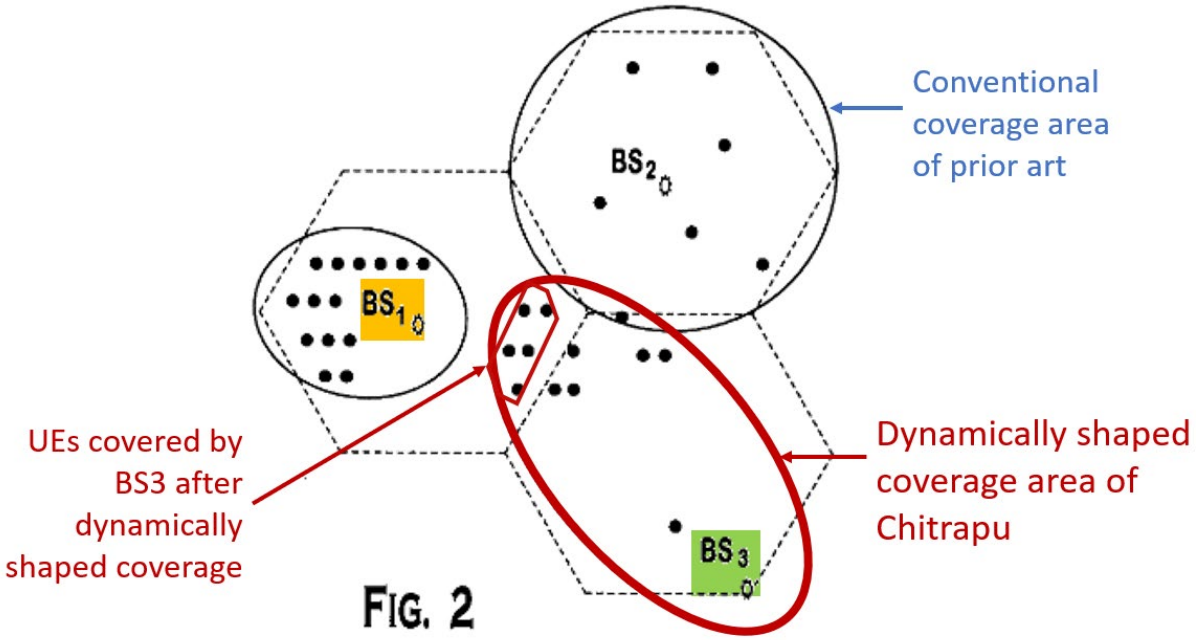
155. For the UEs in the red box with an active connection, those UEs are operating with BS1 (source) and will be handed over to BS3 (target) during the dynamic shaped coverage area process using the smart handover described above. Ex. 1003, ¶[0105] ("Dynamic beam forming can also be advantageously employed in implementing handover of on-going communications.").

156. As noted above, the source base station (BS1) makes the beamforming determination by acquiring UE location information and beamforming capabilities

of BS3. Thus, BS1 determines that those UEs are not currently covered by BS3 but are capable of being covered by BS3. Ex. 1003, ¶[0109].

157. Next, I've shown the coverage areas (using the original dynamically shaped coverage area of Figure 3) that occurs after executing the smart handover:

Ex. 1003, Fig. 2 (annotated to show new coverage after smart handover)



158. In addition, TS 36.300 also explicitly discloses that the source base station makes the handover determination in 3GPP systems like Chitrapu.

159. TS 36.300 discloses "source access system decides about starting the preparation and provides the necessary information to the target system in the format required by the target system." Ex. 1223 at 77.

160. A POSITA would have understood in the context of Chitrapu's 3GPP-based systems, that the source base station would therefore be responsible for determining the UE location information and "providing the necessary information to the target system." Ex. 1223 at 77.

161. TS 36.300 likewise discloses that the "actual handover execution is decided in the source system." Ex. 1223 at 77. Thus, TS 36.300 would have shown to a POSITA that the source base station is responsible for handover determinations, including that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network. Ex. 1223 at 77.

