

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS
Petitioner

v.

GENERAL ACCESS SOLUTIONS, LTD.
Patent Owner

IPR2023-01147
U.S. Patent No. 9,426,794

**DECLARATION OF DR. KEVIN C. ALMEROOTH IN
SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,426,794**

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4.	[1.c] wherein the first wireless transceiver receives from the base station a first downlink signal intended for the first mobile station and provides the first downlink signal to the second wireless transceiver and wherein the second wireless transceiver receives the first downlink signal and re-transmits the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol, and.....	98
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3.	[6.b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol, ...	116

4.	[6.c] the method comprising: receiving, using the first wireless transceiver from the base station, a first downlink signal intended for the first mobile station; providing, using the first wireless transceiver, the first downlink signal to the second wireless transceiver; receiving, using the second wireless transceiver, the first downlink signal and re-transmitting the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol;	117
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CLAIM LISTING

The following claim listing adds bracketed labels ([preamble], [a], [b], etc.) for reference:

1. [preamble] A wireless communication device, comprising:
 - [a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and
 - [b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,
 - [c] wherein the first wireless transceiver receives from the base station a first downlink signal intended for the first mobile station and provides the first downlink signal to the second wireless transceiver and wherein the second wireless transceiver receives the first downlink signal and re-transmits the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol, and
 - [d] wherein the second transceiver monitors first signal characteristics of the second downlink signal of the first mobile station and monitors second signal characteristics of the second mobile station, and based on the first signal characteristics and the second characteristics, routes information to the first mobile station and the second mobile station, respectively.
2. The wireless communication device of claim 1, wherein the second wireless transceiver is coupled to the first wireless transceiver by a wireline connection.
3. The wireless communication device of claim 2, wherein the second wireless transceiver is removably coupled to the first wireless transceiver.
4. The wireless communication device of claim 1, wherein the first wireless transceiver and second wireless transceiver are disposed in a fixed site subscriber station.

5. The wireless communication device of claim 1, wherein the first wireless transceiver and the second wireless transceiver are part of an integrated device.

6. [preamble] A method for communicating with a wireless communication device, comprising:

[a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and

[b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,

[c] the method comprising:

receiving, using the first wireless transceiver from the base station, a first downlink signal intended for the first mobile station;

providing, using the first wireless transceiver, the first downlink signal to the second wireless transceiver;

receiving, using the second wireless transceiver, the first downlink signal and re-transmitting the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol;

[d] monitoring, using the second transceiver, first signal characteristics of the second downlink signal of the first mobile station;

monitoring, using the second transceiver, second signal characteristics of the second mobile station; and

based on the first signal characteristics and the second characteristics, routing, using the second transceiver, information to the first mobile station and the second mobile station, respectively.

I. Introduction

1. I have been retained by Cellco Partnership d/b/a Verizon Wireless (“Petitioner”) to provide my opinion concerning the claimed subject matter of U.S. Patent No. 9,426,794 (Ex. 1001 and henceforth referred to as “the ’794 patent”) in support of a Petition for *Inter Partes* Review of the ’794 patent.

2. This Declaration summarizes the opinions I have formed to date. I reserve the right to modify my opinions, if necessary, based on further review and analysis of information that I receive subsequent to the filing of this report, including in response to positions taken by General Access Solutions (“GAS”) or its experts that I have not yet seen, including any secondary consideration evidence that GAS or its expert may consider and present.

II. Experience and Qualifications

3. I am currently a Professor Emeritus in the Department of Computer Science at the University of California, Santa Barbara (UCSB). While at UCSB, I held faculty appointments and was a founding member of the Computer Engineering (CE) Program, Media Arts and Technology (MAT) Program, and the Technology Management Program (TMP). I also served as the Associate Director of the Center for Information Technology and Society (CITS) from 1999 to 2012. I have been a faculty member at UCSB since July 1997.

4. I hold three degrees from the Georgia Institute of Technology: (1) a Bachelor of Science degree in Information and Computer Science (with minors in Economics, Technical Communication, and American Literature) earned in June 1992; (2) a Master of Science degree in Computer Science (with specialization in Networking and Systems) earned in June 1994; and (3) a Doctor of Philosophy (Ph.D.) degree in Computer Science (Dissertation Title: Networking and System Support for the Efficient, Scalable Delivery of Services in Interactive Multimedia System, minor in Telecommunications Public Policy) earned in June 1997. During my education, I have taken a wide variety of courses as demonstrated by my minor. My undergraduate degree also included a number of courses more typical of a degree in electrical engineering including digital logic, signal processing, and telecommunications theory.

5. One of the major concentrations of my research over the past 30+ years has been the delivery of multimedia content and data between computing devices, including various network architectures. In my research, I have studied large-scale content delivery systems, and the use of servers located in a variety of geographic locations to provide scalable delivery to hundreds or thousands of users simultaneously. I have also studied smaller-scale content delivery systems in which content is exchanged between individual computers and portable devices. My work has emphasized the exchange of content more efficiently across computer networks,

including the scalable delivery of content to many users, mobile computing, satellite networking, delivering content to mobile devices, and network support for data delivery in wireless networks.

6. In 1992, the initial focus of my research was on the provision of interactive functions (*e.g.*, VCR-style functions like pause, rewind, and fast-forward) for near video-on-demand systems in cable systems; in particular, how to aggregate requests for movies at a cable head-end and then how to satisfy a multitude of requests using one audio/video stream broadcast to multiple receivers simultaneously. This research has continually evolved and resulted in the development of techniques to scalably deliver on-demand content, including audio, video, web documents, and other types of data, through the Internet and over other types of networks, including over cable systems, broadband telephone lines, and satellite links.

7. An important component of my research has been investigating the challenges of communicating multimedia content, including video, between computers and across networks including the Internet. Although the early Internet was used mostly for text-based, non-real time applications, the interest in sharing multimedia content, such as video, quickly developed. Multimedia-based applications ranged from downloading content to a device to streaming multimedia content to be instantly used. One of the challenges was that multimedia content is

typically larger than text-only content, but there are also opportunities to use different delivery techniques since multimedia content is more resilient to errors. I have worked on a variety of research problems and used a number of systems that were developed to deliver multimedia content to users. One content-delivery method I have researched is the one-to-many communication facility called “multicast,” first deployed as the Multicast Backbone, a virtual overlay network supporting one-to-many communication. Multicast is one technique that can be used on the Internet to provide streaming media support for complex applications like video-on-demand, distance learning, distributed collaboration, distributed games, and large-scale wireless communication. The delivery of media through multicast often involves using Internet infrastructure, devices and protocols, including protocols for routing and TCP/IP.

8. Starting in 1997, I worked on a project to integrate the streaming media capabilities of the Internet together with the interactivity of the web. I developed a project called the Interactive Multimedia Jukebox (IMJ). Users would visit a web page and select content to view. The content would then be scheduled on one of a number of channels, including delivery to students in Georgia Tech dorms delivered via the campus cable plant. The content of each channel was delivered using multicast communication.

9. In the IMJ, the number of channels varied depending on the capabilities of the server including the available bandwidth of its connection to the Internet. If one of the channels was idle, the requesting user would be able to watch their selection immediately. If all channels were streaming previously selected content, the user's selection would be queued on the channel with the shortest wait time. In the meantime, the user would see what content was currently playing on other channels, and because of the use of multicast, would be able to join one of the existing channels and watch the content at the point it was currently being transmitted.

10. The IMJ service combined the interactivity of the web with the streaming capabilities of the Internet to create a jukebox-like service. It supported true Video-on-Demand when capacity allowed, but scaled to any number of users based on queuing requested programs. As part of the project, we obtained permission from Turner Broadcasting to transmit cartoons and other short-subject content. We also connected the IMJ into the Georgia Tech campus cable television network so that students in their dorms could use the web to request content and then view that content on one of the campus's public access channels.

11. More recently, I have also studied issues concerning how users choose content, especially when considering the price of that content. My research has examined how dynamic content pricing can be used to control system load. By

raising prices when systems start to become overloaded (*i.e.*, when all available resources are fully utilized) and reducing prices when system capacity is readily available, users' capacity to pay as well as their willingness can be used as factors in stabilizing the response time of a system. This capability is particularly useful in systems where content is downloaded or streamed on-demand to users.

12. As a parallel research theme, starting in 1997, I began researching issues related to wireless devices and sensors. In particular, I was interested in showing how to provide greater communication capability to “lightweight devices,” *i.e.*, small form-factor, resource-constrained (*e.g.*, CPU, memory, networking, and power) devices. Starting in 1998, I published several papers on my work to develop a flexible, lightweight, battery-aware network protocol stack. The lightweight protocols we envisioned were similar in nature to protocols like Bluetooth, Universal Plug and Play (UPnP) and Digital Living Network Alliance (DLNA).

13. From this initial work, I have made wireless networking—including ad hoc, mesh networks and wireless devices—one of the major themes of my research. My work in wireless networks spans the protocol stack from applications through to the encoding and exchange of data at the data link and physical layers.

14. At the application layer, even before the large-scale “app stores” were available, my research looked at building, installing, and using apps for a variety of purposes, from network monitoring to support for traditional computer-based

applications (*e.g.*, content retrieval) to new applications enabled by ubiquitous, mobile devices. For example, my research has looked at developing applications for virally exchanging and tracking “coupons” through “opportunistic contact” (*i.e.*, communication with other devices coming into communication range with a user). In many of the courses I have taught there is a project component. Through these projects I have supervised numerous efforts to develop new “apps” for download and use across a variety of mobile platforms.

15. Toward the middle of the protocol stack, my research also looked to build wireless infrastructure support to enable communication among a set of mobile devices unaided by any other kind of network infrastructure. These kinds of networks are useful either in challenged network environments (*e.g.*, when a natural disaster has destroyed existing infrastructure) or when suitable support for network communication never existed. The deployment of such networks (or even the use of traditional network support) are critical to support services like disaster relief, catastrophic event coordination, and emergency services deployment.

16. Yet another theme is monitoring wireless networks, in particular different variants of IEEE 802.11 compliant networks, to (1) understand the operation of the various protocols used in real-world deployments, (2) use these measurements to characterize use of the networks and identify protocol limitations and weaknesses, and (3) propose and evaluate solutions to these problems. I have

successfully used monitoring techniques to study wireless data link layer protocol operation and to improve performance by enhancing the operation of such protocols. For wireless protocols, this research includes functions like network acquisition and channel bonding.

17. Protecting networks, including their operation and content, has been an underlying theme of my research almost since the beginning of my research career. Starting in 2000, I have been involved in several projects that specifically address security, network protection, and firewalls. After significant background work, a team on which I was a member successfully submitted a \$4.3M grant proposal to the Army Research Office (ARO) at the Department of Defense to propose and develop a high-speed intrusion detection system. Key aspects of the system included associating streams of packets and analyzing them for viruses and other malware. Once the grant was awarded, we spent several years developing and meeting the milestones of the project. A number of my students worked on related projects and published papers on topics ranging from intrusion detection to developing advanced techniques to be incorporated into firewalls. I have also used firewalls, including their associated malware detection features, in developing techniques for the classroom to ensure that students are not distracted by online content.

18. My recent work ties some of the various threads of my past research together. I have investigated content delivery in online social networks and proposed

reputation management systems in large-scale social networks and marketplaces. On the content delivery side, I have looked at issues of caching and cache placement, especially when content being shared and the cache has geographical relevance. We were able to show that effective caching strategies can greatly improve performance and reduce deployment costs. Our work on reputation systems showed that reputations have economic value, and as such, creates a motivation to manipulate reputations. In response, we developed a variety of solutions to protect the integrity of reputations in online social networks. The techniques we developed for content delivery and reputation management were particularly relevant in peer-to-peer communication and recommendations for downloadable “apps.”

19. As an important component of my research program, I have been involved in the development of academic research into available technology in the market place. One aspect of this work is my involvement in the Internet Engineering Task Force (IETF). The IETF is a large and open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. I have been involved in various IETF groups including many content delivery-related working groups like the Audio Video Transport (AVT) group, the MBone Deployment (MBONED) group, Source Specific Multicast (SSM) group, the Inter-Domain Multicast Routing (IDMR) group, the Reliable Multicast Transport (RMT) group,

the Protocol Independent Multicast (PIM) group, etc. I have also served as a member of the Multicast Directorate (MADDOGS), which oversaw the standardization of all things related to multicast in the IETF. Finally, I was the Chair of the Internet2 Multicast Working Group for seven years.

20. My involvement in the research community extends to leadership positions for several academic journals and conferences. I am the co-chair of the Steering Committee for the ACM Network and System Support for Digital Audio and Video (NOSSDAV) workshop and on the Steering Committees for the International Conference on Network Protocols (ICNP), ACM Sigcomm Workshop on Challenged Networks (CHANTS), and IEEE Global Internet (GI) Symposium. I have served or am serving on the Editorial Boards of IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE Network, ACM Computers in Entertainment, AACE Journal of Interactive Learning Research (JILR), and ACM Computer Communications Review. I have co-chaired a number of conferences and workshops including the IEEE International Conference on Network Protocols (ICNP), IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), International Conference on Communication Systems and Networks (COMSNETS), IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS), the International Workshop On Wireless Network Measurement (WiNMee), ACM

Sigcomm Workshop on Challenged Networks (CHANTS), the Network Group Communication (NGC) workshop, and the Global Internet Symposium, and I have served on the program committees for numerous conferences.

21. Furthermore, in the courses I taught at UCSB, a significant portion of my curriculum covered aspects of the Internet and network communication including the physical and data link layers of the Open System Interconnect (OSI) protocol stack, and standardized protocols for communicating across a variety of physical media such as cable systems, telephone lines, wireless, and high-speed Local Area Networks (LANs). The courses I have taught also cover most major topics in Internet communication, including data communication, multimedia encoding, and mobile application design. My research and courses have covered a range of physical infrastructures for delivering content over networks, including cable, Integrated Services Digital Network (ISDN), Ethernet, Asynchronous Transfer Mode (ATM), fiber, and Digital Subscriber Line (DSL). For a complete list of courses I have taught, see my curriculum vitae (CV).

22. In addition, I co-founded a technology company called Santa Barbara Labs that was working under a sub-contract from the U.S. Air Force to develop very accurate emulation systems for the military's next generation internetwork. Santa Barbara Labs' focus was in developing an emulation platform to test the performance characteristics of the network architecture in the variety of

environments in which it was expected to operate, and, in particular, for network services including IPv6, multicast, Quality of Service (QoS), satellite-based communication, and security. Applications for this emulation program included communication of a variety of multimedia-based services, including video conferencing and video-on-demand.

23. In addition to having co-founded a technology company myself, I have worked for, consulted with, and collaborated with companies for nearly 30 years. These companies range from well-established companies to start-ups and include IBM, Hitachi Telecom, Turner Broadcasting System (TBS), Bell South, Digital Fountain, RealNetworks, Intel Research, Cisco Systems, and Lockheed Martin.

24. Through my graduate education, leadership with CITS, involvement in TMP, role in the development of the Internet2 infrastructure, and consulting with ISPs, I have gained a strong understanding in the role of the Internet in our society and the challenges of deploying large-scale production networking infrastructure. CITS, since its inception, has looked at the role of the Internet in society, including how the evolution of technology have created communication opportunities and challenges, including, for example through disruptive technologies like P2P. TMP looks to focus on non-purely technical issues, including, for example, state-of-the-art business methods, strategies for successful technology commercialization, new venture creation, and best practices for fostering innovation. Through my industry

collaborations and Internet2 work, I have developed significant experience in the challenges of deploying, monitoring, managing, and scaling communication infrastructure to support evolving Internet services like streaming media, conferencing, content exchange, social networking, and e-commerce.

25. I am a Member of the Association of Computing Machinery (ACM) and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).

26. Additional details about my employment history, fields of expertise, courses taught, and publications are further included in my CV attached as Appendix A to this Report.

27. In reaching the opinions, I have considered the '794 patent, its prosecution history, and the references below, and have also drawn as appropriate upon my own education, training, research, knowledge, and personal and professional experience.

28. I am being compensated at my standard consulting rate of \$800 per hour for my services. My compensation does not depend on the outcome of this review proceeding or of any pending litigation.

29. I have no direct financial interest in Cellco Partnership or Verizon. I have been informed that GAS claims ownership of the '794 patent. I have no direct financial interest in GAS.

III. Understanding of Legal Principles

A. Claim Construction

30. I understand that claim construction in an *Inter Partes* Review is controlled by the standard in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

31. I have been informed that claim construction begins with the language of the claims. The words are given their “ordinary and customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” The specification and prosecution history are sources of intrinsic evidence that informs the meaning of the claim language. Extrinsic evidence, such as expert testimony and dictionaries, may be useful in educating judges regarding the field of the invention or helping determine what a person of ordinary skill in the art (“POSA”) would understand claim terms to mean. However, extrinsic evidence in general is viewed as less reliable than intrinsic evidence.

32. I understand that in this proceeding, any claim term that is not construed should be given its plain and ordinary meaning.

B. Anticipation

33. I understand that a claim is unpatentable as anticipated if all of the elements of the claim are described or disclosed in a single prior art reference.

C. Obviousness

34. I understand that a prior art reference can render a patent claim obvious to one of ordinary skill in the art if the differences between the subject matter set forth in the patent claim and the prior art are such that the subject matter of the claim would have been obvious at the time the alleged invention was made. In analyzing obviousness, I understand that it is important to consider the scope of the claims, the level of skill in the relevant art, the scope and content of the prior art, the differences between the prior art and the claims, and any secondary considerations.

35. I understand that when the claimed subject matter involves combining pre-existing elements to yield no more than one would expect from such an arrangement, the combination is obvious. I also understand that in assessing whether the claimed subject matter is obvious, one must consider whether the claimed improvement is more than the predictable use of prior art elements according to their established functions. I understand that there need not be a precise teaching in the prior art directed to the specific subject matter of a claim because one can take account of the inferences and creative steps that a person of skill in the art would employ. I further understand that a person of ordinary skill is a person of ordinary creativity, not an automaton.

36. I understand that obviousness cannot be based on the hindsight combination of components selectively culled from the prior art. I understand that

in an obviousness analysis, neither the motivation nor the avowed purpose of the inventors controls the inquiry. Any need or problem known in the field at the time of the invention and addressed by the patent can provide a reason for combining elements. For example, I understand that it is important to consider whether 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 understand that known techniques can have obvious uses beyond their primary purposes, and that in many cases a person of ordinary skill can fit the teachings of multiple pieces of prior art together like pieces of a puzzle.

37. I understand that, when there is a reason to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. I further understand that, if this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense, which bears on whether the claim would have been obvious.

38. I understand that secondary considerations can include, for example, evidence of commercial success of the invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention, or evidence that an invention achieved a surprising result. I further understand that such evidence

must have a nexus or causal relationship to the elements of a claim, in order to be relevant. I am unaware of any such secondary considerations for the '931 patent.

IV. Summary of Materials Reviewed and Considered

39. All of the opinions contained in this Declaration are based on the documents I reviewed, as well as my knowledge and professional judgment, through the lens of a POSA. In forming the opinions expressed in this Declaration, while drawing on my experience in the field of network technologies and infrastructures (including wireless), I reviewed the following documents.

Ex. No.	Description
1001	U.S. Patent No. 9,426,794 (“’794 patent”)
1004	U.S. Patent No. 6,556,553 (“Palmer”)
1005	U.S. Patent No. 6,816,706 (“Hohnstein”)
1006	U.S. Patent No. 5,790,536 (“Mahany”)
1007	U.S. Patent No. 5,722,051 (“Agrawal”)
1008	Prosecution History of U.S. Patent No. 9,426,794
1011	Excerpts from Newton’s Telecom Dictionary, 16 th Expanded and Updated Edition (2000)
1012	Wikipedia, “Rack Unit” (last visited June 26, 2023)
1013	Charles S. Demarest, “Telephone Equipment for Long Cable Circuits”, Bell System Technical Journal. Vol. 2, No. 3, pp. 112-140 (July 1923)
1014	Excerpts from William C. Y. Lee, Mobile Cellular Telecommunications, 2 nd ed. (1995)

Ex. No.	Description
1015	Excerpts from Roger L. Freeman, Fundamentals of Telecommunications (1999)

40. My opinions are additionally guided by my appreciation of how a POSA would have understood the claims of the '794 patent at the time of the alleged invention, which I have asked to assume is just before the earliest priority date for the '794 patent (which I understand is January 19, 2001).

V. Level of Skill in the Art and Perspective Applied in this Declaration

41. I understand that most issues relating to validity (including obviousness) must be judged from the perspective of a person of ordinary skill in the relevant art, as I discuss below

42. The '794 patent is directed to wireless communication systems, particularly such communications between a base station and devices disposed at subscriber premises.

43. In determining the level of ordinary skill, I have been asked to consider, for example, the types of problems encountered in the field, prior solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. Taking those factors into consideration, a person of ordinary skill in the art at the relevant time would have a bachelor's degree in computer science, electrical or computer

engineering, or a related field, and at least 2 years of work or research experience in digital communications systems, such as wireless communications systems and networks, or equivalent, or a Master's degree in electrical engineering, computer engineering, computer science or similar field. Additional education could compensate for less practical experience and vice versa. Through education and relevant work experience, the person of ordinary skill would have an understanding and familiarity with the development and operation of wireless communication systems. More education could replace a lower amount of experience and *vice versa*.

44. I would have qualified, at least, as a person of at least ordinary skill in the art as of the relevant timeframe, and also as of the earliest claimed January 19, 2001 priority date on the face of the '794 patent. I have a sufficient level of knowledge, experience, and education to provide an expert opinion in the field of the '794 patent.

45. While my own level of skill exceeded that of the ordinary level of skill in the art at the relevant timeframe, as I had earned my Ph.D. in computer science and had been working as a university professor, I am well-acquainted with the actual performance and capabilities of a person of ordinary skill in the art as defined above. This is because, during the relevant timeframe, I was teaching and working with graduate students and telecommunications professionals—so I was quite familiar with the skills that people with a range of experience had at the time.

46. My opinions in this Declaration are based on the perspective of a POSA as of the relevant timeframes discussed above, or somewhat before (approximately early 2001). This is true even if the testimony is stated in the present tense. Each of the statements below reflects my opinion based on my review of the documents listed in the table above.

VI. Identification of Challenges

Ground 1: Claims 1-4 and 6 recite subject matter that is anticipated by and/or would have been obvious to a POSA in view of U.S. Patent No. 6,556,553 (“Palmer”; Ex. 1004).

Ground 2: Claims 1-6 recite subject matter that would have been obvious to a POSA in view of U.S. Patent No. 6,816,706 (“Hohnstein”; Ex. 1005) and Palmer.

Ground 3: Claims 1-6 recite subject matter that would have been obvious to a POSA in view of Palmer and U.S. Patent No. 5,790,536 (“Mahany”; Ex. 1006).

Ground 4: Claims 1-4 and 6 recite subject matter that would have been obvious to a POSA in view of Palmer and U.S. Patent No. 5,722,051 (“Agrawal”; Ex. 1007).

Ground 5: Claim 5 recite subject matter that would have been obvious to a POSA in view of Palmer, Agrawal, and Mahany.

Ground 6: Claims 1-6 recite subject matter that would have been obvious to a POSA in view of Hohnstein and Agrawal.

VII. Background

A. The '794 Patent

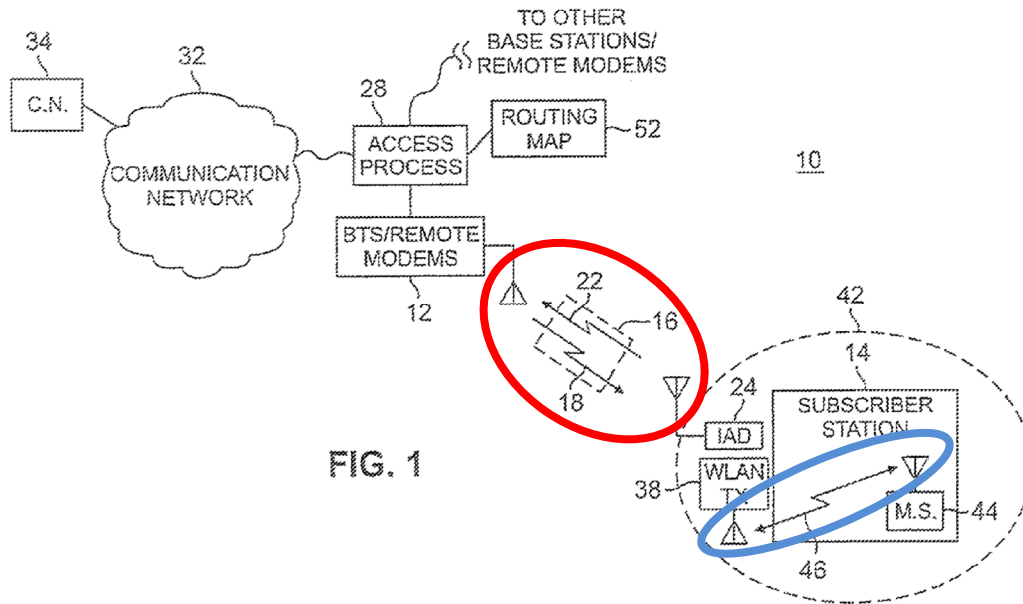
47. The '794 patent is directed to an intermediary device that connects two different networks together. This concept was already well known in the art well prior to the '794 patent—in fact, the telecommunications industry has historically referred to such a device as a “bridge”. Generally, a bridge provides pass-through connectivity between the networks:

Bridge 1. In classic terms, a bridge is a data communications device that connects two or more network segments and forwards packets between them. ...

Classic bridges are relatively dumb devices, which are fast and inexpensive; they simply accept data packets, perhaps buffering them during periods of network congestion, and forward them.

Ex. 1011 at 126-27.

48. In the case of the '794 patent, the particular networks being connected together via the bridge device are a wireless wide area network (commonly known as a “wireless WAN” or “WWAN”) and a wireless local area network (commonly known as a “wireless LAN” or “WLAN”). Fig. 1 of the '794 patent illustrates these two networks, as shown below with a WWAN radio link circled in **red** and a WLAN radio link circled in **blue**:



Ex. 1001, Fig. 1 (annotated).

49. As depicted in Fig. 1, the '794 patent describes its bridge device being formed of two components:

- (1) an “integrated access device” (or “IAD”) 24 that communicates over the WWAN with a base station 12, and
- (2) a WLAN transceiver 38 that communicates over the WLAN with a mobile station 44,

with these two components being connected to each other.

In the exemplary implementation, *an integrated access device (IAD) 24 forms a transceiver* located at the subscriber station and at which forward link signals transmitted upon the forward link channels of the radio link are detectable and which generate reverse link signals for transmission upon the reverse link

channels of the radio link. A separate IAD 24 is located at each subscriber station of the communication system.

Ex. 1001, 7:36-43 (emphasis added).

Pursuant to an embodiment of the present invention, ***a WLAN (wireless local area network) transceiver 38*** is positioned at the subscriber station 14 at the integrated access device 24 to be ***connected to the transceiver circuitry of the integrated access device***. The WLAN transceiver defines a coverage area 42 defining a cell. A mobile station 44 positioned within the cell 42 is capable of communicating with the transceiver 38. That is to say, the radio link 46 is formable between the transceiver 38 and the mobile station 44 upon which forward and reverse link signals are communicated therebetween. Signals originated at the mobile station are communicated upon reverse link channels of the radio link 46 to the WLAN transceiver 38. And, communication signals to be terminated at the mobile station 44 are communicated upon forward link channels of the radio link 46.

Because of the ***connection of the WLAN transceiver to the transceiver of the integrated access device 24***, signals originated at the mobile station and communicated to the WLAN transceiver can, in turn, be provided to the transceiver of the integrated access device to be communicated upon reverse link channels of the radio link 16 and, thereafter, be communicated to another device, such as the correspondent node 34. Analogously, signals originated at the correspondent node, or elsewhere, can

be communicated to the mobile station by way of forward link channels of the radio links 16 and 46 to the mobile station. Thereby communications are effectuable with a mobile station in the fixed wireless access communication system.

Id., 7:65-8:27 (emphasis added); *see also* 3:41-49, 5:2-11, 5:55-6:13.

50. The device operates to provide two-way communication between the mobile station 44 and the base station 12 by forwarding signals in both directions. As described in the '794 patent and consistent with the bridging concept, the device forwards signals sent by the base station 12 via the WWAN link and destined for a mobile station 44, to that mobile station. The device also forwards signals sent by the mobile station 44 via the WLAN link and destined for the base station 12, to that base station.

Because of the connection of the WLAN transceiver to the transceiver of the integrated access device 24, signals originated at the mobile station and communicated to the WLAN transceiver can, in turn, be provided to the transceiver of the integrated access device to be communicated upon reverse link channels of the radio link 16 and, thereafter, be communicated to another device, such as the correspondent node 34. Analogously, signals originated at the correspondent node, or elsewhere, can be communicated to the mobile station by way of forward link channels of the radio links 16 and 46 to the mobile station.

Thereby communications are effectuable with a mobile station in the fixed wireless access communication system.

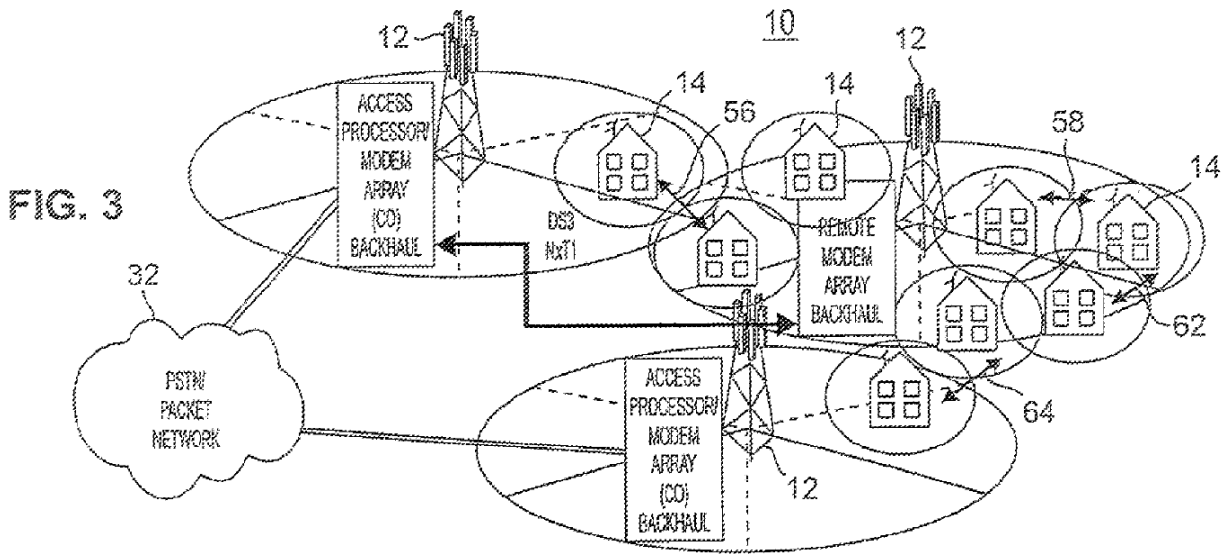
Because of the connection of the WLAN transceiver to the transceiver of the integrated access device 24, signals originated at the mobile station and communicated to the WLAN transceiver can, in turn, be provided to the transceiver of the integrated access device to be communicated upon reverse link channels of the radio link 16 and, thereafter, be communicated to another device, such as the correspondent node 34. Analogously, signals originated at the correspondent node, or elsewhere, can be communicated to the mobile station by way of forward link channels of the radio links 16 and 46 to the mobile station. Thereby communications are effectuable with a mobile station in the fixed wireless access communication system.

Id., 8:15-27; *see also* 9:4-19, 8:36-43.

51. The device's WLAN transceiver 38 defines a wireless coverage area 42 of communication coverage for the WLAN. A system may include multiple bridging devices as depicted in Fig. 3, each defining their individual WLAN coverage areas as circled around each house in Fig. 3.

The WLAN transceiver defines a coverage area 42 defining a cell. A mobile station 44 positioned within the cell 42 is capable of communicating with the transceiver 38.

Id., 8:2-5.



Id., Fig. 3.

FIG. 3 again illustrates the communication system 10, here showing a plurality of base stations 12 and subscriber stations 14 associated with various ones of the base stations. Each of the subscriber stations includes a WLAN transceiver (shown in FIG. 1) various of the base transceiver stations are here shown also to be coupled by way of the communication network 32, again either a PSTN, a packet data network, or a combination of such networks.

Id., 9:20-27; *see also* 9:27-56.

52. The system allows for subscriber stations to travel between different WLAN coverage areas while still maintaining continuous communications, via a handover operation.

Mobile stations which *travel between coverage areas defined by different ones of the WLAN transceivers* are permitted

continued communication by way of local radio links by ***handing over*** communications between WLAN transceivers. Ongoing communication sessions with the mobile station continue in spite of handover of communications between the WLAN transceivers.

Id., 6:20-26 (emphasis added).

Movement of a mobile station between the coverage areas is defined by different ones of the subscriber stations are shown in the figure. For instance, movement of a mobile station indicated by the arrow 56 represents movement of the mobile station between subscriber stations associated with separate cells of separate base stations.

Id., 9:27-33.

53. The '794 patent further notes that a determination of when to initiate handover is made based on “measurements of signal characteristics of communication signals communicated between the WLAN transceiver and the mobile station.”

Determination of when to initiate handover of communications is made responsive to ***measurements of signal characteristics of communication signals communicated between the WLAN transceiver and the mobile station***. In one implementation signal characteristics are measured, or otherwise determined, at the mobile station and results of such measures or determinations of are reported back to the WLAN transceiver and appropriate

control circuitry. Thereafter, if appropriate, the handover of communications is effectuated.

Id., 8:61-9:3 (emphasis added).

54. While the '794 patent specification refers broadly to “signal characteristics,” it does *not* actually provide any examples of particular “signal characteristics.”

55. Additionally, although the '794 patent claims refer to “monitor[ing]” signal characteristics, the '794 patent specification does not actually use the term “monitor” (or any grammatical variant thereof). And, the '794 patent specification does not contain any example where the WLAN transceiver or access point itself performs any monitoring action, other than the WLAN transceiver or access point simply receiving measurements sent to it by a mobile station (which actually conducts the measurements).

VIII. Claim Construction

56. I have generally applied the plain and ordinary meaning of the terms recited in the claims, as would have been understood by persons of skill in the art in 2001.

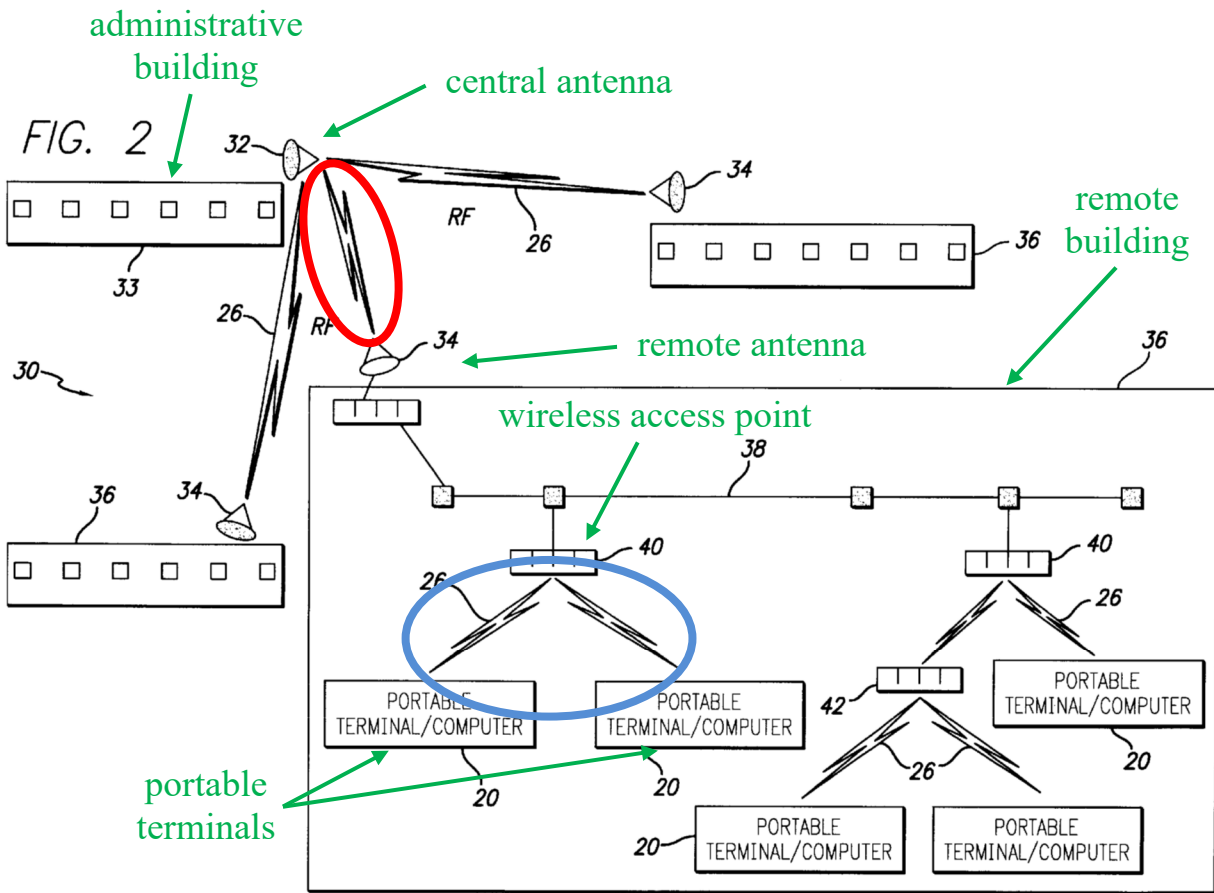
57. I am not currently aware of any particular claim term whose specific construction would alter my opinions herein. Nonetheless, I reserve the right to respond to any claim constructions advanced by Patent Owner.

IX. Ground 1: Claims 1-4 and 6 are Anticipated by And/or Obvious Over Palmer

A. Summary of Palmer

58. Palmer is a U.S. patent that issued on April 29, 2003, from an application filed April 12, 1999. Ex. 1004, cover.

59. Palmer describes a wireless communication system that can span multiple buildings or even an entire city. The system incorporates a device that provides connectivity between a WWAN and a WLAN. An exemplary system in Palmer includes a central antenna 32 that is located on a central administration building 33. The central antenna 32 communicates wirelessly with remote antennas 34 in various remote buildings 36.



Id., FIG. 2 (annotated, and WWAN and WLAN links circled in red and blue, respectively).

FIG. 2 illustrates a communication system 30. The communication system 30 expands upon the features of the communication system 10 of FIG. 1 by providing wireless coverage not only within a building, but also among *several buildings or even within a city*. The communication system 30 includes a *central antenna 32* that communicates through RF links 26 to a plurality of *remote antennas 34*. The *central antenna 32* may be attached to an *administration building 33*

or other central location based upon the location of the remote antennas 34. The remote antennas 34 may be located on various buildings 36 or other convenient remote locations.

Id., 4:53-64 (emphasis added); *see also* 4:26-5:9.

60. As also depicted in Fig. 2 of Palmer (reproduced above), the remote building 36 also establishes a local area network within that building, which includes a wired network 38 that interconnects the remote antenna 34 and one or more wireless access points 40 providing wireless network connectivity to portable terminals 20.

The building 36 may include a wired network 38 with a plurality of access points 40. The access point 40, as in FIG. 1, would consist of a transmitter/receiver defining a cell 18 that provides RF coverage for the wireless communication devices 20. The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38. There may also be wireless access points 42 that consist of transmitter/receiver repeaters, as in FIG. 1. The wired network 38 is then linked to the administration building 33 and its associated network through the remote antenna 34 to the central antenna 32 and finally through its link to a wired network (not shown) within the administration building 33.

Id., 4:64-5:9.

61. Each access point 40 defines a service area of wireless coverage and operates as a bridge between the wireless coverage area and the wired network.

The access point 40, as in FIG. 1, would consist of a transmitter/receiver defining a cell 18 that provides RF coverage for the wireless communication devices 20. The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38.

Id., 4:65-5:3; *see also* 4:36-44, 4:64-5:9; Fig. 1 (depicting coverage areas 18 for access points).

62. Palmer describes that a remote building 36 may include multiple access points 40 to expand the scope of wireless coverage for portable terminals 20. A mobile worker operating the portable terminal 20 can move from a first coverage area to another (*e.g.*, within the same building, or from one building to another), the system provides for switching of the portable terminal 20's wireless connection from one WLAN to another (generally known as "roaming") to maintain network connectivity without loss of connection.

In FIG. 1, as the mobile worker, with the wireless communication device 20, moves throughout the work area, it is necessary to maintain the wireless connection between the wireless communication device 20 and the wired network 34 and ultimately to the central host processor 12. The wireless communication device 20 may ***transition between one cell 18 to another or between the cell 18 and the cell 24 covered by the***

wireless access point 22. In FIG. 2, the wireless communication device 20 may also **transition between buildings** or comprise part of a wireless wide area network.

Id., 5:10-19 (emphasis added); *see also* 1:53-2:6.

63. Palmer further describes that the network performs measurements of various characteristics of the wireless network connection between an access point 40 and a portable terminal 20. Palmer identifies examples of specific measurements, including signal-to-noise ratio (SNR), bit error rate (BER), number of transmission retries (NTR), received signal strength indicator (RSSI), bit energy-to-noise density (E_b/N_0), global position information (GPS), and cell congestion information (also known as load factor).

In accordance with a first embodiment of the present invention, a predictive method for **determining when a communication device should rate shift or roam in a wireless environment** is provided. FIG. 3 illustrates the basic steps, in flowchart form, of the predictive method. The method would utilize **various measurements to evaluate connection quality**, the measurement data obtained at step 50. These measurements may include but are not limited to: 1) signal-to-noise ratio (SNR), 2) bit error rate (BER), 3) number of transmission retries (NTR), 4) received signal strength indicator (RSSI), 5) bit energy-to-noise density (E_b/N_0), 6) global position information (GPS), and 7) cell congestion information (also known as load factor). These

measurements (m_j) would be utilized in conjunction with configurable parameters that controls the use of m_j such as: 1) utilization of a measurement (e.g., yes/no) u_j , 2) how measurement is used (e.g., weighting factor) h_j , and 3) related measurement decision criteria (e.g., threshold) d_j .

Id., 5:37-54 (emphasis added).

Alternatively, the method steps may be *performed* centrally, for example, *by the network* or a central host processor.

Id., 5:34-36 (emphasis added); *see also* 5:10-49.

64. Using these measurements, the network determines whether a radio frequency (RF) connection between the access point 40 and the portable terminal 20 has degraded. If the RF connection has degraded, the network determines whether to reduce the information bit rate for the network connection or switch (e.g., roam) the portable terminal 20 to another access point.

For the examples discussed above, the wireless communications can consist of voice or data information, as known in the art. The wireless connection should be transparent to the mobile worker as the wireless communication device 20 roams from cell to cell or rate shifts. There should be no loss of connection or service degradation and it should appear as if there is a wired connection. If the RF connection begins to degrade, a determination should be made as to whether communication performance would

improve by transmitting at a lower information rate or roaming to another cell offering a higher quality RF connection.

Id., 5:20-30.

FIG. 4 illustrates the basic steps, in flowchart form, of the heuristic method. This method would utilize various measurements, taken at step 60, to evaluate connection quality. These measurements may include but are not limited to: 1) signal-to-noise ratio (SNR), 2) bit error rate (BER), 3) number of transmission retries (NTR), 4) received signal strength indicator (RSSI), 5) bit energy-to-noise density (E_b/N_0), 6) global position information (GPS), and 7) cell congestion information. These measurements (m_j) would be utilized in conjunction with historical data vectors (r_j) that represent when a rate shift or roam should occur. The historical data vectors store the measurements taken prior to a transmission or reception failure for each rate shift and one for roam, as shown at step 62 and 64. The ***current measurements m_j*** , last data rate L_j , and pertinent vector r_j are then ***used to determine whether to rate shift or roam*** based on a function $f(m_j, L_j, r_j)$, as shown at step 66 and 68. The function f can be a very simplistic function that performs a compare operation against the vector values r_j or it can be a more sophisticated function such as taking the median, highest, or lowest value of r_j .