162. Chitrapu teaches that the serving base station executes handover, and it would have been obvious to a POSITA that the that execution of the handover would be designed and implemented using TS 36.300's standardized handover messaging, including the handover request message defined by 3GPP to "pass[] necessary information to prepare the HO at the target side[,]" which further could include coverage information. Ex. 1223 at 64. Thus this limitation would have been obvious to a POSITA.

[9.b]: based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

163. Chitrapu in combination with TS 36.300 renders obvious this claim limitation.

164. I Incorporate my analysis of element 9.a. above. For example, above I describe how Figure 2 of Chitrapu and the description of smart handover in paragraphs [0105] to [0109] show the serving base station is responsible for the handover process. TS 36.300 show the information about the handover process is sent in the handoff request.

165. As described above, paragraph [0109] discloses that the serving base station determines how the beams of the target base station should be adapted. Chitrapu states "the serving base station determines which base stations are to be involved *and proceeds with the negotiation process to select[] a preferred beam allocation pattern* for all of the involved base stations." Ex. 1003, ¶[0109]. Furthermore, paragraph [0109] confirms, based upon the selection of the beams for the target base station by the source base station, the target base station then "refocus" its beams based upon the selected pattern. Ex. 1003, ¶[0109] ("Where a handover is to occur, the new serving based station will first implement the selected beams determined for it and acquire the UE communication, before the original serving base station implements its new beam pattern.").

166. A POSITA would have understood that the selected beam allocation patterns described above must be communicated to the target base station (or at least it would be obvious to do so) so that BS2 can implement the pattern. This process is shown in the annotated version of Figure 8 below.

Ex. 1003, Fig. 8 (annotated).

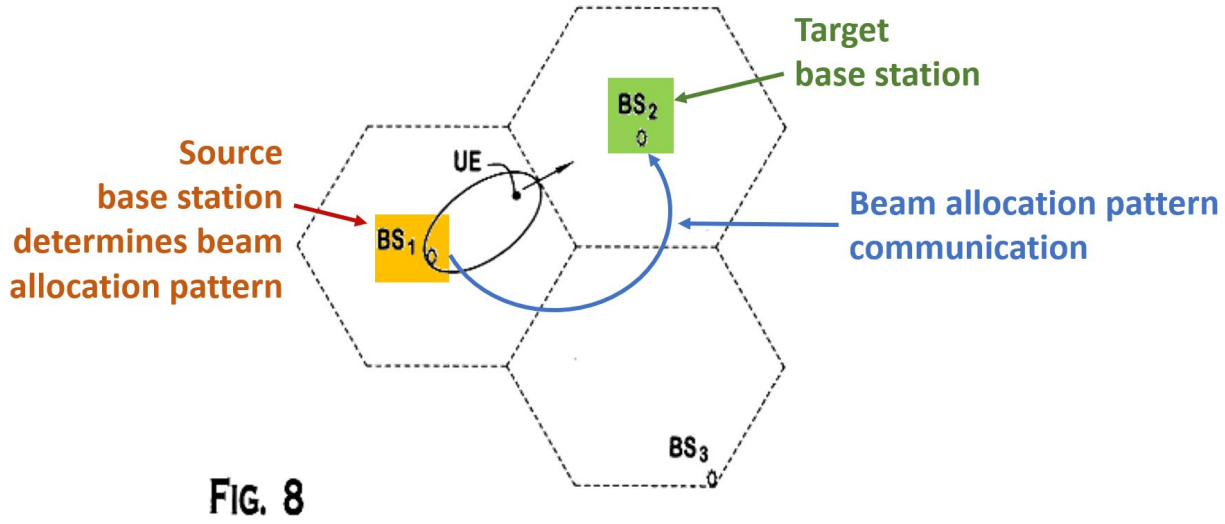


FIG. 8

167. A POSITA would have understood that messages would be exchanged between the source and target base station to communicate the beam allocation pattern. This communication is shown in blue in the annotated Figure above.