Thus, it dynamically calculates the rate shift and roam criteria based on a given wireless environment. If the wireless environment changes, the decision criteria will evolve and be

automatically updated to reflect the current wireless environment. With each transmission or reception, the measurements are compared to the rate shift and roaming criteria and the appropriate action is taken. The vector updates and criteria updates occur after the last transmission or reception and prior to the next. In this fashion, the criteria is always optimal. The result is a rate shift and roaming algorithm that is tailored to a customer's environment and that dynamically adjusts to changes in the wireless environment.

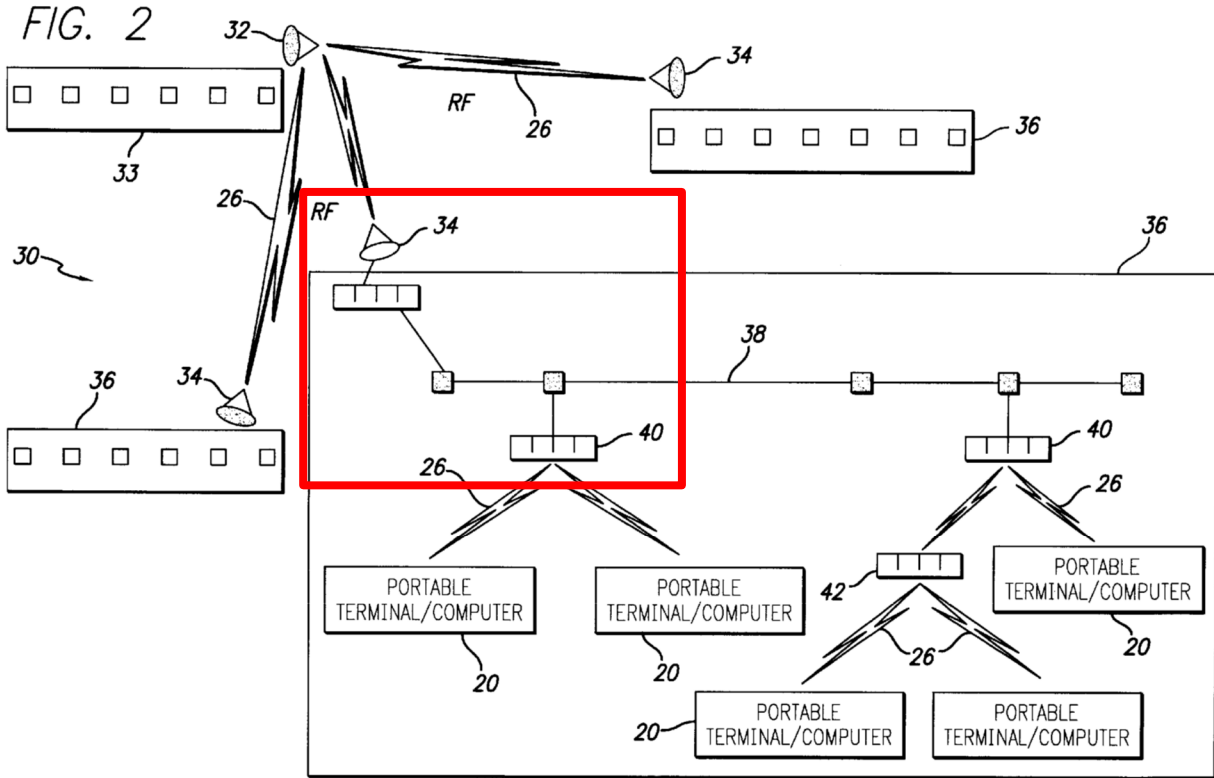
Id., 6:20-54 (emphasis added); *see also* 5:10-49.

B. Claim 1

65. Claim 1 is anticipated by and/or obvious over Palmer.

1. [1.preamble] A wireless communication device, comprising:

66. As discussed above, Palmer describes a wireless communication device, such as a remote antenna 34 in combination with an access point 40.



Ex. 1004, Fig. 2 (annotated).

The access point 16 acts as a bridge from the wireless communication arena defined by its cell 18 to the wired network 14.

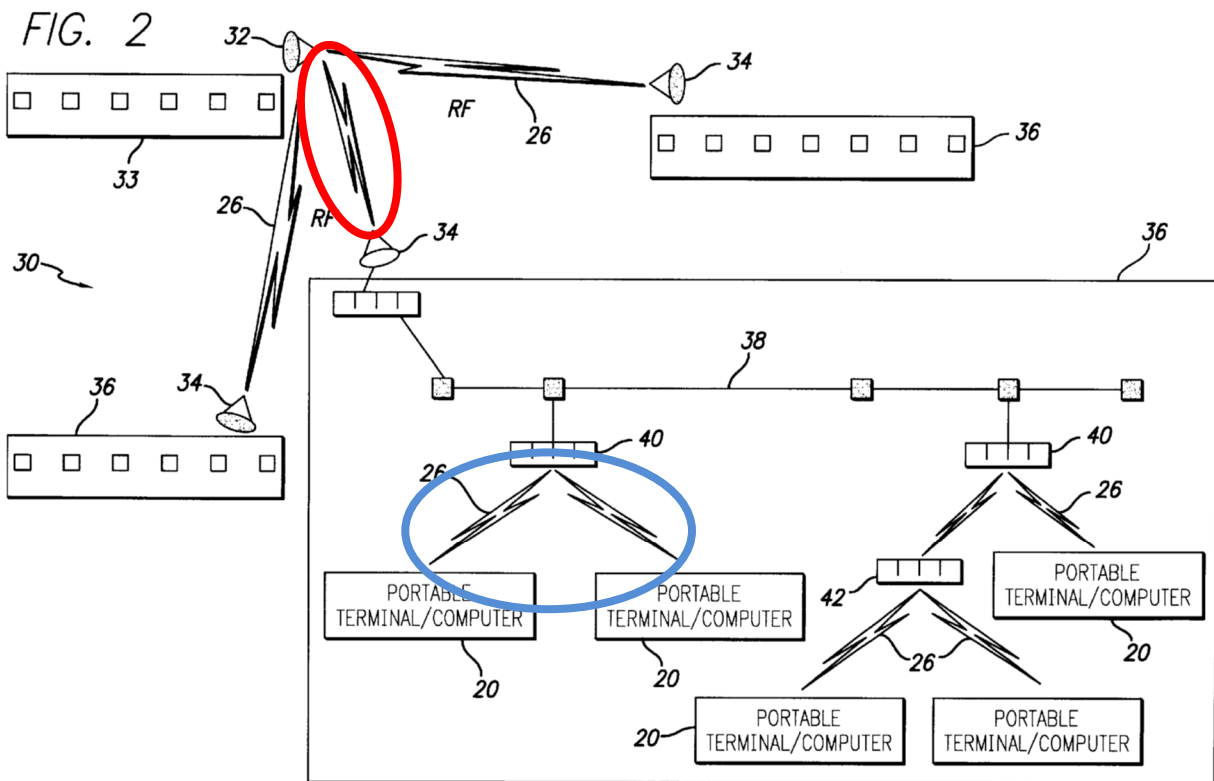
Id., 4:42-44.

The access point 40, as in FIG. 1, would consist of a transmitter/receiver defining a cell 18 that provides RF coverage for the wireless communication devices 20. The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38.

Id., 4:65-5:3.

67. This device communicates wirelessly with a central antenna 32 via a wireless wide area network (WWAN) link, and also communicates wirelessly with portable terminals 20 via a wireless local area network (WLAN) link. I note that Palmer also describes portable terminals 20 as “wireless communication devices 20” in the specification. *Id.*, 4:36-40, 1:38-42 (“the wireless communication devices may comprise portable units”), 1:53-55 (“wireless communication device such as a portable terminal or computer”).

68. Reproduced below is Fig. 2 of Palmer, with a WWAN link circled in red and a WLAN link circled in blue.



Id., Fig. 2 (annotated).

The communication system 30 includes a central antenna 32 that communicates through RF links 26 to a plurality of remote antennas 34. The central antenna 32 may be attached to an administration building 33 or other central location based upon the location of the remote antennas 34. The ***remote antennas 34 may be located on various buildings 36*** or other convenient remote locations. The building 36 may include a wired network 38 with a plurality of ***access points 40***. The access point 40, as in FIG. 1, would consist of a transmitter/receiver defining a cell 18 that provides RF coverage for the wireless communication devices 20. The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38. There may also be wireless access points 42 that consist of transmitter/receiver repeaters, as in FIG. 1. The wired network 38 is then linked to the administration building 33 and its associated network through the remote antenna 34 to the central antenna 32 and finally through its link to a wired network (not shown) within the administration building 33.

Id., 4:57-5:3 (emphasis added); *see also* 1:53-2:6 (describing WLANs within buildings and roaming from one coverage area to another).

69. I note that claim 1 does not recite any requirement that the device's components be integrated, while dependent claim 5 recites that certain device components "are part of an integrated device." Therefore, I have been instructed

and understand that the principle of claim differentiation holds that independent claim 1 should be interpreted to not be so limited to require such integration.

70. Nonetheless, even if claim 1 is deemed to require the device be an integrated in some respect, including fully integrated into a single unit, and Palmer is deemed to not explicitly disclose such integration, the integration of components within such a device would still have been an obvious variant. For instance, the '794 patent describes one form of an “integrated” device consisting of the components installed together in a rack-assembly.

In the exemplary implementation, the integrated access device 24 forms a rack-assembly having expansion slots to receive expansion cards thereat. And, the WLAN transceiver is mounted upon, or is otherwise formed at, an expansion card connectable to the expansion slot of the rack-assembly. Thereby the integrated access device together with the WLAN transceiver form an integrated device providing for two-way communication upon the radio link 16 as well as two-way communication upon the radio link 46.

Ex. 1001 ('794 patent), 8:28-36.

71. In this regard, the use of rack assemblies for housing telecommunications equipment at a location has been known and widely employed for decades. For example:

The 19-inch *rack format* with rack-units of 1.75 inches (44.45 mm) *was established as a standard by AT&T around 1922* in order to reduce the space required for repeater and termination equipment in a telephone company central office.

Ex. 1012 (Wikipedia entry for “Rack Unit”).

And, the Wikipedia entry cites an article from July 1923, which depicts and describes rack mounts for telecommunications equipment—a description that is still applicable today. *See generally* Ex. 1013.

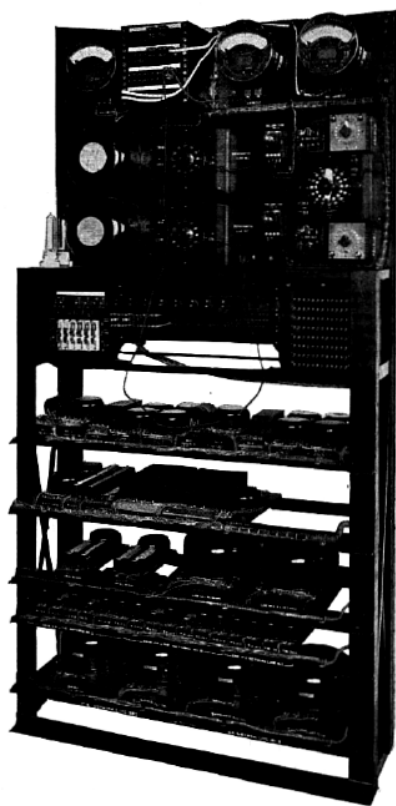


Fig. 2—Wide Rack Through Line Repeater

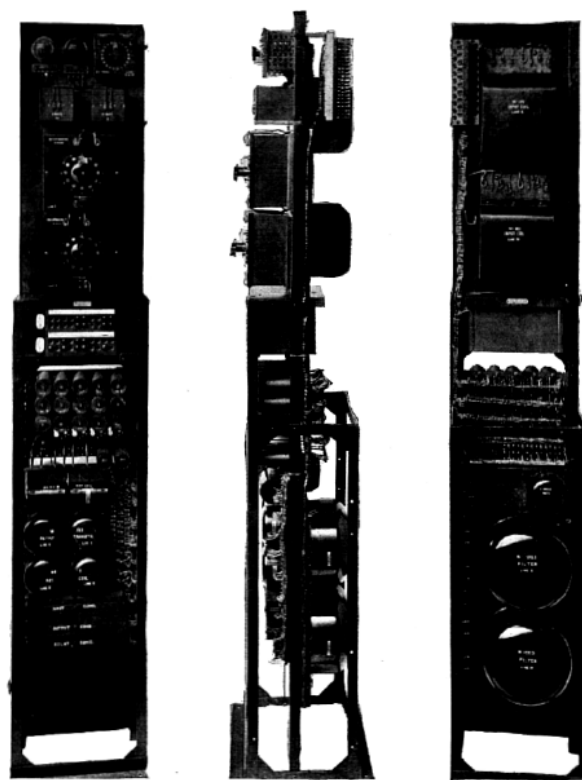


Fig. 3—Standard Through Line Repeater for Open-Wire Use

Id. at 114-15 (Figs. 2-3).

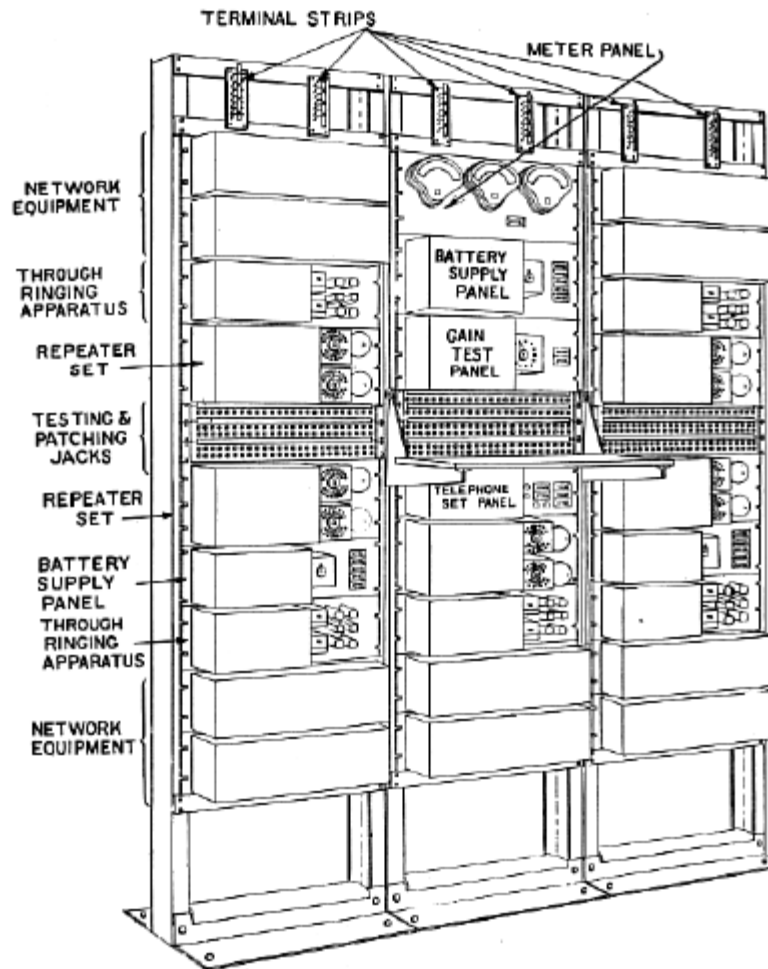


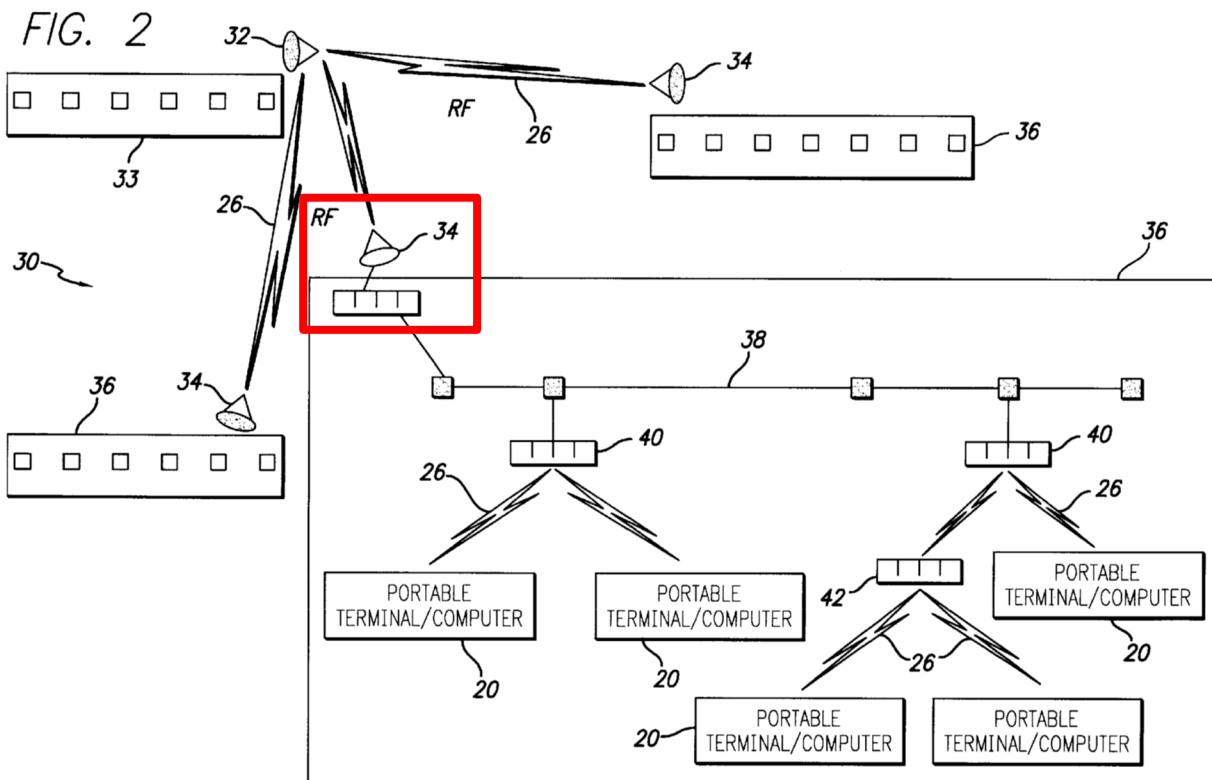
Fig. 7—Panel Mounted Repeaters as Arranged in a Small Installation

Id. at 118 (Fig. 7).

72. A POSA would have appreciated that integrating multiple telecommunications equipment components into a single enclosure or frame (whether as a rack-mount style, a unified housing or case, etc.) would have been a simple matter of design choice using conventional packaging approaches. For instance, providing the device as a single dual-function product would have provided a benefit of avoiding the purchase of two separate components.

2. [1.a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and

73. Palmer describes a first wireless transceiver (remote antenna 34 attached to remote building 36) that is operable to communicate with a base station (central antenna 32 attached to administration building 33).



Ex. 1004, Fig. 2 (annotated).

FIG. 2 illustrates a communication system 30. The communication system 30 expands upon the features of the communication system 10 of FIG. 1 by providing wireless

coverage not only within a building, but also among several buildings or even within a city. The communication system 30 includes a central antenna 32 that communicates through RF links 26 to a plurality of remote antennas 34. The central antenna 32 may be attached to an administration building 33 or other central location based upon the location of the remote antennas 34. The *remote antennas 34 may be located on various buildings 36* or other convenient remote locations. The building 36 may include a wired network 38 with a plurality of *access points 40*.

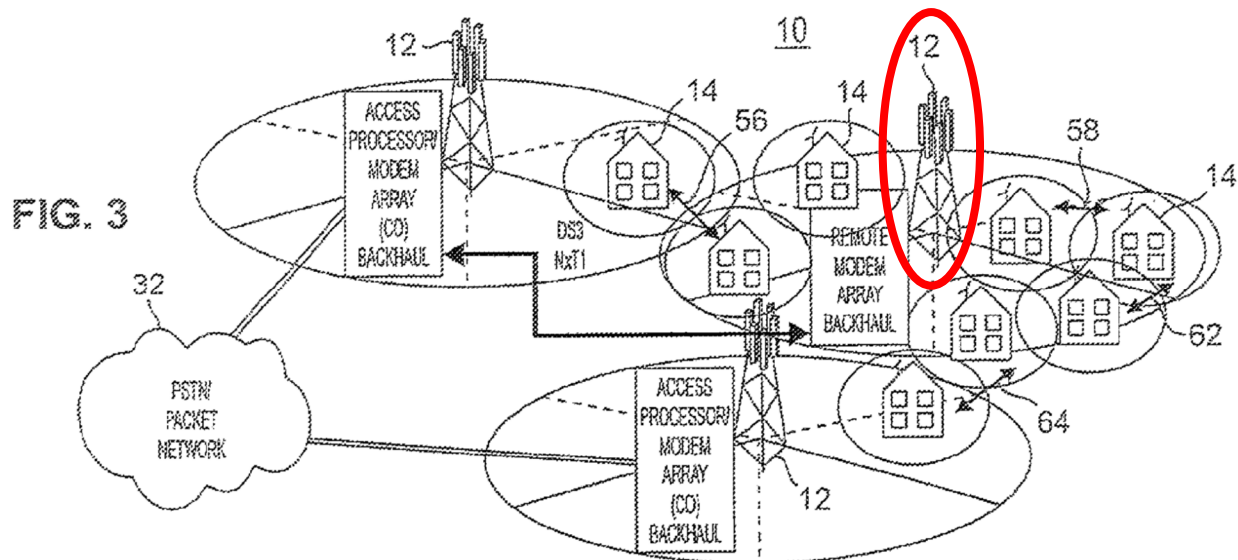
Id., 4:53-64 (emphasis added).

74. The remote antenna 34 is wireless, as it communicates via radio frequency (RF) links.

The communication system 30 includes a central antenna 32 that *communicates through RF links 26* to a plurality of remote antennas 34.

Id., 4:57-59 (emphasis added).

75. I note that the '794 patent does not define the term "base station." But Palmer's central antenna 32 is a "base station" at least because it is provided at a "central location based upon the location of the remote antennas 34." Ex. 1004, 4:59-62. I also note that the '794 patent itself presents a similar arrangement of a base station 12 centrally located and communicating with subscriber stations 14 in various buildings, as shown in Fig. 3 of the '794 patent.