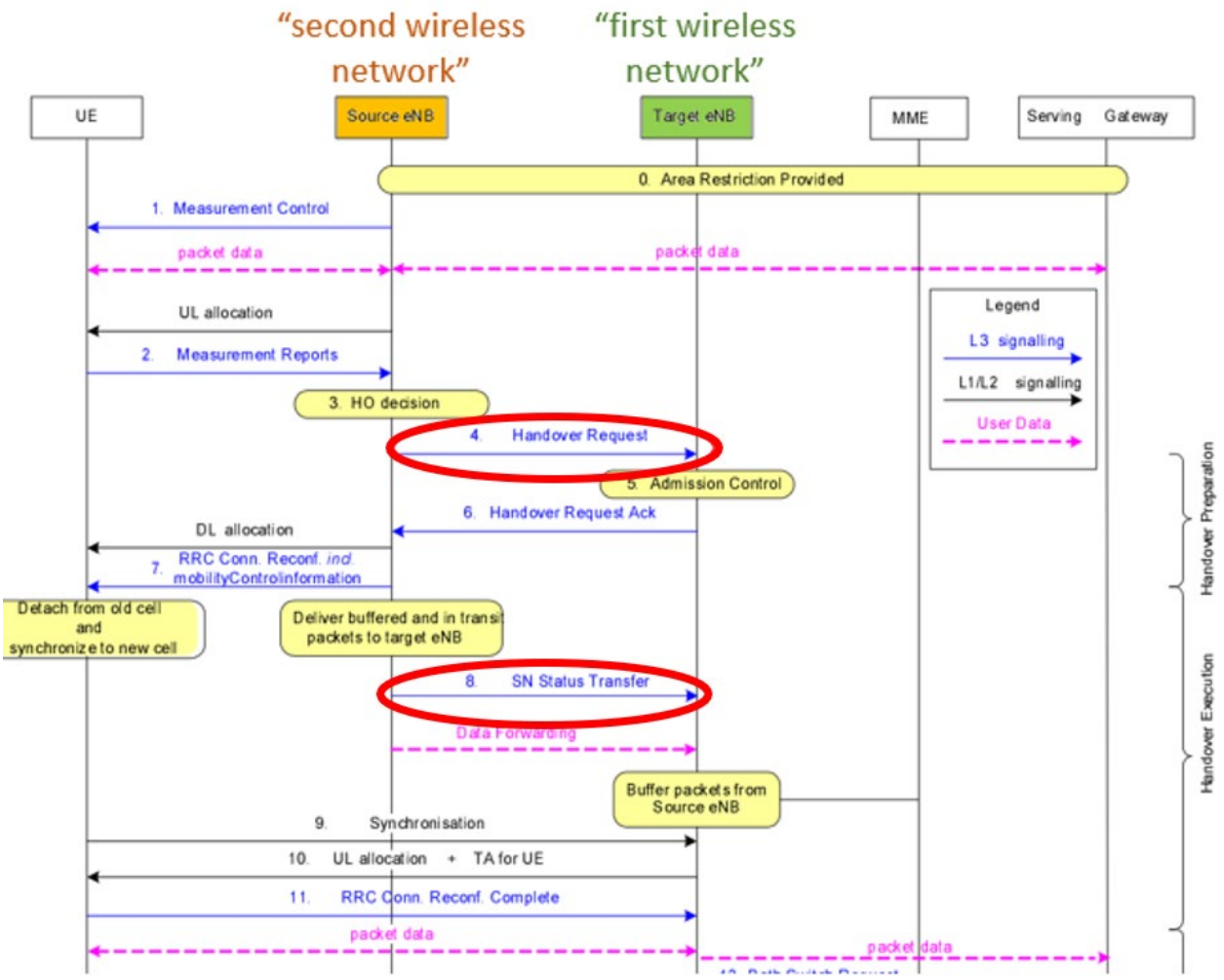
168. A POSITA would have understood that communication of the beam allocation should occur during the handover process so the UE is covered by the target base station at the completion of the handover request. A POSITA would have also understood that the handover process would begin with a request to the

target base station to begin the handover process (i.e. a handover request). It would have been obvious to a POSITA that the handover request should include the information necessary for the target base station to complete the handover in order to limit the number of messages required to complete the handover, and thus the beam allocation should be include in the handover request.

169. For example, a POSITA would have understood that 3GPP defined standardized handover messaging for exchanging such information. TS 36.300 discloses the available standardized messages. Based on TS 36.300, it would have been obvious to a POSITA to have transmitted the beam allocation pattern in the Handover Request message.

170. The Handover Preparation and Execution phases are shown below:

Ex. 1223 at 63 (partial)



171. Only two messages (circled in red above) are transmitted from the source base station to the target base station (*e.g.*, messages 4 and 8) during handover preparation and execution stages. Thus, a POSITA would have found it obvious to use one of those two messages to transmit the pattern.

172. The first message (message 4) is the claimed Handover Request message circled in red and is the most logical message to use for this transmission.

173. In describing the Handover Request message, TS 36.300 discloses the "source eNB issues a HANDOVER REQUEST message to the target eNB *passing necessary information to prepare the HO at the target side*." Ex. 1223 at 64. A POSITA would have understood that necessary information to prepare for HO at the target side would have included the beam allocation pattern the source base station selected. The beam allocation pattern is "necessary information" because the beam allocation patters would have been needed by the base station and UE in the steps after the handover message.

174. Thus, it would have been obvious to a POSITA to transmit the beam selection information to a target base station as part of the handover request, and it would have been obvious that the target base station would adapt one or more beams based on the request to facilitate coverage of the wireless device by the first wireless network.

175. Finally, Chitrapu discloses that the base station consists of an antenna array. Ex. 1003, ¶[0049]; Ex. 1003, Fig. 4 ("Base Stations Refocus the Radio Beams Using Antenna Arrays"). Based on Chitrapu's explanation that a "beam former" is "operatively associated with the RF module of each base station to from a set of desired beams within a range of beams which the base station's antenna array system is capable of producing," a POSITA would have understood this to mean that a "beam former" in Chitrapu adapts the beams of an antenna array to adapt a base

station to a certain beam pattern. *See* Ex. 1003, ¶[0049]. Therefore, a POSITA would have known that beam forming requires adapting the beam using the antenna array.

[9.c]: transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

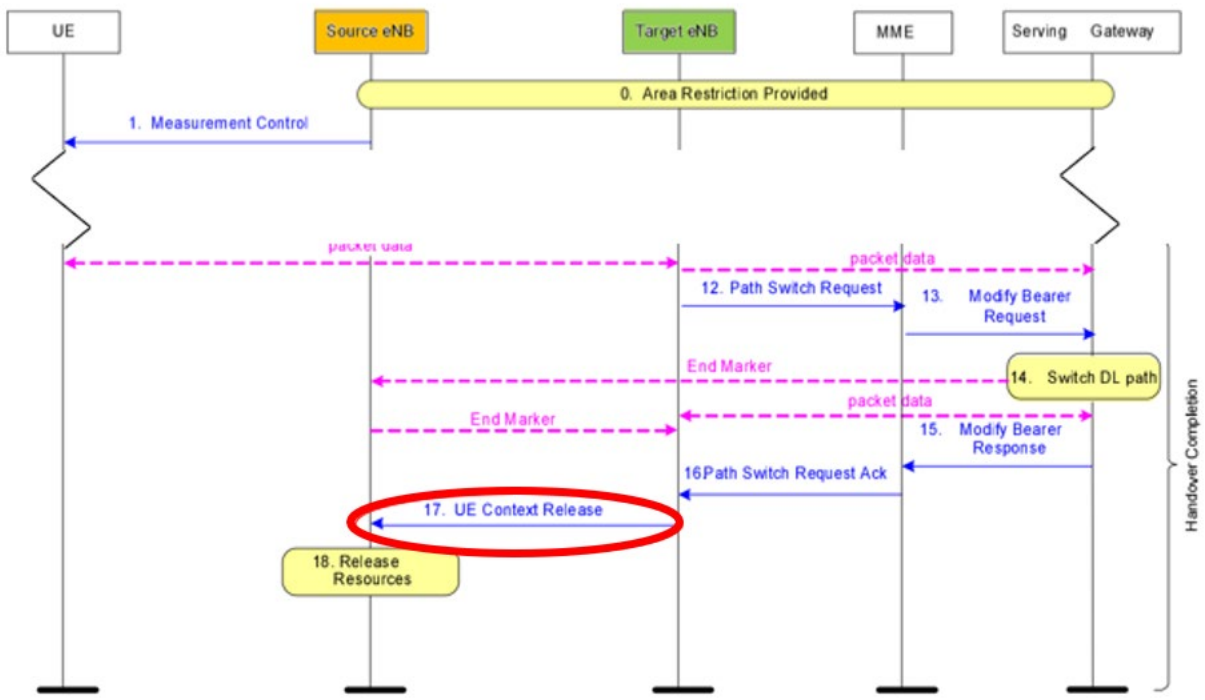
176. Chitrapu in view of TS 36.300 renders obvious this claim limitation.