Ex. 1001 ('794 patent), Fig. 3 (“base station 12” annotated); *see also* 7:27-31.

76. Nonetheless, even if Palmer is deemed not to explicitly teach a “base station,” a POSA would have nonetheless found it obvious to configure Palmer’s central antenna 32 as a “base station.” A base-station topology was already well established and commonly utilized in the telecommunications industry by even the earliest priority date for the '794 patent, and was an overarching topology used for cellular communications by that time. For example, a telecommunications textbook dating back to 1995 refers to a “base station” in the context of a “basic cellular system.”

A basic cellular system consists of three parts: a mobile unit, a cell site, and a mobile telephone switching office (MSTO), as Fig. 1.3 shows, with connections to link the three subsystems.

Ex. 1014 at 7.

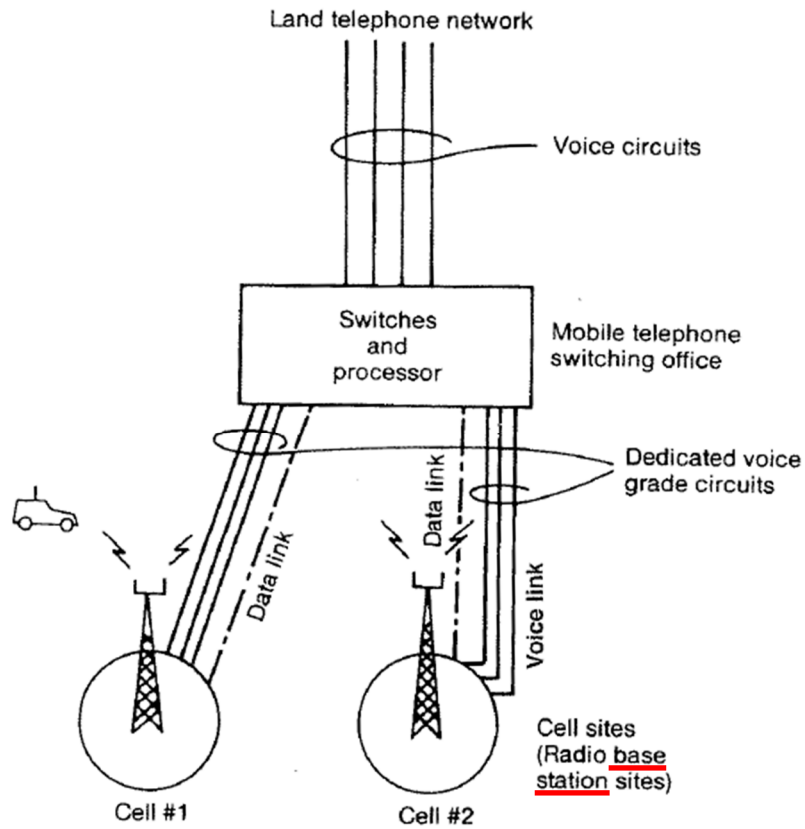
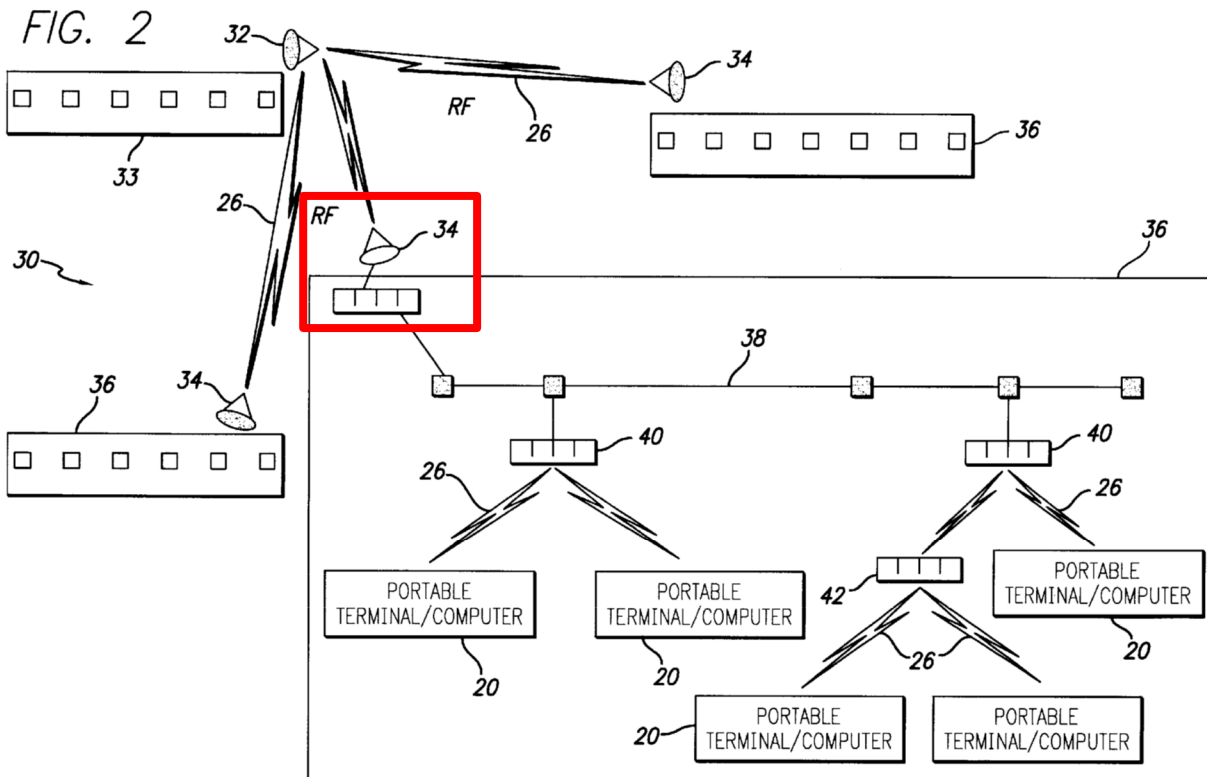


Figure 1.3 Cellular system.

Id. at 8 (annotated); *see also id.* at 7-9.

77. Palmer describes that the central antenna 32 (which corresponds to the “base station” in claim 1) communicates with, not only one remote antenna 34 (*e.g.*, the annotated one in Palmer’s Fig. 2 reproduced above), but also a plurality of other wireless communication devices such as other instances of antennas 34 in additional remote buildings 36 illustrated in Fig. 2).



Ex. 1004, Fig. 2 (annotated).

The communication system 30 includes a central antenna 32 that communicates through RF links 26 to a *plurality of remote antennas 34*. The central antenna 32 may be attached to an administration building 33 or other central location based upon the location of the remote antennas 34. The *remote antennas 34 may be located on various buildings 36* or other convenient remote locations. The building 36 may include a wired network 38 with a plurality of access points 40.

Id., 4:57-64 (emphasis added).

78. The communications between the central antenna 32 and the multiple remote antennas 34 involve a wide area wireless communication protocol, as Palmer

describes that its system in Figs. 1-2 could span an entire “city”. Palmer also describes utilizing industry standard network protocols” for wireless communication.

The method would further reduce network connection losses due to the *use of industry standard network protocols* by the wireless media.

Id., 2:52-55 (emphasis added).

FIG. 2 illustrates a communication system 30. The communication system 30 expands upon the features of the communication system 10 of FIG. 1 by providing wireless coverage not only within a building, but also among several buildings or *even within a city*.

Id., 4:53-57 (emphasis added).

79. A POSA would have therefore understood based on these teachings in Palmer that a wide area wireless communication protocol is used for the wireless transmissions between central antenna 32 and the multiple remote antennas 34.

80. I also note that the ’794 patent does not include any detail concerning “wide area wireless communication protocol,” and therefore Palmer includes at least the same level of disclosure of wide area network as the ’794 patent. The ’794 patent uses this term thrice—in claims 1 and 6 and broadly in the abstract. Beyond these

three instances, the '794 patent does not even mention the term “wide” or even “WAN” (*i.e.*, wide area network).

81. A POSA would have understood those industry standard protocols described in Palmer to include wireless wide area communication protocols such as cellular protocols. Cellular and other long-distance radio frequency protocols were already well known in the art by the time of Palmer, and were a popular solution to transmit information, and may be preferable for transmission over longer distances (*e.g.*, multiple miles) compared to a wireless LAN protocol.

16.2 BASIC CONCEPTS OF CELLULAR RADIO

...

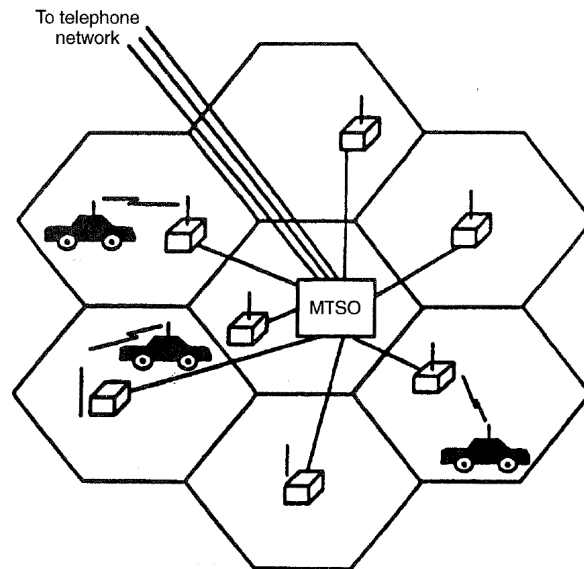


Figure 16.1 Conceptual layout of a cellular radio system.

The area to be served by a cellular geographic serving area (CGSA) is divided into small geographic cells, which ideally are hexagonal. Cells are initially laid out with centers spaced about

4-8 m (6.4-12.8 km) apart. The basic system components are the cell sites, the MTSO, and mobile units. These mobile units may be hand-held or vehicle-mounted terminals.

Ex. 1015 at 479 (emphasis added).

16.10 WIRELESS LANs

Wireless LANs (WLANs), much as their wired counterparts, operate in excess of 1Mbps. Signal coverage runs from *50 ft to less than 1000 ft.*

...

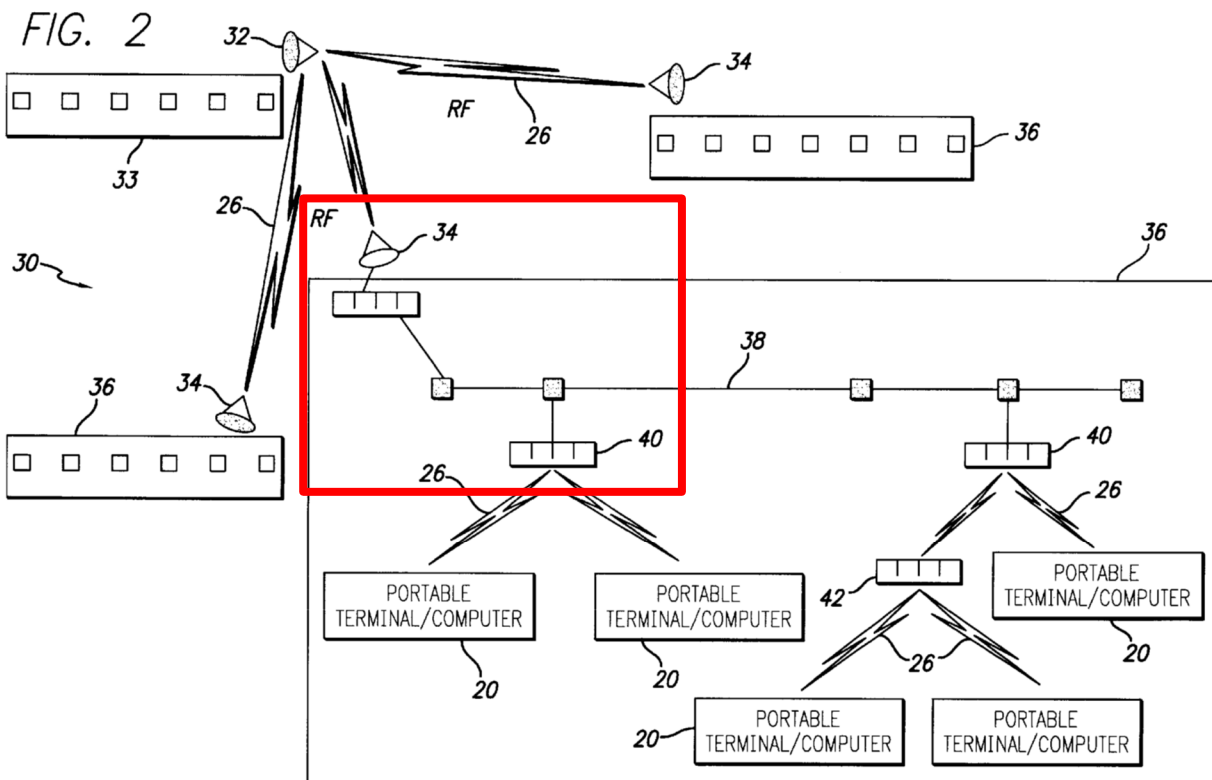
Id. at 505 (emphasis added).

82. To the extent such communications in Palmer are deemed not to involve a wide area wireless communication protocol, a POSA would have nonetheless found it obvious to utilize such a protocol, especially given Palmer explicitly contemplates its communication system spanning an entire “city” (Ex. 1004, 4:53-57) which would have prompted use of wide area protocols. A POSA would have recognized that wide area wireless communication protocols are appropriate in circumstances requiring wireless data transmissions over a longer distance, compared to smaller distances where a local area protocol may suffice. A POSA would have appreciated that using a wide area wireless communication protocol would have been a simple matter of design choice that incorporates known

techniques with expected outcomes, and would have been appropriate for transmission between buildings or across a city, as described in Palmer.

3. [1.b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,

83. Palmer describes a second wireless transceiver (access point 40) coupled to the first wireless transceiver (remote antenna 34), through wired network 38.



Ex. 1004, Fig. 2 (annotated).

would *provide a bridge* for the wireless communication devices 20 to the wired network 38.

Id., 4:65-5:3 (emphasis added).

In FIG. 1, as the *mobile worker, with the wireless communication device 20, moves throughout the work area*, it is necessary to maintain the wireless connection between the wireless communication device 20 and the wired network 34 and ultimately to the central host processor 12.

Id., 5:10-14 (emphasis added); *see also* 4:38-40 (describing portable terminals 20 as “wireless communication device[s]”).

85. Palmer’s access point 40 communicates with the portable terminals 20 according to a local area wireless communication protocol, since the terminals 20 connect wirelessly to a wireless *local area* network.

One example of a radio communication network is a wireless *local area* network (*WLAN*). A WLAN comprises a plurality of wireless communication devices that communicate using radio frequency (RF) signals.

Id., 1:23-27 (emphasis added).

For example, in a *WLAN*, a *mobile worker may move throughout the work area* carrying a wireless communication device such as a portable terminal or computer.

Id., 1:53-55 (emphasis added).

In FIG. 1, as the *mobile worker, with the wireless communication device 20, moves throughout the work area*, it is necessary to maintain the wireless connection between the wireless communication device 20 and the wired network 34 and ultimately to the central host processor 12.

Id., 5:10-14 (emphasis added).

The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38.

Id., 5:1-3; *see also* 2:52-55 (“the use of *industry standard network protocols* by the wireless media” (emphasis added)).

86. A POSA would have therefore understood based on these teachings in Palmer that a local area wireless communication protocol is used for the wireless transmissions between the access point 40 and the multiple portable terminals 20 (which are WLAN transmissions).

87. I also note that the ’794 patent does not use the word “protocol” beyond generically in the abstract and the claims, nor does the ’794 patent even describe or identify a single example of a “local area wireless communication protocol.”

88. In any event, using “protocols” in wireless communications was well known in the field and would have formed, at least, an obvious part of the system, especially in light of Palmer’s explicit mention of using “industry standard network protocols.” For example, a POSA would have readily understood that those industry

standard network protocols would include well-known local area network protocols such as IEEE 802.11 (WiFi). A POSA would have appreciated that using a local area wireless communication protocol would have been a simple matter of design choice that incorporates known techniques with expected outcomes, and would have been appropriate for transmission within a building, as described in Palmer.

4. **[1.c] wherein the first wireless transceiver receives from the base station a first downlink signal intended for the first mobile station and provides the first downlink signal to the second wireless transceiver and wherein the second wireless transceiver receives the first downlink signal and re-transmits the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol, and**

89. Palmer describes the first wireless transceiver (remote antenna 34):

- (1) receiving from the base station (central antenna 32), a first downlink signal (such as a voice or data signal sent from the central antenna 32 to the remote antenna 34) intended for the first portable terminal 20, and
- (2) providing the first downlink signal to the access point 40.

For example, Palmer describes that the remote antenna 34 is used to link the wired network 38 of the building 36 to the administration building 33 and its associated network, and also describes two-way communications (and therefore including downlink signals) across this link.

The wired network 38 is then *linked to the administration building 33* and its associated network *through the remote antenna 34* to the central antenna 32 and finally through its link to a wired network (not shown) within the administration building 33.

Ex. 1004, 5:4-9 (emphasis added).

Under some current implementations, delays in rate shifting and/or roaming within a cell or to a new cell may result in the loss of a network connection, such as a *TCP/IP network connection, between the wireless communication device and the central host processing unit.*

Id., 2:26-30 (emphasis added).

For the examples discussed above, the wireless communications can consist of voice or data information, as known in the art.

Id., 5:19-22.

The WLAN may also include a central host processing unit that sends information to and receives information from any one of the plurality of remotely disposed communication devices.

Id., 1:32-36; *see also* 6:11-12, 6:30-33, and 6:45-47 (referring to both transmission and reception).

90. Palmer's remote antenna 34 provides the first downlink signal to the access point 40, as the access point 40 is a bridge that interconnects the portable terminals 20 to the administration building 33 via the access point 40, remote

antenna 34, and the wired network 38 interconnecting the access point 40 and the remote antenna 34.

The access point 40 would *provide a bridge for the wireless communication devices 20 to the wired network 38*. There may also be wireless access points 42 that consist of transmitter/receiver repeaters, as in FIG. 1. The *wired network 38 is then linked to the administration building 33* and its associated network *through the remote antenna 34* to the central antenna 32 and finally through its link to a wired network (not shown) within the administration building 33.

Id., 5:1-9 (emphasis added).

The radio frequency (RF) wireless links are represented symbolically by RF links 26. The access point 16 *acts as a bridge* from the wireless communication arena defined by its cell 18 to the wired network 14.

Id., 4:40-44 (emphasis added).

91. A POSA would have understood that a “bridge”, including in Palmer’s context, connects two or more network segments and forwards packets between them.

Bridge 1. In classic terms, a bridge is a data communications device that *connects two or more network segments and forwards packets between them. ...*

Classic bridges are relatively dumb devices, which are fast and inexpensive; they simply *accept data packets*, perhaps buffering them during periods of network congestion, *and forward them*.

Ex. 1011 at 126-27 (italicized emphasis added).¹

92. Palmer's access point 40 receives the first downlink signal and re-transmits the first downlink signal to the first mobile station as a second downlink signal, again as access point 40 operates as a "bridge" and therefore "forwards packets" from the remote antenna 34 to the portable terminal 20 by accepting data packets and forwarding them, consistent with the above-presented dictionary definition for "bridge". Additionally, such re-transmission is performed according to the local area wireless communication protocol, since Palmer refers to "the use of industry standard network protocols by the wireless media." Ex. 1004, 2:52-55.

5. **[1.d] wherein the second transceiver monitors first signal characteristics of the second downlink signal of the first mobile station and monitors second signal characteristics of the second mobile station, and based on the first signal characteristics and the second characteristics, routes information to the first mobile station and the second mobile station, respectively.**

93. Palmer describes the access point 40 monitoring first signal characteristics (*e.g.*, signal-to-noise ratio (SNR), received signal strength indicator

¹ Although I have referenced the most notable excerpts from the definition, the entire definition is relevant to a POSA's understanding on the meaning of "bridge".

(RSSI), and/or bit energy-to-noise density (E_b/N_0)) of the second downlink signal of the first portable terminal 20 (wireless signal from the access point 40 to a portable terminal 20).

... a predictive method for determining when a communication device should rate shift or roam in a wireless environment is provided. FIG. 3 illustrates the basic steps, in flowchart form, of the predictive method. The method would utilize various measurements to evaluate connection quality, the measurement data obtained at step 50. These measurements may include but are not limited to: 1) ***signal-to-noise ratio (SNR)***, 2) bit error rate (BER), 3) number of transmission retries (NTR), 4) ***received signal strength indicator (RSSI)***, 5) bit energy-to-noise density (E_b/N_0), 6) global position information (GPS), and 7) cell congestion information (also known as load factor).

Ex. 1004, 5:37-49 (emphasis added).

94. Palmer describes the monitoring including the downlink signals from the access point 40 to a portable terminal 20, since Palmer refers to measurements of signals in both directions, that is, for both downlink and uplink signals.

With ***each transmission or reception***, the measurements are compared to the rate shift and roaming criteria and the appropriate action is taken.

Id., 6:45-47 (emphasis added).

95. Palmer's access point 40 performs such monitoring, as Palmer describes the monitoring being performed "by the network," and the access point 40 is part of the network and the specific component directly interacting wirelessly with the portable terminals 20 and therefore collecting such measurements.

If the RF connection begins to degrade, a *determination* should be made as to whether communication performance would improve by transmitting at a lower information rate or roaming to another cell offering a higher quality RF connection. This determination could be made by the wireless communication device 20 having a processor and a memory, with the processor executing a stored program for carrying out the method steps discussed below. Alternatively, the *method steps may be performed centrally*, for example, *by the network* or a central host processor.

Id., 5:26-36 (emphasis added).

96. Moreover, even if Palmer's access point 40 is deemed to not to be the component performing the monitoring, it would have nonetheless been obvious to a POSA to select the access point 40 to perform the monitoring. The access point 40 is the component that directly communicates with the portable terminals 20, and therefore the access point 40 would have been the most logical component to handle the monitoring of the signal connection between itself and the portable terminal. A POSA would have appreciated having Palmer's access point 40 perform the

monitoring functions described in Palmer, would have been a simple matter of design choice among a finite and limited number of possible components to perform these functions, incorporates known techniques with expected outcomes, and would have been an appropriate component for performing the monitoring functions described in Palmer.

97. Palmer's access point 40 also monitors second signal characteristics (*e.g.*, SNR, RSSI, and/or E_b/N_0) of the second portable terminal 20, since it monitors these signal characteristics for all portable terminals 20.

With *each transmission or reception*, the measurements are compared to the rate shift and roaming criteria and the appropriate action is taken.

Id., 6:45-47 (emphasis added); *see also* 5:37-49.

98. Palmer's access point 40 routes information to the first mobile station and the second mobile station, respectively, based on the monitored first signal characteristics and the second characteristics, as the access point 40 determines whether roaming by a portable terminal 20 should take place and routes data packets accordingly. For instance, Palmer describes that the access point 40 determines when the wireless RF connection (which include both transmissions and receptions) between itself and the portable terminal 20 becomes unstable based on the

measurements, and determines whether or not to reduce the data rate or to hand off the wireless connection to another access point.

For the examples discussed above, the wireless communications can consist of voice or data information, as known in the art. The wireless connection should be transparent to the mobile worker as the wireless communication device 20 roams from cell to cell or rate shifts. There should be no loss of connection or service degradation and it should appear as if there is a wired connection. *If the RF connection begins to degrade, a determination* should be made as to whether communication performance would *improve by transmitting at a lower information rate or roaming to another cell* offering a higher quality RF connection. This determination could be made by the wireless communication device 20 having a processor and a memory, with the processor executing a stored program for carrying out the method steps discussed below. Alternatively, the method steps may be *performed centrally*, for example, *by the network* or a central host processor.

Id., 5:20-36 (emphasis added).

Once a mobile station has been handed off to a new access point based on the signal monitoring, the original access point no longer routes downlink signals to the mobile station to which it is no longer connected.

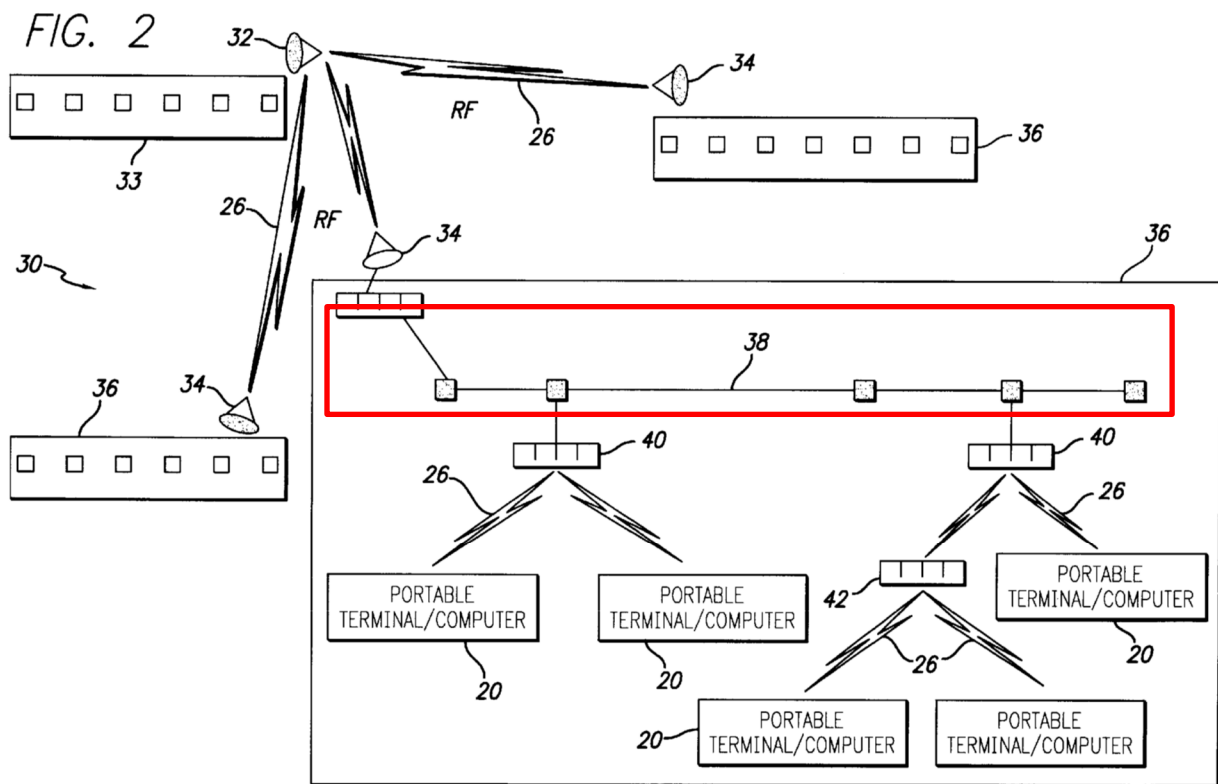
C. Claim 2

99. Claim 2 recites:

The wireless communication device of claim 1, wherein the second wireless transceiver is coupled to the first wireless transceiver by a wireline connection.

100. Claim 2 is anticipated by and/or obvious over Palmer.

101. Palmer describes the second wireless transceiver (access point 40) coupled to the first wireless transceiver (remote antenna 34) by a wireline connection (wired network 38).



Ex. 1004, Fig. 2 (annotated).

The *access point 40* would provide a bridge for the wireless communication devices 20 to the wired network 38. There may also be wireless access points 42 that consist of

transmitter/receiver repeaters, as in FIG. 1. The *wired network 38 is then linked to the administration building 33* and its associated network *through the remote antenna 34* to the central antenna 32 and finally through its link to a wired network (not shown) within the administration building 33.

Id., 5:1-9 (emphasis added).

The wired network 14 media may, for example, consist of an *Ethernet*, Token Ring, or ATM, and utilize network protocols such as TCP/IP, SPX/IPX, SNA LU6.2, as known in the art.

Id., 4:31-34 (emphasis added).

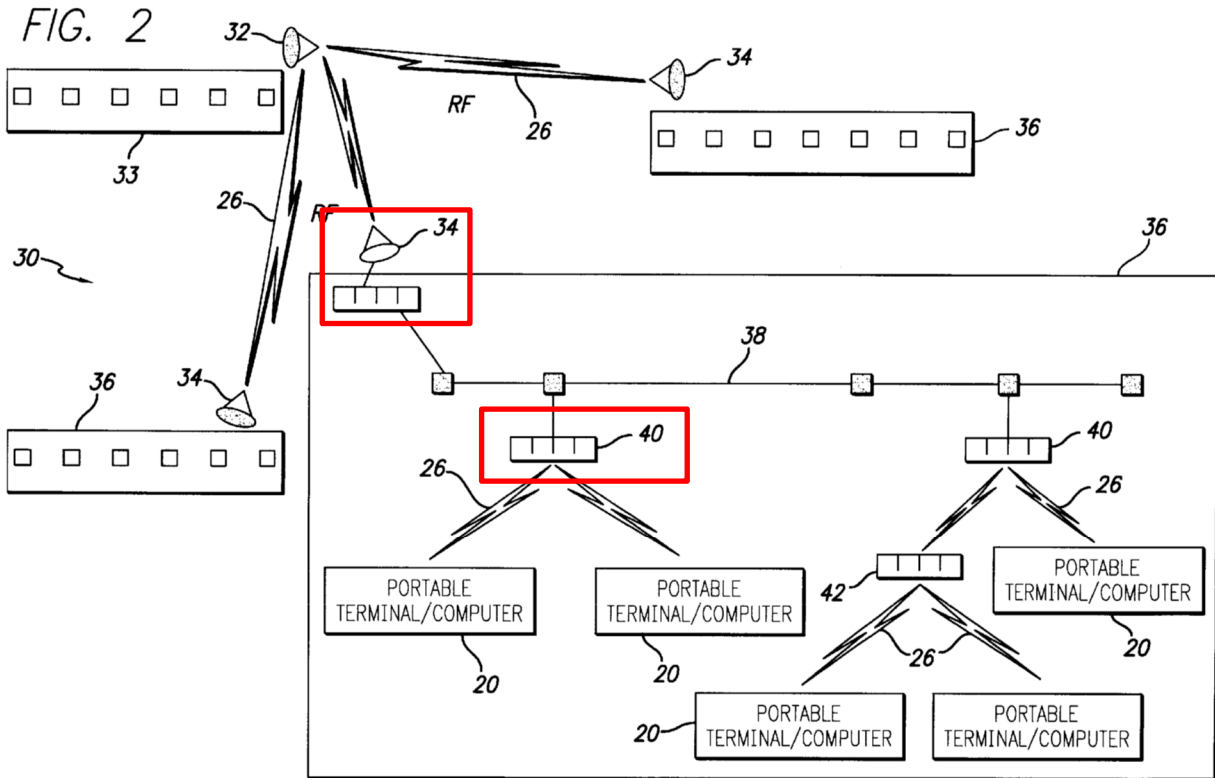
D. Claim 3

102. Claim 3 recites:

The wireless communication device of claim 2, wherein the second wireless transceiver is removably coupled to the first wireless transceiver.

103. Claim 3 is anticipated by and/or obvious over Palmer.

104. Palmer describes that the second wireless transceiver (access point 40) is removably coupled to the first wireless transceiver (remote antenna 34). Palmer's Fig. 2 presents these two components separately and connected by a wired network 38 such as Ethernet. A POSA would have understood, based on these disclosures, that Ethernet cables (such as twisted-pair CAT5, which would have been a prevalent Ethernet cable type in the Palmer timeframe) are detachable.



Ex. 1004, Fig. 2 (annotated)

The wired network 14 media may, for example, consist of an *Ethernet*, Token Ring, or ATM, and utilize network protocols such as TCP/IP, SPX/IPX, SNA LU6.2, as known in the art.

Id., 4:31-34 (describing “Ethernet” as an example of a wired network); *see also* 5:1-9.

105. At the very least, a POSA would have found it obvious that separate components wired together by Ethernet could be removably coupled (as opposed to permanently attached) as a design choice. For instance, including removable wiring between the components would have made repairs or replacement of defective components easier. A POSA would have appreciated that providing a removable

coupling between components would have been a simple matter of design choice that incorporates known techniques with expected outcomes and predictable results and benefits.

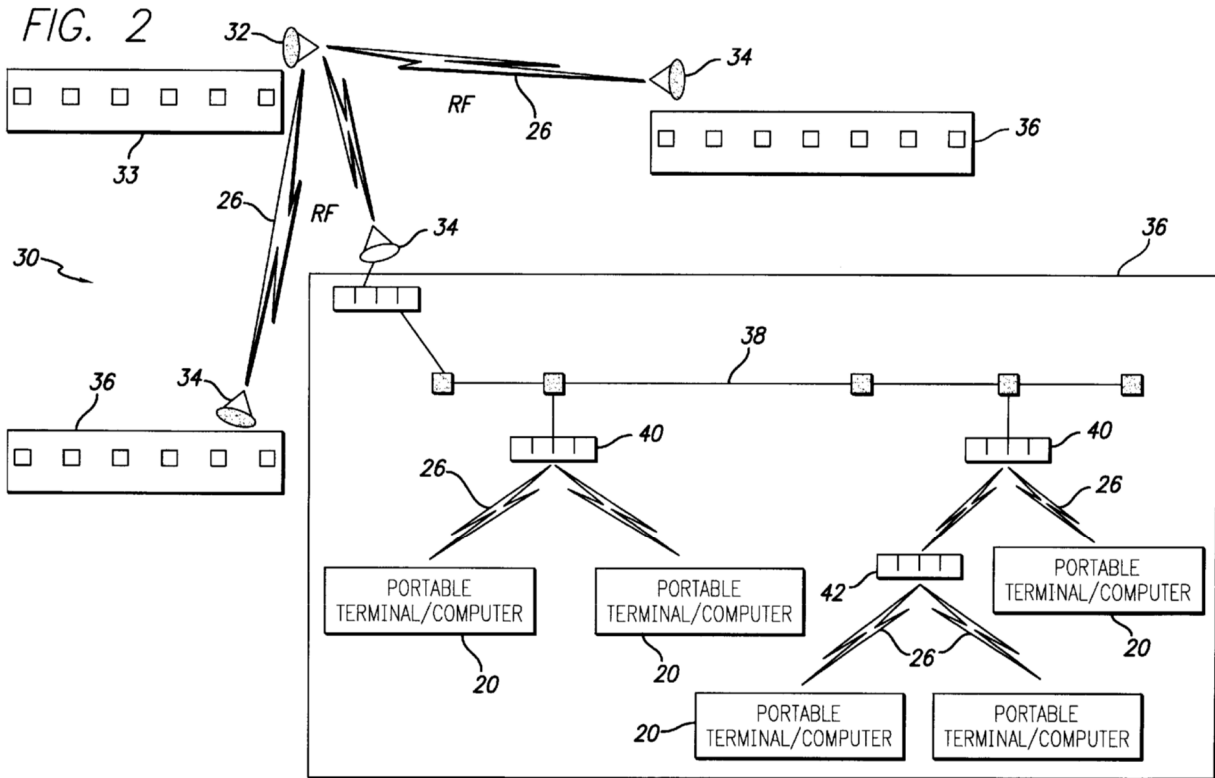
E. Claim 4

106. Claim 4 recites:

The wireless communication device of claim 1, wherein the first wireless transceiver and second wireless transceiver are disposed in a fixed site subscriber station.

107. Claim 4 is anticipated by and/or obvious over Palmer.

108. Palmer describes the first wireless transceiver and second wireless transceiver disposed in a fixed site subscriber station such as a building 36.



Ex. 1004, Fig. 2.

The remote antennas 34 may be located on various *buildings 36* or other convenient remote locations. The *building 36* may include a wired network 38 with a plurality of access points 40. The access point 40, as in FIG. 1, would consist of a transmitter/receiver defining a cell 18 that provides RF coverage for the wireless communication devices 20. The access point 40 would provide a bridge for the wireless communication devices 20 to the wired network 38. There may also be wireless access points 42 that consist of transmitter/receiver repeaters, as in FIG. 1. The wired network 38 is then linked to the administration building 33 and its associated network through the remote antenna 34 to the central antenna 32 and finally through its link

to a wired network (not shown) within the administration building 33.

Id., 4:62-5:9 (emphasis added); *see also* 4:53-57.

109. To the extent Palmer is not deemed to disclose this claim, it would have nonetheless been obvious to a POSA to dispose the first wireless transceiver and second wireless transceiver in a fixed site subscriber station. Providing a WLAN access point at a fixed location allows for a static and consistent coverage area for the WLAN access served by the transponder, reducing the possibility of uncertain signal coverage at particular points within the coverage area. A POSA would have appreciated that disposing the first and second wireless transceivers in a fixed site subscriber station would have been a simple matter of design choice that incorporates known techniques with expected outcomes, especially given that there are finite locations for providing such a device, and would have been appropriate for transmission between buildings or across a city, as described in Palmer.

F. Claim 6

110. Claim 6 is anticipated by and/or obvious over Palmer.

1. [6.preamble] A method for communicating with a wireless communication device, comprising:

111. Palmer describes a method for communicating with a wireless communication device (*e.g.*, portable terminals 20). *See* [1.preamble] section above.

2. **[6.a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and**

112. *See* [1.a] section above.

3. **[6.b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,**

113. *See* [1.b] section above.

4. **[6.c] the method comprising: receiving, using the first wireless transceiver from the base station, a first downlink signal intended for the first mobile station; providing, using the first wireless transceiver, the first downlink signal to the second wireless transceiver; receiving, using the second wireless transceiver, the first downlink signal and re-transmitting the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol;**

114. *See* [1.c] section above.

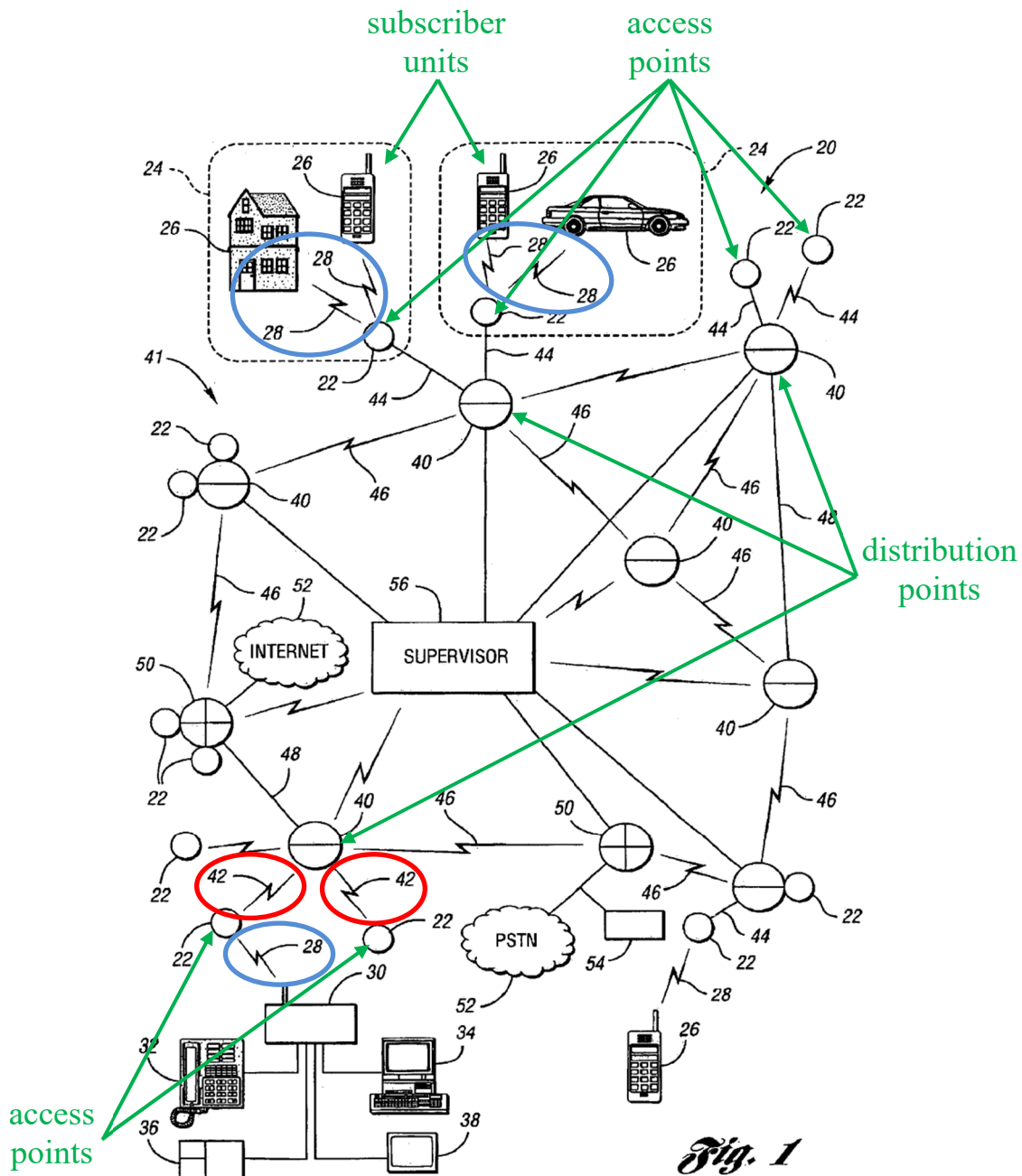
5. [6.d] monitoring, using the second transceiver, first signal characteristics of the second downlink signal of the first mobile station; monitoring, using the second transceiver, second signal characteristics of the second mobile station; and based on the first signal characteristics and the second characteristics, routing, using the second transceiver, information to the first mobile station and the second mobile station, respectively.

115. See [1.d] section above.

X. Ground 2: Claims 1-6 Are Obvious Over Hohnstein and Palmer

A. Summary of Hohnstein

116. Hohnstein describes a wireless communication system providing connectivity between a WWAN and a WLAN. Hohnstein's system includes distribution points 40 that communicate wirelessly (*i.e.*, over a WWAN) with access points 22 (which in turn may also themselves operate as other distribution points 40). Ex. 1005, 5:43-65. Each access point 22 defines a wireless coverage area 24 and provides network connectivity (*i.e.*, over a WLAN) to subscriber units 26 such as mobile telephones. *Id.*, 4:7-28. Fig. 1 of Hohnstein is reproduced below, with WWAN links circled in red and WLAN links circled in blue.



Id., Fig. 1 (annotated).

117. Hohnstein describes that access point 22 may be embodied as an antenna module 502 (illustrated in Figs. 9-13) for mounting, *e.g.*, on a light pole, and includes a backhaul system 550 and an access system 564.

Referring now to FIG. 9, an elevation view drawing of a pole mounted antenna system powered according to an embodiment of the present invention is shown. An antenna system, shown generally by 500, includes ***antenna module 502***, having at least one wireless telecommunication antenna. ***Antenna module 502 is mounted on vertical pole 504***, the top portion of which is shown in FIG. 9.

Id., 13:40-46 (emphasis added).

After mounting antenna module 502, power adapter 512 is inserted between electric eye 510 and the remainder of the light circuit in light system 508 by first removing electric eye 510 from housing 513, installing power adapter 512 in the opening for electric eye 510, and installing electric eye 510 in power adapter 512. Cabling 514 is connected between power adapter 512 and antenna module 502.

Id., 15:1-18.

Antenna module 502 also includes an ***access system, shown generally by 564***. Access system 564 includes access data terminal 566 connected to junction box 562 through access cable 568. Directional access antenna 570 is attached to access data terminal 566 and may form a directional coverage area 24 for access point 22.

Id., 15:29-33.

An antenna system, shown generally by 590, implements a ***combined access point 22 and distribution point 40.***

Id., 16:35-37 (emphasis added).

118. The access point's backhaul system 550 includes a backhaul antenna 552 attached to a backhaul data terminal 554, for communicating wirelessly with other distribution points 40 (*i.e.*, over a WWAN).

During operation, ***backhaul data terminal 554 formats baseband digital packetized information for transmission by backhaul antenna 552 and converts information received by backhaul antenna 552 into baseband digital information.***

Likewise, access data terminal 566 formats baseband digital packetized information for transmission by access antenna 570, 574 and converts information received by access antenna 570, 574 into baseband digital information. The frequencies and formats for transmission are based on regulatory requirements, frequency availability, data rates provided, noise, and other disturbances. Typical backhaul frequencies include 6, 11, 18 and 23 GHz licensed bands for DS3/OCS transmission and 5.8 and 24 GHz for unlicensed ATM-25 transmission. Typical frequencies for transmission by access antennas 570, 574 include 5.8 GHz and 700 MHz.