177. I incorporate my analysis of 9.a-b above.

178. As mentioned above, a POSITA would have found it obvious to consider the standardized handover messaging in TS 36.300 when implementing the system in Chitrapu. Moreover, a POSITA would have also understood, based on standardized messaging protocols, that the target base station would respond to the source base station to communicate that the information was received, and the process is complete.

179. TS 36.300 discloses a message sent from the target network to the source network in the form of a "UE Context Release." The target network sends the message as the final message in the "handover completion" phase. Ex. 1223 at 63. Figure 10.1.2.1.1-1 illustrates this message as message 17 (titled "UE Context message"). Ex. 1223 at 63.

Ex. 1223 at Fig. 10.1.2.1.1-1 (annotated and partial)

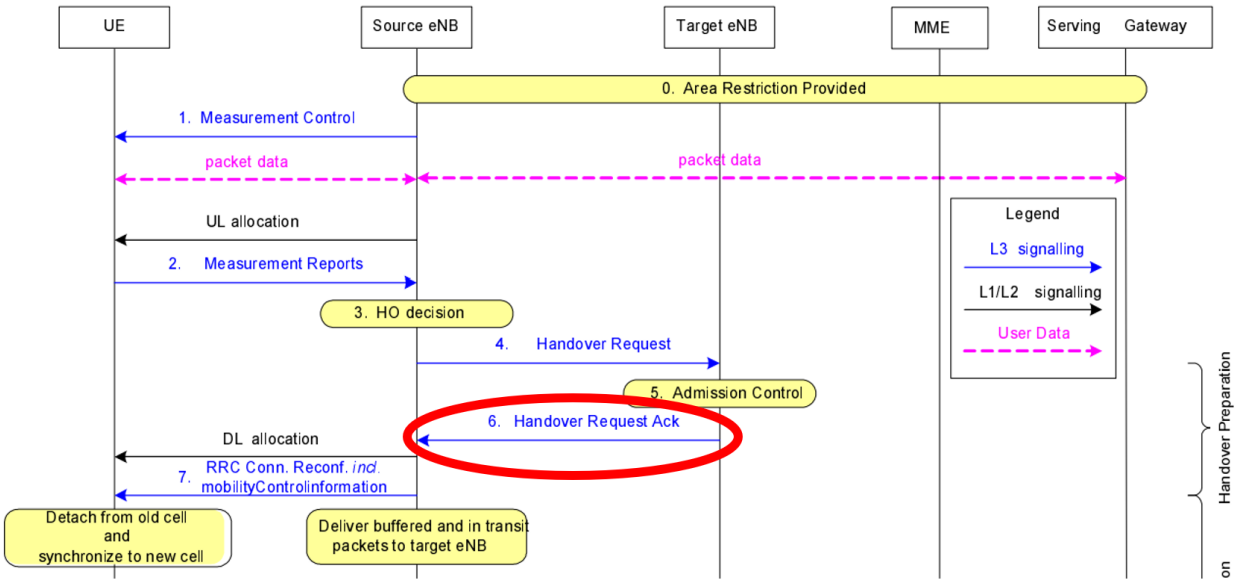


180. The TS 36.300 specification states, "[b]y sending the UE CONTEXT RELEASE message, the target eNB *informs success of HO* (handover) to source eNB." Ex. 1223 at 64 (emphasis added).

181. Thus, the UE Context Release message is a handover confirmation message as required by the claim limitation.

182. Finally, to the extent Patent Owner interprets its claims such that the handover confirmation is merely an acknowledgement that the message was accepted (and not that the handover was complete), then message 6 ("Handover Request Ack") also supports this limitation.