Id., 16:7-22 (emphasis added).

Distribution point 40 also includes back end communication interfaces 106 for connecting distribution point 40 with

additional distribution points 40, with supervisor 56, and, if distribution point 40 is a gateway 50, with telecommunication systems, private network systems, video distribution systems, the Internet, or the like. This may be typically referred to as ***backhaul communication***.

Id., 8:49-55 (emphasis added)

A wireless access point includes at least one access antenna for communicating with wireless subscriber units. An access data terminal formats information packets for transmission by and after reception from each access antenna. At least one ***backhaul antenna interconnects the access point with the remainder of a wireless communication system***. A backhaul data terminal formats information packets for transmission by and after reception from each backhaul antenna. Access data terminals and backhaul data terminals within the access point exchange information through baseband digital packets.

Id., Abstract (emphasis added).

119. The access point's access system 564 includes a directional access antenna 570 and an omnidirectional antenna 574, both attached to an access data terminal 566, to form a coverage area 24 (as illustrated in Fig. 1) for communicating wirelessly with subscriber units 26 (*i.e.*, over a WLAN).

Antenna module 502 also includes an access system, shown generally by 564. Access system 564 includes access data terminal 566 connected to junction box 562 through access cable

568. Directional access antenna 570 is attached to access data terminal 566 and may form a directional coverage area 24 for access point 22. Access data terminal 568 attaches to base plate 558 through access data terminal mounting support 572 which may be used to horizontally and elevationally aim directional access antenna 570. Preferably, antenna module 502 includes omnidirectional antenna 574 to form a substantially uniform, omnidirectional coverage area 24 around access point 22.

...

Omnidirectional antenna 574 is connected to access data terminal 566 through cabling not shown.

Id., 15:29-45.

120. The backhaul system 550 and access system 564 are coupled to each other to interconnect the subscriber units 26 with the communication system.

A wireless access point includes at least one access antenna for communicating with wireless subscriber units. An access data terminal formats information packets for transmission by and after reception from each access antenna. At least one backhaul antenna interconnects the access point with the remainder of a wireless communication system. A backhaul data terminal formats information packets for transmission by and after reception from each backhaul antenna. ***Access data terminals and backhaul data terminals within the access point exchange information through baseband digital packets.***

Id., Abstract (emphasis added).

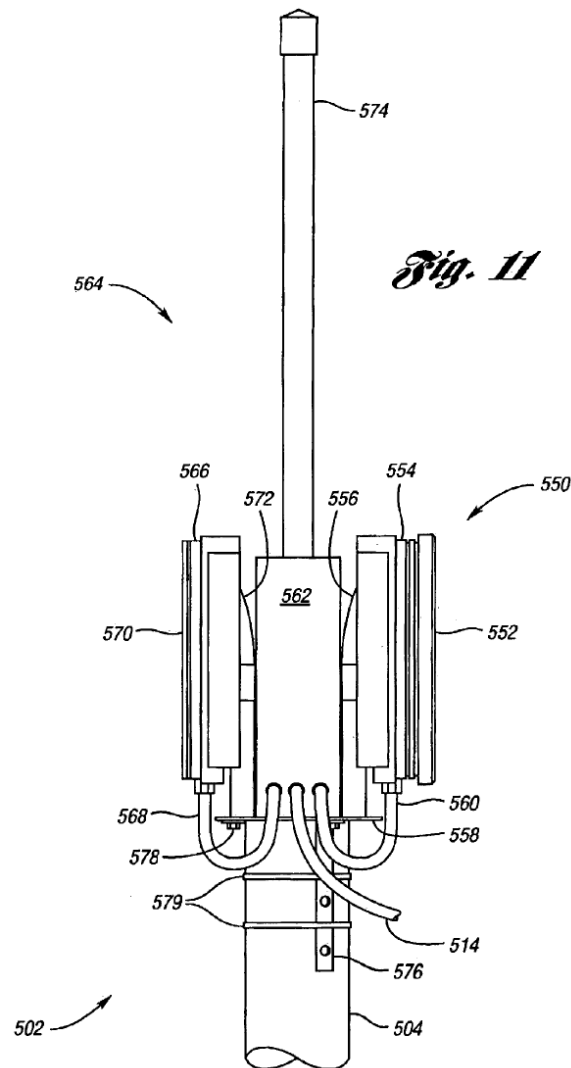
During operation, backhaul data terminal 554 *formats baseband digital packetized information* for transmission by backhaul antenna 552 and *converts information received by backhaul antenna 552 into baseband digital information*. Likewise, access data terminal 566 *formats baseband digital packetized information* for transmission by access antenna 570, 574 and *converts information received by access antenna 570, 574 into baseband digital information*. The frequencies and formats for transmission are based on regulatory requirements, frequency availability, data rates provided, noise, and other disturbances. Typical backhaul frequencies include 6, 11, 18 and 23 GHz licensed bands for DS3/OCS transmission and 5.8 and 24 GHz for unlicensed ATM-25 transmission. Typical frequencies for transmission by access antennas 570, 574 include 5.8 GHz and 700 MHz.

Id., 16:8-32 (emphasis added).

A wireless communication system interconnecting a plurality of wireless subscriber units is also provided. The wireless communication system provides a plurality of access points. Each access point includes at least one access antenna for communicating with wireless subscriber units. An access data terminal formats information packets for transmission by and after reception from each access antenna. Each access point also includes at least one backhaul antenna interconnecting the access

point with the remainder of the wireless communication system. A backhaul data terminal formats information packets for transmission by and after reception from each backhaul antenna.

Id., 2:66-3:10.



Id., Fig. 11.

121. Hohnstein also describes roaming capabilities for the subscriber unit, such that the subscriber unit may move from access point to another.

If subscriber unit 26 is mobile or portable, as indicated by U1 in FIG. 8, ***subscriber unit 26 may move out of coverage area 24 for one access point 22 and into coverage area 24 for a new access point 22.*** The address for subscriber unit 26 is then moved from FEC 402 of original access point 22 into FEC 402 for new access point 22. In an embodiment, when original access point 22 is no longer in communication with subscriber unit 26, original access point 22 broadcasts a message to distribution points 40 and supervisor 56. If original access point 22 subsequently receives any packets for subscriber unit 26, original access point forwards these packets back into distribution point network 41. If the packets are sequentially indicated, such as IP packets, correct order will be established by subscriber unit 26 when packets are received.

Id., 13:25-39 (emphasis added).

In an embodiment of the present invention, a quality error bit rate is established for each subscriber unit 26. This quality error bit rate may be based on the location of subscriber unit 26 within communication system 20, the class of service assigned to subscriber unit 26, the grade of service assigned to subscriber unit 26, the data or transmission rate of service assigned to subscriber unit 26, or any other suitable parameter. The quality error bit rate may be modified while subscriber unit 26 is within communication system 20 to reflect changing conditions such as noise, demand, connectivity, or any other suitable parameter. Applications providing services to subscriber unit 26 may adjust

these services based on the quality error bit rate. For example, an application providing streaming audio and video may reduce the frame update rate as noise increases, guaranteeing successful transmission at a lower information rate. The information rate may be further reduced to provide only still pictures and audio if conditions continue to worsen. The information rate may also be automatically changed if subscriber unit 26 *moves between coverage areas 24* with differing transmission capabilities or loads.

Id., 5:1-21 (emphasis added).

In an embodiment of the present invention, each subscriber unit 26 is autonomously registered with communication system 20 when subscriber unit 26 *first enters coverage area 24* within communication system 20. Each subscriber unit 26 maintains registration as subscriber unit 26 moves from one coverage area 24 into another coverage area 24 within communication system 20 and is autonomously deregistered when subscriber unit 26 leaves communication system 20. To accomplish automatic registration and deregistration of subscriber units 26, each access point 22 periodically reports the status of subscriber units 26 within any controlled coverage area 24 to supervisor 56 performing registration and authentication. Each access point 22 communicates with subscriber units 26 to determine status. When a subscriber unit 26 voluntarily enters or *leaves coverage area 24*, such as by powering up or down, subscriber unit 26 transmits a particular signal to access point 22. Information is

also received from subscriber unit 26 in response to periodic queries from network 20. Access point 22 may determine the absence of subscriber unit 26 from coverage area 24 if no communication is received after a particular time interval. Algorithms for registering and deregistering subscriber units 26 may be based on various factors including quality of service, traffic, location, service type, network topology, and the like.

Id., 8:7-31 (emphasis added).

B. Claim 1

122. Claim 1 is obvious over Hohnstein and Palmer.

123. As I explain below, Hohnstein describes a first wireless transceiver (backhaul system 550) communicating with a base station (another distribution point 40) according to a wide area wireless communication protocol, and a second wireless transceiver (access system 564) coupled to the backhaul system 550 and communicating wirelessly with mobile stations (subscriber units 26). Further, the access system 564 receives a first downlink signal from the backhaul system 550 and re-transmits it to a subscriber unit 26 (such as a mobile telephone) as a second downlink signal according to a local area wireless communication protocol.

124. As I also explain below, Hohnstein teaches monitoring signal characteristics of downlink signals of subscriber units, as a quality error bit rate, and also describes the access point 22 routing information to first and second subscriber

units 26 based on whether the respective subscriber unit is connected to the access point 22 or has been handed off to another access point.

125. To the extent Hohnstein's monitoring is deemed to differ from the claimed monitoring limitations, these claimed monitoring limitations are described and/or suggested in Palmer. Like Hohnstein, Palmer describes a wireless communication system providing connectivity between a WWAN and a WLAN. *See* Ground 1. Palmer describes a first wireless transceiver (*e.g.*, remote antenna 34) that communicates with a base station (central antenna 32), the base station also communicating with a plurality of other wireless communication devices (*e.g.*, other remote antennas 34 in other remote buildings 36). *See* Ground 1, [1.a]. Palmer also describes a second wireless transceiver (access point 40) that communicates with multiple mobile stations (portable terminals 20), and receives a first downlink signal from the central antenna 32 and re-transmits the first downlink signal to a portable terminal 20) as a second downlink signal according to a local area wireless communication protocol. *See* Ground 1, [1.b]-[1.c].

126. Palmer further describes the access point 40 monitoring first signal characteristics of the second downlink signal of a first portable terminal 20 and monitoring second signal characteristics of a second portable terminal 20. Based on the first signal characteristics and the second characteristics, Palmer's system routes

information to the first and second portable terminals, respectively. *See* Ground 1, limitation [1.d], above.

127. A POSA would have had reason to have Hohnstein's access system 564 monitor first signal characteristics of the second downlink signal of a first subscriber unit 26 and monitor second signal characteristics of a second subscriber unit 26, and based on the first signal characteristics and the second characteristics, route information to the first and second subscriber units 26, respectively, as taught by Palmer.

128. Hohnstein describes a subscriber unit 26 may be a mobile device such as a mobile telephone. Ex. 1005, 4:24-28, 13:25-26, Fig. 1. Hohnstein and Palmer both disclose providing roaming capabilities to switch a mobile device's wireless network connection from one wireless access point to another, for instance as the mobile device user is moving from one coverage area (cell site) to another. Ex. 1005, 13:25-39, 5:1-21; Ex. 1004, 1:53-2:6, 5:10-19. Hohnstein discloses that its access points 22 oversee the handoff of the mobile device from one access point to another. Ex. 1005, 8:7-31 ("Each subscriber unit 26 maintains registration as subscriber unit 26 moves from one coverage area 24 into another coverage area 24 within communication system 20 ... Access point 22 may determine the absence of subscriber unit 26 from coverage area 24 if no communication is received after a particular time interval."), 13:23-39. Hohnstein further describes that the system

registers and deregisters subscriber units using “[a]lgorithms ... based on various factors including quality of service” (*id.*, 8:25-31, 8:7-15) and that a “quality error bit rate” may be based on “changing conditions such as noise” (*id.*, 5:1-17).

129. Palmer discloses that its access point determines whether or not to execute a roaming handoff by monitoring signal characteristics—such as signal-to-noise ratio, received signal strength indicator, and/or bit energy-to-noise density—of each downlink signal between the access point and the mobile device, and executing a roaming handoff based on comparing these measured signal characteristics with historical data. Ex. 1004, 5:37-49, 6:45-47 (measurements for “each transmission or reception”), 6:8-40.

130. A POSA would have recognized that Palmer’s approach of monitoring downlink signal characteristics would have provided the ability in Hohnstein’s access points to determine when to perform a roaming handoff (*e.g.*, diminished wireless connection based on these continuously-measured signal characteristics), a function that Hohnstein already discloses that the access points are responsible for overseeing, and that such handoff determines how downlink signals are routed to respective mobile devices.

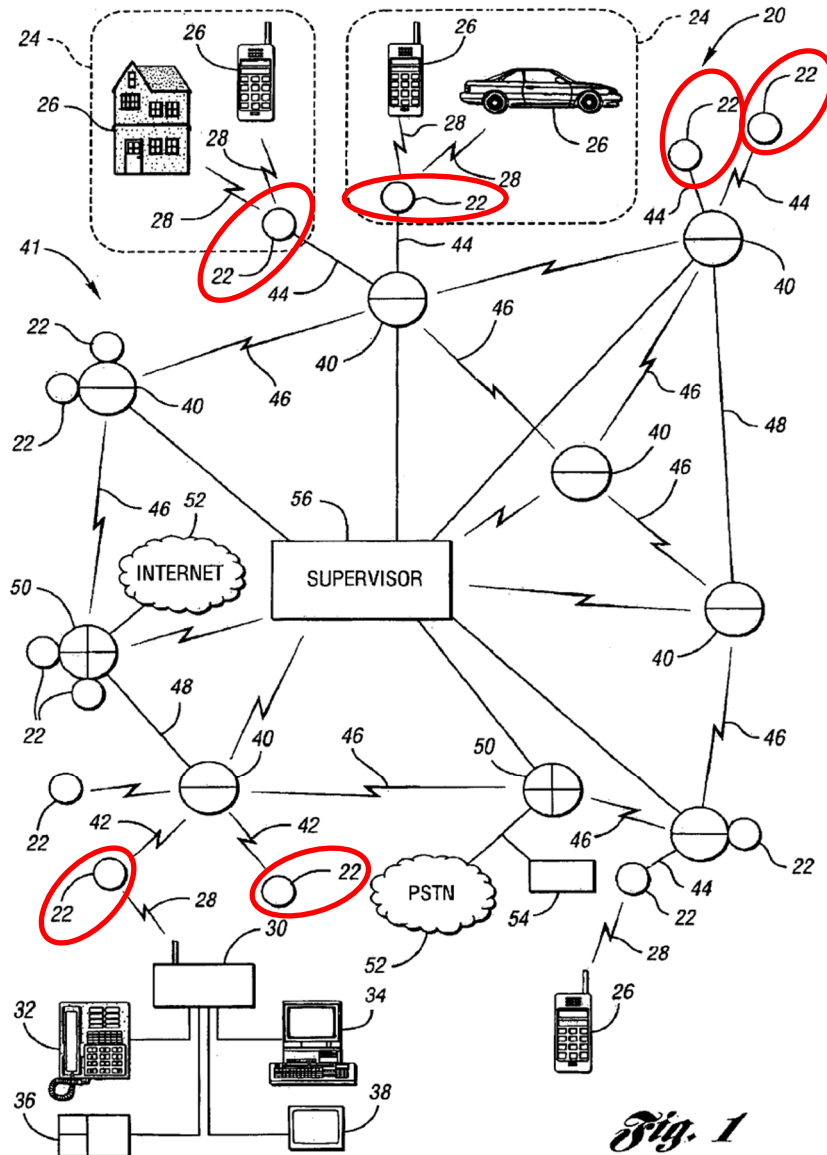
131. A POSA would have appreciated that such monitoring would have allowed Hohnstein’s access points 22 to provide a continuous wireless network connection in a transparent fashion, a benefit appreciated in both Hohnstein and

Palmer. Ex. 1005, 5:19-21 (“automatically chang[ing]” an “information rate” if “subscriber unit 26 moves between coverage areas 24”); Ex. 1004, 1:58-61 (“The wireless device must maintain a wireless connection that is transparently maintained”), 4:22-26 (“The wireless connection should be transparent to the mobile worker as the wireless communication device 20 roams from cell to cell or rate shifts. There should be no loss of connection or service degradation and it should appear as if there is a wired connection.”).

132. A POSA would also have had a reasonable expectation of success in implementing such monitoring and routing based thereon. Hohnstein already discloses its access points 22 overseeing the handoff functions, so incorporating the monitoring functionality would have been a straightforward implementation involving measuring the signals already being transmitted from these access points 22 and integrating such measurements into the existing handoff determinations and existing routing operations.

1. [1.preamble] A wireless communication device, comprising:

133. Hohnstein describes a wireless communication device, such as an access point 22.



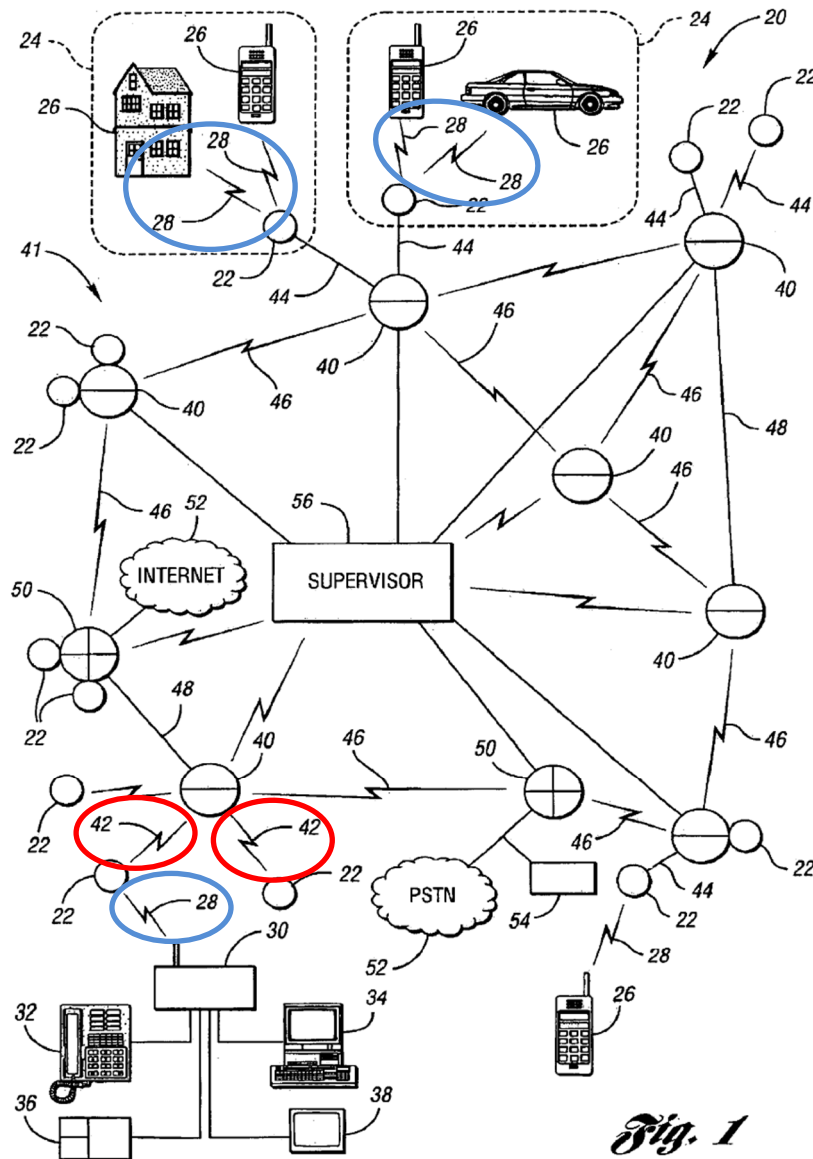
Ex. 1005, Fig. 1 (annotated).

The present invention provides access points for a wireless communication system.

Id., 2:14-15.

134. Hohnstein's access point 22 communicates with a base station 40 via a WAN link (such as wireless radio link 42, annotated below in red, or a wireline link

44) and also communicates wirelessly with subscriber units 26 via a wireless LAN link (such as wireless link 28, annotated below in blue).



Id., Fig. 1 (annotated).

Subscriber unit 26 within coverage area 24 may establish two-way wireless link 28 with access point 22. Subscriber unit 26 may also establish wireline link 29 with access point 22.

Id., 4:17-21.

Wireless link 28 may be any form of electromagnetic signaling not confined to a wire or cable, including energy radiated by antenna as well as visible and invisible light. As will be appreciated by one of ordinary skill in the art, wireless link 28 may be implemented by any access technology, including CDMA, TDMA, FDMA, OFDM, analog, and the like. Modulation techniques that may be used with the present invention include FSK, BPSK, QPSK, m-ary QAM, FM, AM, and the like. Further, the invention does not depend on modulation frequency or on the use of FDD or TDD. In a preferred embodiment, the access technology, frequency, and modulation method for establishing wireless link 28 are based, in part, on local geography, local regulations, noise and distortion sources, other operating wireless systems, cost, or any other suitable parameter. Subscriber unit 26 and access point 22 may establish wireless link 28 using a plurality of combinations of access technology, frequency, and modulation techniques.

Information transmitted on links 28, 29 may represent voice, data, video, streaming audio, streaming video, or the like. Types of information include speech, facsimile, computer data, entertainment and informational audio and video, video game data, telemetry information, security information, and the like. If the information occurs as a continuous stream, subscriber unit 26 breaks the information into packets prior to packet transmission and reassembles the information stream from packets after

packet reception. Any type of information that exists in packets or that may be packetized can be used with the present invention.

Id., 4:29-57.

Each access point 22 communicates with at least one distribution point 40. Distribution point 40 contains both routing and switching functionality. ***Access point 22 may be in contact with one or more radio access distribution points 40 over radio link 42***, may be wired or cabled to distribution point 40 through wireline link 44, or may be packaged with distribution point 40.

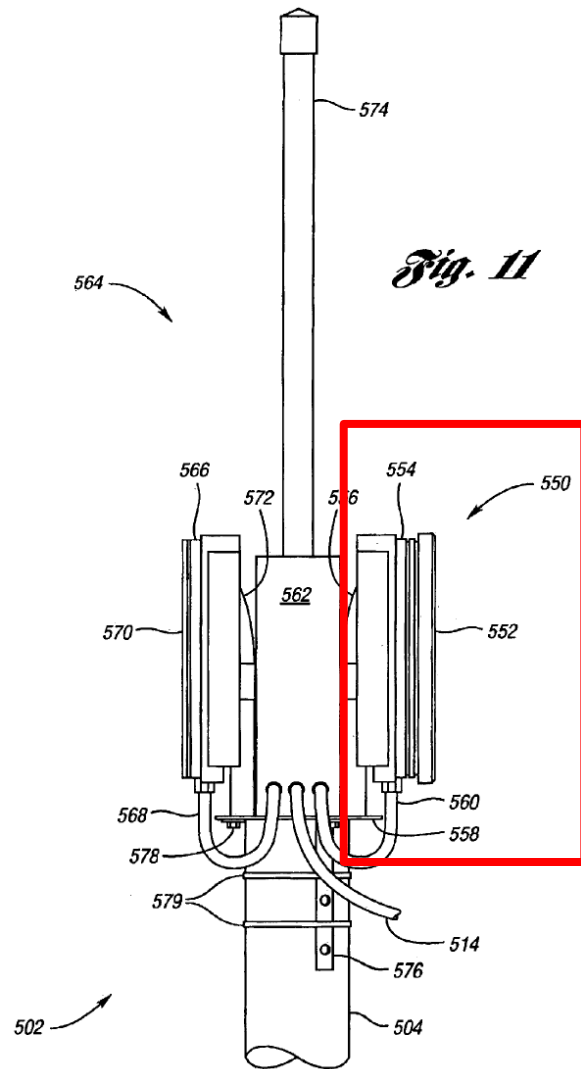
Id., 5:42-47 (emphasis added).

135. A POSA would have understood that Hohnstein teaches the interchangeability between wireless link 42 and wireline link 44 in any example, given that Hohnstein describes both link types as acceptable connectivity options and utilizes a variety of each link type in the exemplary arrangement of Fig. 1. Ex. 1005, 5:45-49.

136. As explained above, Hohnstein's access point 22 may also function as a distribution point 40 and be embodied as an antenna module 502 illustrated in Figs. 9-13, including a backhaul system 550 and an access system 564. *Id.*, 13:40-46, 15:7-1-18, 15:29-33, 16:35-37 (antenna system "implements a combined access point 22 and distribution point 40").

2. **[1.a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and**

137. Hohnstein describes a first wireless transceiver (backhaul system 550, including backhaul antenna 552 and backhaul data terminal 554) operable to communicate with a base station (*e.g.*, another distribution point 40) over a wireless link 42 (also referenced in Hohnstein as “backhaul communication”).



Ex. 1005, Fig. 11 (annotated).

During operation, backhaul data terminal 554 formats baseband digital packetized information for transmission by backhaul antenna 552 and converts information received by backhaul antenna 552 into baseband digital information. Likewise, access data terminal 566 formats baseband digital packetized information for transmission by access antenna 570, 574 and converts information received by access antenna 570, 574 into baseband digital information. The frequencies and formats for

transmission are based on regulatory requirements, frequency availability, data rates provided, noise, and other disturbances. Typical backhaul frequencies include 6, 11, 18 and 23 GHz licensed bands for DS3/OCS transmission and 5.8 and 24 GHz for unlicensed ATM-25 transmission. Typical frequencies for transmission by access antennas 570, 574 include 5.8 GHz and 700 MHz.

Id., 16:7-22.

Distribution point 40 also includes back end communication interfaces 106 for connecting distribution point 40 with additional distribution points 40, with supervisor 56, and, if distribution point 40 is a gateway 50, with telecommunication systems, private network systems, video distribution systems, the Internet, or the like. This may be typically referred to as backhaul communication.

Id., 8:49-55.

138. Hohnstein's backhaul system 550 is a wireless transceiver, as it "receive[s]" information packets for "downstream communication" and "transmit[s]" information packets for "upstream communication." *Id.*, 2:49-59, 6:38-43, 7:7-20, 16:46-49, 3:8-10.

139. Hohnstein's distribution point 40 communicates with the access point 22 and additional access points 22.

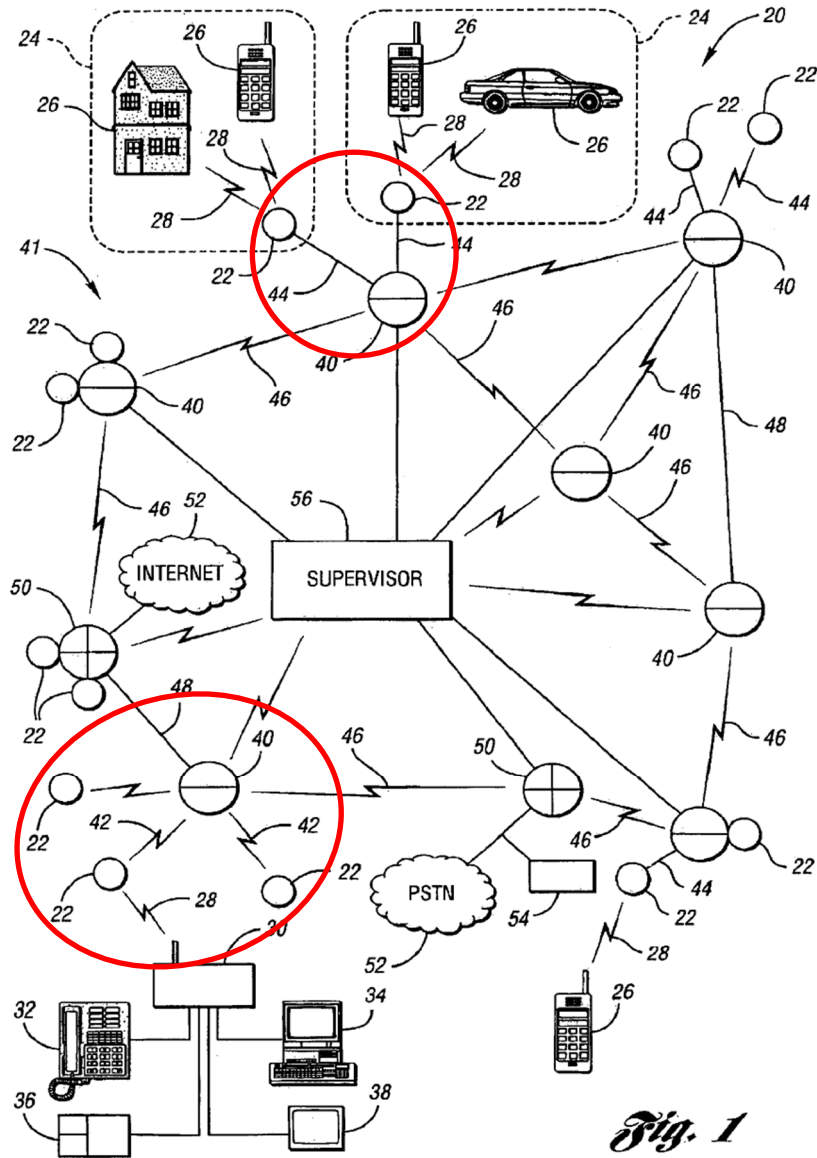


Fig. 1

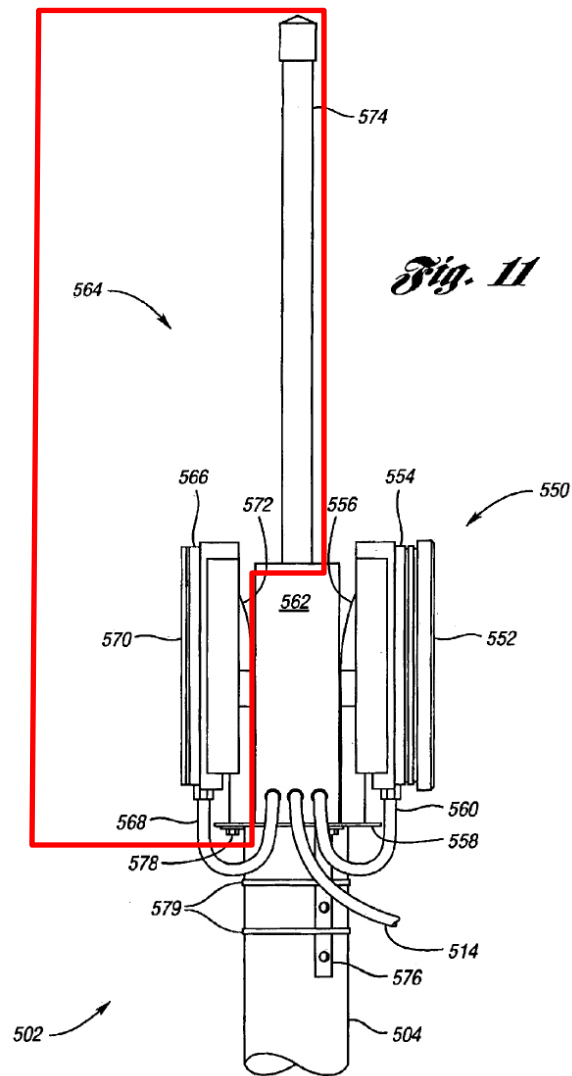
Id., Fig. 1 (annotated).

140. The communications between the distribution point 40 and the multiple access points 22 via wireless link 42 involve a wide area communication protocol, as Hohnstein describes such communications as “backhaul communication” that includes communication over the Internet, which involves wide area networks and communication protocols. *Id.*, 16:15-21, 8:49-55.

141. Moreover, while Hohnstein describes wireless links 28 of access points 22 as having a limited wireless coverage area 24 (illustrated in Fig. 1), Hohnstein offers no parallel limiting description of coverage area for wireless links 42. Therefore, a POSA would have understood that wireless links 42 are wide area links (communicating via a wide area communication protocol), as distinguished from wireless links 28 which are local area links (communicating via a local area communication protocol).

3. **[1.b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,**

142. Hohnstein describes a second wireless transceiver (access system 564, including directional access antenna 570, omnidirectional antenna 574, and access data terminal 566) coupled to the backhaul data terminal 554 (*e.g.*, via access cable 568, junction box 562, and backhaul cable 560).



Ex. 1005, Fig. 11 (annotated).

Backhaul cable 560 connects backhaul data terminal 554 with junction box 562.

Id., 15:24-25.

Access system 564 includes access data terminal 566 connected to junction box 562 through access cable 568.

Id., 15:29-31.

At least one backhaul antenna interconnects the access point with the remainder of a wireless communication system ... Access data terminals and backhaul data terminals within the access point exchange information through baseband digital packets ...

Id., Abstract.

Each access point also includes at least one backhaul antenna interconnecting the access point with the remainder of the wireless communication system.

Id., 3:6-8.

143. Hohnstein's access system 564 is a wireless transceiver, as it "transmit[s]" information packets received from the backhaul system 550 destined for a subscriber unit 26 and also "receives" information packets from a subscriber unit 26 to be transmitted via the backhaul system 550. *Id.*, 2:49-59, 6:38-43, 7:7-20, Abstract, 3:2-6.

144. Hohnstein's access system 564, including its antennas 570 and 574, communicates with first and second mobile stations (*e.g.*, subscriber units 26).

Omnidirectional access antenna 574 may operate at 5.8 GHz providing 57.9 Mbps peak data rate to fixed and portable subscriber units 26 such as terminal network controllers 30. A plurality of directional access antennas 570 may operate at 700 MHz providing 2.4 Mbps data rate per sector to portable subscriber units 26 such as wireless telephones.

Id., 16:27-32.

A wireless access point includes at least one access antenna for communicating with wireless subscriber units. An access data terminal formats information packets for transmission by and after reception from each access antenna ...

Id., Abstract.

Each access point includes at least one access antenna for communicating with wireless subscriber units.

Id., 3:2-3.

4. [1.c] wherein the first wireless transceiver receives from the base station a first downlink signal intended for the first mobile station and provides the first downlink signal to the second wireless transceiver and wherein the second wireless transceiver receives the first downlink signal and re-transmits the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol, and

146. Hohnstein describes the backhaul system 550 receiving, from another distribution point 40, a first downlink signal (*e.g.*, information packet contained in a backhaul signal) intended for the first mobile station (subscriber unit 26).

During operation, backhaul data terminal 554 formats baseband digital packetized information for transmission by backhaul antenna 552 *and converts information received by backhaul antenna 552* into baseband digital information.

...

If an information packet *received by antenna system 590* is *destined for subscriber unit 26*, 30 communicating with access point 22 through antenna 570, 574, the packet is routed to access data terminal 566.

Ex. 1005, 16:8-49 (emphasis added),

For example, backhaul antenna 522 may operate at 23 GHz providing 579 Mbps peak data rate.

Id., 16:25-26.

For downstream communication, information packets are ***received through a backhaul antenna*** and converted to a digital baseband format. The information packets are ***then converted*** from the digital baseband format to a broadband format ***and transmitted*** from an access antenna.

Id., 2:50-54 (emphasis added).

An access data terminal formats information packets for transmission by and after reception from each access antenna. Each access point also includes at least one backhaul antenna interconnecting the access point with the remainder of the wireless communication system. A backhaul data terminal formats information packets for transmission by and after reception from each backhaul antenna.

In an embodiment of the present invention, each access point is in communication with at least one distribution point. Each distribution point receives an information packet and forwards the information packet to a particular access point in communication with the distribution point if the information packet is destined for a subscriber unit in communication with the particular access point.

Id., 3:13-17.

147. Hohnstein describes the backhaul system 550 providing the first downlink signal to the access system 564, as backhaul terminal 554 “converts

information received by backhaul antenna 552 into baseband digital information” (*id.*, 16:10-11) and provided to the access system 564.

During operation, backhaul data terminal 554 formats baseband digital packetized information for transmission by backhaul antenna 552 and ***converts information received by backhaul antenna 552 into baseband digital information.***

Id., 16:8-11 (emphasis added).

A method of wireless communication is also provided. For downstream communication, information packets are received through a backhaul antenna and ***converted to a digital baseband format.*** The information packets are then converted from the digital baseband format to a broadband format and transmitted from an access antenna.

Id., 2:49-54 (emphasis added).

In an embodiment of the present invention, an ***information packet in a digital baseband format is routed to an access antenna*** if a subscriber unit to which the information packet is addressed is in communication with the access antenna. Otherwise, the information packet is routed to a backhaul antenna.

Id., 2:60-64 (emphasis added).

At least one backhaul antenna interconnects the access point with the remainder of a wireless communication system.

Id., 2:26-28.

Each access point also includes at least one backhaul antenna interconnecting the access point with the remainder of the wireless communication system.

Id., 3:6-8,

Access data terminals and backhaul data terminals within the access point exchange information through baseband digital packets.

Id., Abstract.

148. Hohnstein describes that the access system 564 receives the first downlink signal and re-transmits the first downlink signal to the subscriber unit 26 as a second downlink signal, since the access system 564 “convert[s] ... the digital baseband format,” that was received from the backhaul system 550, “to a broadband format and transmit[s] [the information packet] from an access antenna.” *Id.*, 2:50-54, 2:60-64, 3:4-6, 16:12-15 (“access data terminal 566 formats baseband digital packetized information for transmission by access antenna 570, 574”), Abstract.

149. This re-transmission is performed according to the local area wireless communication protocol. *See* [1.b] section above.

5. [1.d] wherein the second transceiver monitors first signal characteristics of the second downlink signal of the first mobile station and monitors second signal characteristics of the second mobile station, and based on the first signal characteristics and the second characteristics, routes information to the first mobile station and the second mobile station, respectively.

150. Hohnstein describes the access system 564 in an access point 22 monitoring signal characteristics of downlink signals of subscriber units, as Hohnstein notes that “a quality error bit rate is established for each subscriber unit 26” which “reflect[s] *changing conditions* such as *noise*, demand, connectivity, or any other suitable parameter.”

In an embodiment of the present invention, *a quality error bit rate is established for each subscriber unit 26*. This quality error bit rate may be based on the location of subscriber unit 26 within communication system 20, the class of service assigned to subscriber unit 26, the grade of service assigned to subscriber unit 26, the data or transmission rate of service assigned to subscriber unit 26, or any other suitable parameter. The quality error bit rate may be modified while subscriber unit 26 is within communication system 20 to *reflect changing conditions* such as *noise*, demand, connectivity, or any other suitable parameter. Applications providing services to subscriber unit 26 may adjust these services based on the quality error bit rate. For example, an application providing streaming audio and video may reduce the frame update rate as noise increases, guaranteeing successful transmission at a lower information rate. The information rate

may be further reduced to provide only still pictures and audio if conditions continue to worsen. The information rate may also be automatically changed if subscriber unit 26 moves between coverage areas 24 with differing transmission capabilities or loads.

Ex. 1005, 5:1-21 (emphasis added),

Control of the information rate may be achieved by having subscriber unit 26 ***monitor*** a signaling channel ***transmitted by access point 22*** for each coverage area 24.

Id., 5:22-24 (emphasis added).

Subscriber unit 26 ***monitors*** a signaling channel transmitted by access point 22 for each coverage area 24. Subscriber unit 26 only consumes bandwidth when instructed to transmit by the signaling channel or when receiving packets.

Id., 5:38-42.

151. Hohnstein describes the access point 22 routing information to first and second subscriber units 26. *Id.*, 16:46-54, 2:50-54, 2:60-64, 3:4-6, 16:12-15.

152. Hohnstein describes the access points 22 performing a hand off operation from one access point 22 to another as a subscriber unit 26 moves out of one access point's coverage area and into a new access point's coverage area.

If subscriber unit 26 is mobile or portable, as indicated by U1 in FIG. 8, subscriber unit 26 may ***move out of coverage area 24 for***

one access point 22 and into coverage area 24 for a new access point 22. The address for subscriber unit 26 is then moved from FEC 402 of original access point 22 into FEC 402 for new access point 22. In an embodiment, when original access point 22 is no longer in communication with subscriber unit 26, original access point 22 broadcasts a message to distribution points 40 and supervisor 56. If original access point 22 subsequently receives any packets for subscriber unit 26, original access point forwards these packets back into distribution point network 41. If the packets are sequentially indicated, such as IP packets, correct order will be established by subscriber unit 26 when packets are received.

Id., 13:25-39 (emphasis added).

153. To the extent Hohnstein is deemed not to explicitly describe its access system 564 monitoring first signal characteristics of the second downlink signal of the first mobile station and monitors second signal characteristics of the second mobile station, and based on the first signal characteristics and the second characteristics, routing information to the first mobile station and the second mobile station, respectively, Palmer teaches and/or suggests this limitation. *See* Ground 1, [1.d].

154. It would have been obvious to a POSA to monitor a signal characteristic of the downlink signals to each subscriber unit 26 in Hohnstein and perform routing to the mobile hosts based on such monitored characteristics, to determine when to

perform a roaming handoff from one access point to another to maintain a continuous wireless connection, as I already discuss above in addressing a POSA's motivation to combine Palmer with Hohnstein for this claim.

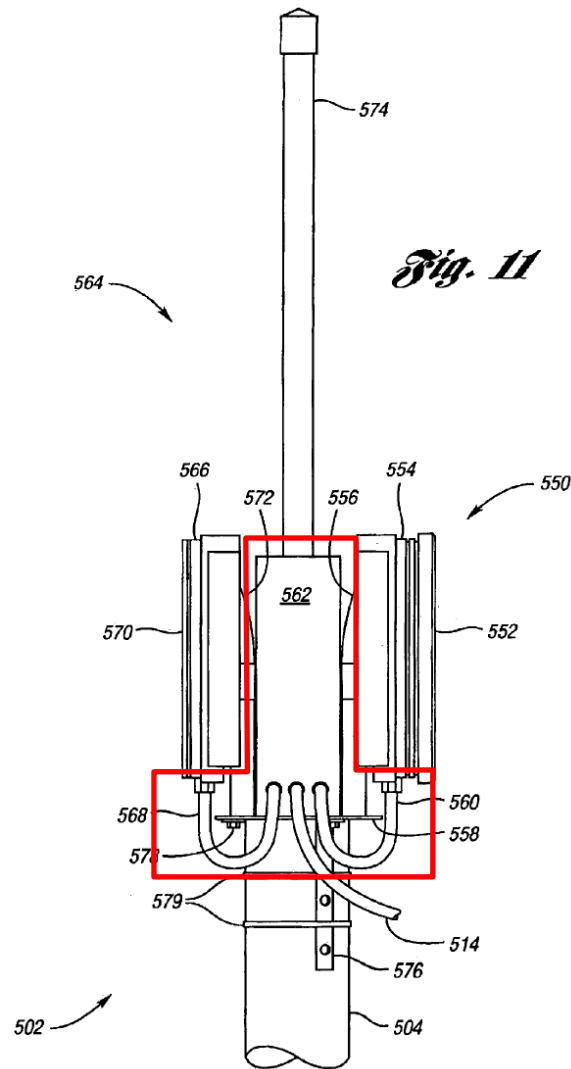
C. Claim 2

155. Claim 2 recites:

The wireless communication device of claim 1, wherein the second wireless transceiver is coupled to the first wireless transceiver by a wireline connection.

156. Claim 2 is obvious over Hohnstein and Palmer.

157. Hohnstein describes the second wireless transceiver coupled to the first wireless transceiver by a wireline connection (*e.g.*, via access cable 568, junction box 562, and backhaul cable 560).



Ex. 1005, Fig. 11 (annotated),

Referring now to FIG. 11, an elevation view drawing of an antenna system according to an embodiment of the present invention is shown. An antenna module, shown generally by 502, includes a backhaul system, shown generally by 550. Backhaul system 550 has backhaul antenna 552 attached to backhaul data terminal 554. Typically, backhaul antenna 552 is a directional antenna aimed at a corresponding antenna at another location. Backhaul mounting support 556 joins backhaul system 550 to

base plate 558 affixed to pole 504. Backhaul mounting support 556 allows backhaul antenna 552 to be horizontally and elevationally angled to facilitate alignment of backhaul antenna 552. ***Backhaul cable 560 connects backhaul data terminal 554 with junction box 562.*** Backhaul system 550 may be implemented with a UNII SU from Adaptive Broadband located of Sunnyvale, Calif.