Ex. 1223 at Fig. 10.1.2.1.1-1 (annotated and partial)



183. If Patent Owner interprets its claims in such a manner, then the Handover Request Acknowledgement is a handover confirmation message under Patent Owner's interpretation.

B. Dependent claim 10

Claim 10: A method according to claim 9, wherein the receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

184. Chitrapu and TS 36.300 renders obvious this limitation.

185. Chitrapu explains that a "network interface interconnects the base stations." Ex. 1003, ¶[0036]. This "base station/network interface may be by wireline, wireless or any other type of connection." Ex. 1003, ¶[0084].

186. A POSITA would have understood that a network interface that interconnects the base stations means that the base stations are coupled and can communicate with each other.

187. TS 36.300 also describes base stations that are communicatively coupled. Ex. 1223 at 19. Figure 4-1 (reproduced below) illustrates an X2 interface (red line) as an interface on which the base stations can directly communicate and an S1 interface (green line) as an interface on which the base stations indirectly communicate through the MME in the core network. Ex. 1223 at 19.

Ex. 1223 at Fig. 4-1

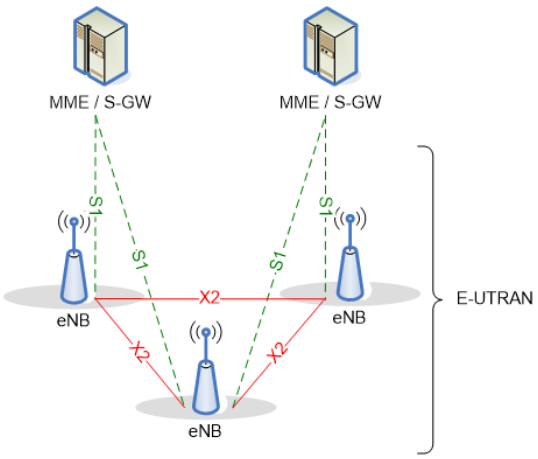


Figure 4-1: Overall Architecture

188. TS 36.300 likewise shows that base stations involving different RATs are communicatively coupled in the same way. Ex. 1223 at 77-78. Section 10.2.2 deals with inter-RAT handover and discloses that the "source access system decides

about starting the preparation and provides the necessary information to the target system in the format required by the target system." Ex. 1223 at 77-78.

189. A POSITA would have understood that in order for one system to provide information to another system, the two systems must be communicatively coupled.

C. Dependent claim 12

Claim 12: A method according to claim 9, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

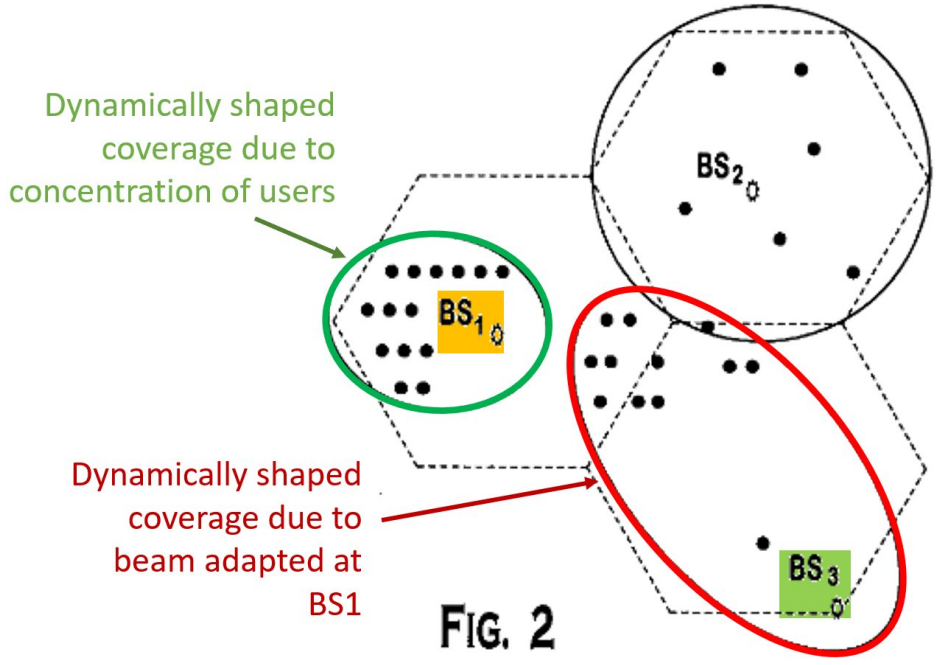
190. Chitrapu discloses obvious this claim limitation.

191. Chitrapu discloses adapting one or more beams based, at least in part, on one of (i) a predetermined network load placed on the first wireless network due to the handoff of the wireless device or (ii) an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first network.

192. Specifically, this limitation is described in Chitrapu as part of the "smart handover" triggering event. Ex. 1003, ¶[0108] ("The first step is to trigger the smart handover process through the occurrence of a triggering event."). The triggering event is based on a predetermined threshold. *E.g.*, Ex. 1003, ¶[0108] ("The triggering event preferably includes thresholds relating to . . . [*e.g.*,] base station load . . . .").

193. Chitrapu discloses one of the triggering events can be a high concentration of uses: "a significantly high concentration of users in a small area can also be used as a triggering event." Ex. 1003, ¶[0078]; Ex. 1003, ¶[0061] ("FIG. 2 illustrates the dynamic use of shaped transmission beams to address a specific concentration of users."); *see also* Ex. 1003, Fig. 10; Ex. 1003, ¶[0107] ("[I]n FIG. 10, a high concentration of users proximate base station BS2 has resulted in the 'smart' handover determination."). Figure 2 (annotated below) illustrates "the dynamic use of shaped transmission beams to address a specific concentration of users." Ex. 1003, ¶[0061].

Ex. 1003, Fig. 2 (annotated)



194. Chitrapu discloses "FIG. 2 illustrates a concentration of users in the base station BS1 region and the region between base station BS1 and base station BS3." Ex. 1003, ¶[0075].

195. Chitrapu discloses that the triggering event is based on a determination about users in *these regions* (*e.g.*, the triggering event is based on a determination about the concentration of users in both the respective base stations): "Upon determining the high concentration of users *in these regions*, the antenna arrays at base station BS1 and base station BS3 are used to transmit a selectively shaped and directed beam to provide the needed radio resources to the user concentrations." Ex. 1003, ¶[0075] (emphasis added).

196. Thus, a POSITA would have understood that in conjunction with the corresponding smart handover disclosure described above in claim 9, Chitrapu discloses adapting one or more beams based, at least in part, on a predetermined network load placed on the first wireless network due to the handoff of the wireless device.

D. Independent claim 20

[20.pre]: A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising

197. Chitrapu and TS 36.300 renders obvious this limitation.

198. I incorporate my analysis for claim limitation 9.p. As noted in that analysis, Chitrapu is not limited to any type of handover and inter-RAT handover was a well-known procedure in the art.

[20.a]: an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

199. Chitrapu and TS 36.300 renders obvious this limitation.

200. I incorporate my analysis for claim limitations 9.a and 9.b above.

201. As noted in that analysis, Chitrapu discloses "Base Stations Refocus the Radio Beams Using Antenna Arrays" as part of Figure 4. Ex. 1003, ¶[0049]; Ex. 1003, Fig. 4. As stated above, a POSITA would have known that beam forming requires adapting the beam using the antenna array.

[20.b]: an adaption manager having logic, the logic configured to:

202. Chitrapu renders obvious this claim limitation.

203. Chitrapu discloses an adaption manager that performs the functions listed in elements 20.b. In particular, Chitrapu discloses a "beam former" and a "geolocation processor" Ex. 1003, ¶[0041]. Chitrapu discloses that the "beam former controls the RF module to transmit or receive communication data for a selected UE in a shaped beam that encompasses an estimated location of the selected UE where geolocation data which corresponds to the estimated location of the selected UE is processed by the geolocation processor." Ex. 1003, ¶[0022].

[20.c]: receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network

204. Chitrapu and TS 36.300 renders obvious this limitation.

205. I incorporate my analysis of claim limitation 9.a.

206. As explained in that analysis, the handover request message was a well-known message in the art. TS 36.300 expressly defines the message. Ex. 1223 at Fig. 10.1.2.1.1-1. Both Chitrapu and TS 36.300 disclose that the source network is responsible for the handover determination. Ex. 1003, ¶[0109] ("the *serving base station determines* which base stations are to be involved and proceeds with the negotiation process *to select[] a preferred beam allocation pattern for all of the involved base stations*."); Ex. 1223 at 77.

[20.d]: cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network, and

207. Chitrapu and TS 36.300 renders obvious this limitation.

208. I incorporate my analysis of claim limitations 9.a-b.

209. As explained in that analysis, there is a "negotiation process" that occurs after a triggering event for smart handover. Ex. 1003, ¶[0079]. Chitrapu describes using the UE location data and determining "the characteristics of the beam forming in order to serve the targeted UE(s) in a manner deemed appropriate and/or optimal by the network." Ex. 1003, ¶[0083]; Fig. 6. Chitrapu then discloses

that the last step of Figure 6 shows how "[o]nce the negotiation process is completed, the base stations refocus their transmitted RF signals to provide the beams for the UEs which are determined during the negotiation process." Ex. 1003, ¶[0079].

[20.e]: transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

210. Chitrapu and TS 36.300 renders obvious this limitation.

211. I incorporate my analysis of claim limitation 9.c.

212. As explained in that analysis, a POSITA would have found it obvious to consider the standardized handover messaging in TS 36.300 when implementing the system in Chitrapu. TS 36.300 discloses a confirmation message sent from the target network to the source network in the form of a "UE Context Release," in which the "target eNB *informs success of HO* (handover) to source eNB." Ex. 1223 at 64 (emphasis added).

E. Dependent claim 21

Claim 21: A system according to claim 20, wherein to receive the handoff request comprises to receive the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

213. Chitrapu and TS 36.300 renders obvious this limitation.

214. I incorporate my analysis of claim 10.

215. In that analysis, I show that Chitrapu states that a "network interface interconnects the base stations." Ex. 1003, ¶[0036]. A POSITA would have

understood that a network interface that interconnects the base stations means that the base stations are communicatively coupled.

216. Similarly, TS 36.300 describes base stations that are communicatively coupled. Ex. 1223 at 19. Section 10.2.2, which deals with inter-RAT handover, discloses that the "source access system decides about starting the preparation and provides the necessary information to the target system in the format required by the target system." Ex. 1223 at 77. A POSITA would have understood that in order for one system to provide information to another system, the two wireless networks must be communicatively coupled.

F. Dependent claim 23

Claim 23: A system according to claim 20, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

217. Chitrapu and TS 36.300 renders obvious this limitation.

218. I incorporate my analysis of claim 12.

219. In that analysis, I describe how the smart handover of Chitrapu is triggered by triggering events. Ex. 1003, ¶[0108] ("The first step is to trigger the smart handover process through the occurrence of a triggering event."). The triggering event is based on a predetermined threshold. *E.g.*, Ex. 1003, ¶[0108]. ("The triggering event preferably includes thresholds relating to . . . [*e.g.*,] base

station load . . . ."); This load could be due to "a significantly high concentration of users in a small area can also be used as a triggering event." Ex. 1003, ¶[0078]; Ex. 1003, ¶[0061]; Ex. 1003, Fig. 2.

X. CONCLUSION

220. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare 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 the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Executed on this 21st day of November, 2023 by:



James A. Proctor

XI. CLAIM LISTING

Cl. No.	Elem.	Claim Language
9	[9.pre]	A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising
	[9.a]	receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;
	[9.b]	based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and.
	[9.c]	transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.
10	[10]	A method according to claim 9, wherein the receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network
12	[12]	A method according to claim 9, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device ***or*** an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.
20	[20.pre]	A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:
	[20.a]	an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and
	[20.b]	an adaption manager having logic, the logic configured to:
	[20.c]	receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network
	[20.d]	cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network, and
	[20.e]	transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.
21	[21]	A system according to claim 20, wherein to receive the handoff request comprises to receive the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.
23	[23]	A system according to claim 20, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network