Antenna module 502 also includes an access system, shown generally by 564. ***Access system 564 includes access data terminal 566 connected to junction box 562 through access cable 568.*** Directional access antenna 570 is attached to access data terminal 566 and may form a directional coverage area 24 for access point 22. Access data terminal 568 attaches to base plate 558 through access data terminal mounting support 572 which may be used to horizontally and elevationally aim directional access antenna 570. Preferably, antenna module 502 includes omnidirectional antenna 574 to form a substantially uniform, omnidirectional coverage area 24 around access point 22. The exact shape of coverage area 24 depends on a variety of factors including the type of antenna 574, frequency of transmission, local geography, and near by obstructions. Omnidirectional antenna 574 is connected to access data terminal 566 through cabling not shown. Access data terminal 566 may be implemented with a UNII SU from Adaptive Broadband. This unit may be modified for interconnection with omnidirectional antenna 574. In this manner, access point 22 may implement both

omnidirectional and sectorized coverage areas 24. Omnidirectional antenna 574 may be a model UNIIM-VR-11-360007-OS from Ball Wireless Communications Products of Broomfield, Colo.

Id., 15:13-53 (emphasis added).

Junction box 562 provides environmental protection for connections between elements of antenna system 502 including between backhaul data terminal 554 and access data terminal 566 and between access data terminal 566 and omnidirectional antenna 574. Cabling 514 supplies electrical power to various elements of antenna system 502 through connections within junction box 562. In an embodiment of the present invention, access data terminal 566 is incorporated into junction box 562.

Id., 15:66-16:7.

Antenna system 590 includes first backhaul antenna 552 with associated data terminal 554 connected to junction box 562 by backhaul cable 560 and second backhaul antenna 592 with backhaul data terminal 594 connected to junction box 562 by backhaul cable 596. Junction box 562 now includes common front end interface 104 interfacing access data terminal 566, common back end interface 112 interfacing backhaul data terminals 554, 594, and intelligent packet switch 114.

Id., 16:37-46.

Access data terminals and backhaul data terminals within the access point exchange information through baseband digital packets.

Id., Abstract.

158. Additionally, Palmer discloses a wireline connection connecting the first and second wireless transceivers (*see* Ground 1, claims 2-3; Ex. 1004, 5:1-9, 4:31-34; Fig. 2). A POSA would have at least found it obvious to connect Hohnstein's components via a wireline connection such as a network cable, to, for instance, allow for easier replacement of faulty components while providing a stable data transfer mechanism between components. A POSA would have appreciated that providing a wireline connection between components would have been a simple matter of design choice that incorporates known techniques with expected outcomes and predictable results and benefits.

D. Claim 3

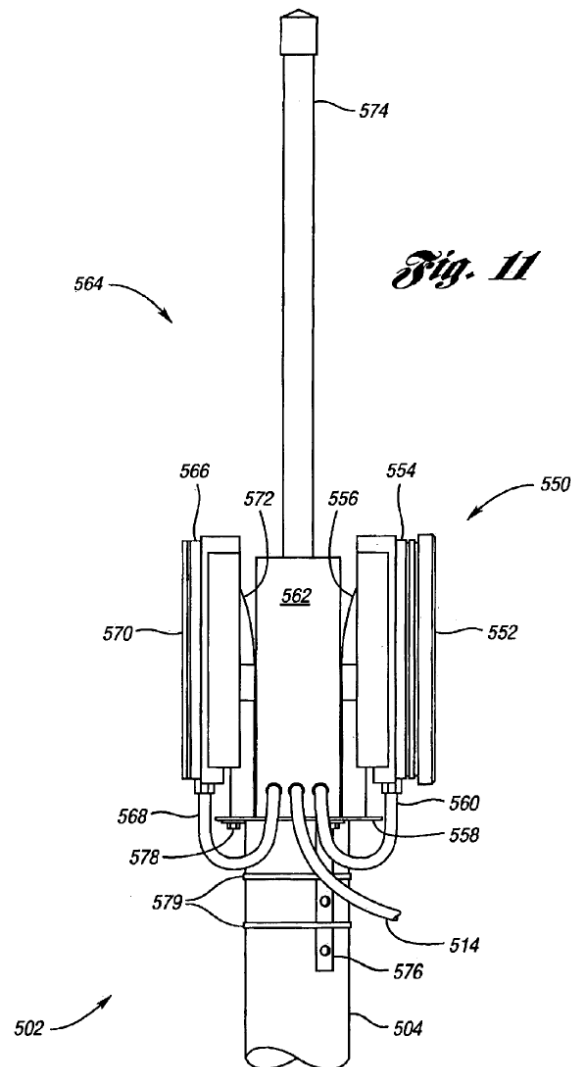
159. Claim 3 recites:

The wireless communication device of claim 2, wherein the second wireless transceiver is removably coupled to the first wireless transceiver.

160. Claim 3 is obvious over Hohnstein and Palmer.

161. Hohnstein describes that the second wireless transceiver (access system 564) is removably coupled to the first wireless transceiver (backhaul system 550),

because access system 564 utilizes an access data terminal mounting support 572 to mount itself to pole 504 and base plate 558 and is data-connected via access cable 568, while backhaul system 550 utilizes a backhaul mounting support 556 to mount itself to pole 504 and base plate 558 and is data-connected via backhaul cable 560.



Ex. 1005, Fig. 11.

Backhaul system 550 has backhaul antenna 552 attached to backhaul data terminal 554. Typically, backhaul antenna 552 is

a directional antenna aimed at a corresponding antenna at another location. *Backhaul mounting support 556 joins backhaul system 550 to base plate 558 affixed to pole 504.* Backhaul mounting support 556 allows backhaul antenna 552 to be horizontally and elevationally angled to facilitate alignment of backhaul antenna 552.

Id., 15:17-24 (emphasis added).

Antenna module 502 also includes an access system, shown generally by 564. Access system 564 includes access data terminal 566 connected to junction box 562 through access cable 568. Directional access antenna 570 is attached to access data terminal 566 and may form a directional coverage area 24 for access point 22. Access data terminal 568 attaches to base plate 558 through *access data terminal mounting support 572* which may be used to horizontally and elevationally aim directional access antenna 570.

Id., 15:29-37 (emphasis added).

162. Since Hohnstein's access system 564 and the backhaul system 550 utilize the described respective supports to attach themselves to the pole, they are removable from the pole by virtue of these supports, and a POSA would have understood that these components are removably coupled to each other.

163. At the very least, a POSA would have found it obvious that separate components wired together could be removably coupled (as opposed to permanently

attached) as a design choice (*e.g.*, to make repairs or replacement of faulty components easier). A POSA would have appreciated that providing a removable coupling between components would have been a simple matter of design choice that incorporates known techniques with expected outcomes and predictable results and benefits.

E. Claim 4

164. Claim 4 recites:

The wireless communication device of claim 1, wherein the first wireless transceiver and second wireless transceiver are disposed in a fixed site subscriber station.

165. I note that this claim does not further define any structural features of the wireless communication device, but merely recites an intended installation location for the device.

166. Regardless, Claim 4 is obvious over Hohnstein and Palmer.

167. Hohnstein describes the antenna module 502 provided in a fixed site subscriber station by being mounted on a fixed light pole 504. Ex. 1005, Figs. 9-13, 13:40-47, 14:63-15:12, 1:43-47 (describing wireless communication system being provided on a building, tower, etc.), 9:21-23.

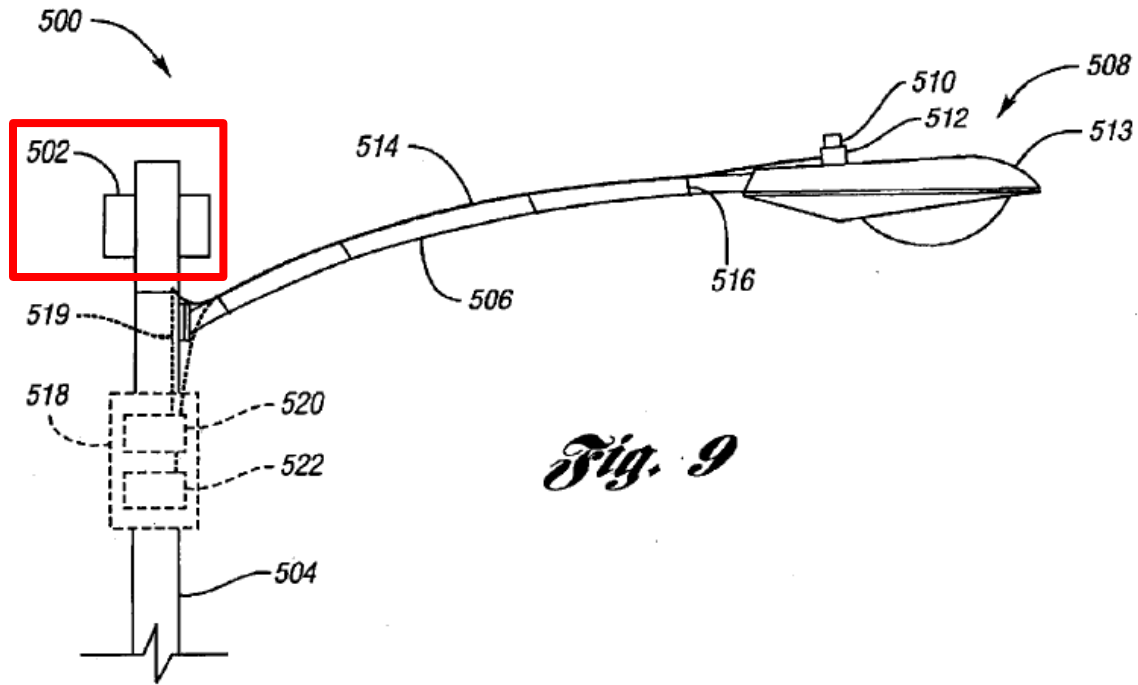


Fig. 9

Id., Fig. 9.

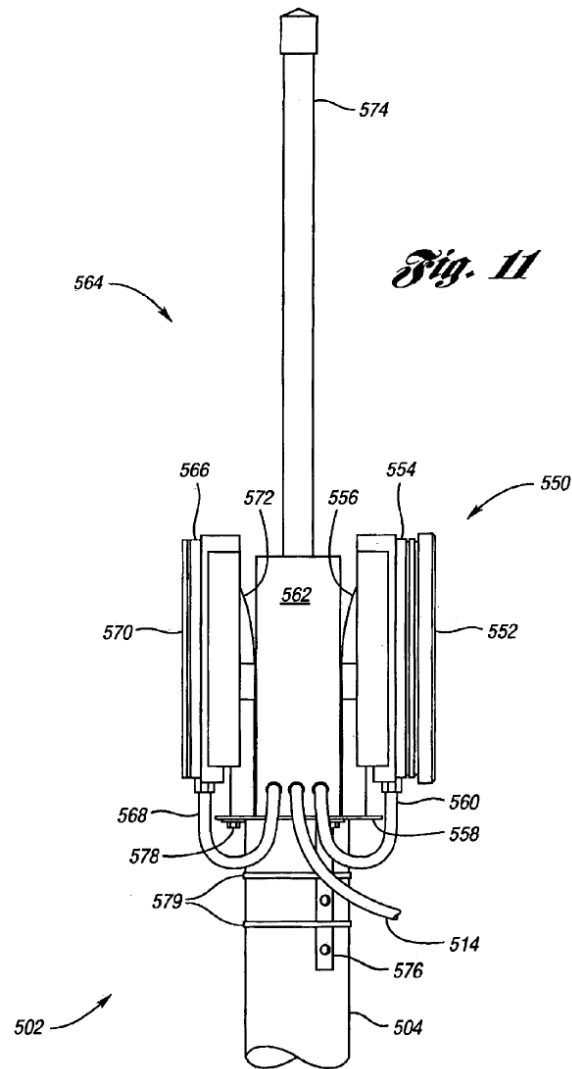
F. Claim 5

168. Claim 5 recites:

The wireless communication device of claim 1, wherein the first wireless transceiver and the second wireless transceiver are part of an integrated device.

169. Claim 5 is obvious over Hohnstein and Palmer.

170. Hohnstein describes that the first wireless transceiver and the second wireless transceiver are part of an integrated device because they are integrated in *e.g.*, antenna module 502.



Ex. 1005, Fig. 11.

Referring now to FIG. 11, an elevation view drawing of an antenna system according to an embodiment of the present invention is shown.

Id., 15:13-15.

171. At the very least, a POSA would have recognized that such integration would have been an obvious variant. For instance, the '794 patent describes that an

“integrated” device is formed simply by installing its components in a rack-assembly.

In the exemplary implementation, the integrated access device 24 forms a rack-assembly having expansion slots to receive expansion cards thereat. And, the WLAN transceiver is mounted upon, or is otherwise formed at, an expansion card connectable to the expansion slot of the rack-assembly. Thereby the integrated access device together with the WLAN transceiver form an integrated device providing for two-way communication upon the radio link 16 as well as two-way communication upon the radio link 46.

Ex. 1001 ('794 patent), 8:28-36.

172. However, the use of rack assemblies for housing telecommunications equipment at a location has been known and widely employed for decades. For example:

The 19-inch *rack format* with rack-units of 1.75 inches (44.45 mm) *was established as a standard by AT&T around 1922* in order to reduce the space required for repeater and termination equipment in a telephone company central office.

Ex. 1012 (Wikipedia entry for “Rack Unit”) (emphasis added)².

² See also Section IX.B.1 and the reference to Exhibit 1013 as the authoritative source to support the Wikipedia entry.

173. A POSA would have appreciated that integrating multiple telecommunications equipment into a single enclosure or frame would have been a simple matter of design choice using conventional packaging approaches that incorporates known techniques with expected outcomes and predictable results and benefits. For instance, providing the device as a single dual-function product would have provided a benefit of avoiding the purchase of two separate components.

G. Claim 6

174. Claim 6 is obvious over Hohnstein and Palmer.

1. [6.preamble] A method for communicating with a wireless communication device, comprising:

175. Hohnstein describes a method for communicating with a wireless communication device (*e.g.*, subscriber units 26). *See* [1.preamble] section above.

2. [6.a] a first wireless transceiver operable to communicate with a base station, wherein the base station communicates with the first wireless transceiver and a plurality of other wireless communication devices according to a wide area wireless communication protocol; and

176. *See* [1.a] section above.

3. [6.b] a second wireless transceiver coupled to the first wireless transceiver and operable to directly communicate with a first mobile station and a second mobile station, wherein the second wireless transceiver communicates with the first mobile station and the second mobile station according to a local area wireless communication protocol,

177. *See* [1.b] section above.

4. **[6.c] the method comprising: receiving, using the first wireless transceiver from the base station, a first downlink signal intended for the first mobile station; providing, using the first wireless transceiver, the first downlink signal to the second wireless transceiver; receiving, using the second wireless transceiver, the first downlink signal and re-transmitting the first downlink signal to the first mobile station as a second downlink signal according to the local area wireless communication protocol;**

178. *See* [1.c] section above.

5. **[6.d] monitoring, using the second transceiver, first signal characteristics of the second downlink signal of the first mobile station; monitoring, using the second transceiver, second signal characteristics of the second mobile station; and based on the first signal characteristics and the second characteristics, routing, using the second transceiver, information to the first mobile station and the second mobile station, respectively.**

179. *See* [1.d] section above.

XI. Ground 3: Claims 1-6 Are Obvious Over Palmer and Mahany

A. Summary of Mahany

180. Mahany describes a hierarchical communication system providing connectivity between a WWAN and a WLAN. Mahany describes a wireless “premises” LAN (that is provided within a building or campus), which includes:

- (1) “a plurality of computing devices at least one of which is a mobile terminal device configured with a wireless transceiver” and
- (2) “a plurality of access devices ... to support communications among the plurality of computing devices, and at least one of the plurality of access devices is configured to selectively intercept, store and forward requested data.”

Mahany describes the premises LAN as providing WLAN coverage for a building.

The present invention solves many of the foregoing problems in a variety of embodiments. The network of the present invention has *a plurality of computing devices at least one of which is a mobile terminal device configured with a wireless transceiver*. The network comprises a plurality of *access devices* arranged in a spanning tree configuration to support communications among the plurality of computing devices, and *at least one of the plurality of access devices is configured to selectively intercept, store and forward requested data*, thereby reducing traffic on the communication network.

Ex. 1006, 4:7-18 (emphasis added).

FIG. 1A illustrates a hierarchical communication system 10 within a building in accordance with the present invention. The illustrated hierarchical communication system 10 includes a

local area network (LAN) for maintaining typical communication flow within the building premises, herein referred to as a premises LAN. The premises LAN is designed to provide efficient end-to-end routing of information among hardwired and wireless, stationary and roaming devices located within the hierarchical communication system 10.

Id., 8:61-9:3.

In particular, the peripheral LAN is intended to provide communications between two or more devices operating within near proximity, e.g., distances of a few tens of feet. The majority of constituents of the peripheral LAN are generally devices that do not require access to resources outside their immediate group, or which can suffice with indirect access through devices which participate outside their immediate peripheral LAN group. In contradistinction, the premises LAN is intended to provide communications between relatively many devices operating across great distances *throughout a building*.

Id., 10:48-58 (emphasis added).

As discussed above with regard to FIG. 1, a *premises LAN* consists of several access points 15 located throughout an environment requiring wireless communications, e.g., a *building or other facility*, or a campus comprised of several buildings. The access points 15 are placed to provide coverage of intended usage areas for the roaming portable or mobile computing devices 20.

Coverage areas must overlap to eliminate dead spots between coverage areas.

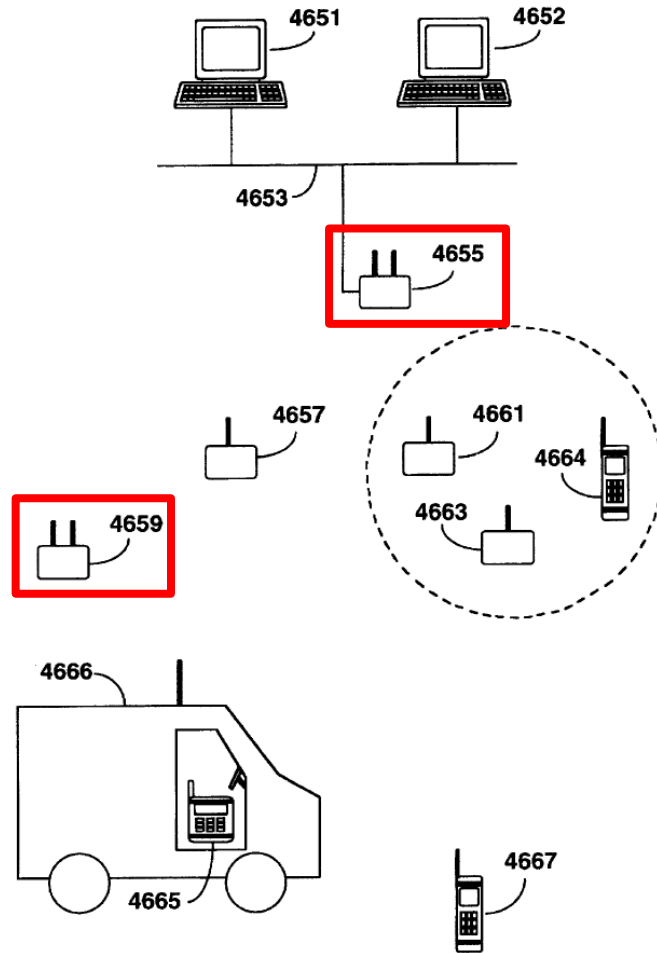
Id., 25:55-62 (emphasis added).

In the illustrated embodiment shown in FIG. 28a, the hierarchical communication system of the present invention consists of a premises LAN ***covering a building*** or group of buildings.

Id., 43:59-62 (emphasis added).

The access devices “are arranged to provide a communication pathway between the mobile terminal device and the computing device.” *Id.*, 4:43-45. Mahany describes such access devices include “access points” and “access servers,” both of “which participate in routing and relaying data throughout the communication network.” *Id.*, 8:61-9:17.

181. Mahany’s Fig. 46b illustrates an exemplary LAN network configuration that includes a portable computer terminal 4667 and various access devices 4655, 4657, 4659, 4661, 4663 configured with radio transceivers for wirelessly communicating in the LAN. Fig. 46b illustrates certain access devices 4655 and 4659 having two antennas, which include, in addition to a first radio transceiver and antenna for a wireless LAN connection, “a second higher power radio and associated antenna. e.g., WAN, paging, cellular, etc.,” “for long distance, wireless communication with the access server 4665.”



Id., Fig. 46b (annotated).

The access points 15 may be configured with radio transceivers only capable of communicating in the premises LAN.

Id., 10:42-44.

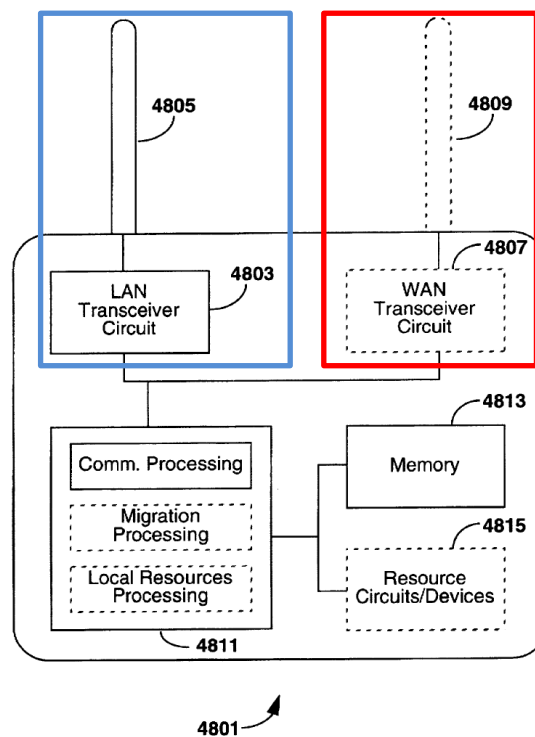
As illustrated, each of the access devices 4655 and 4659 are configured for long distance, wireless communication with the access server 4665 *via a second higher power radio and associated antenna*, e.g., *WAN*, paging, cellular, etc. The

corresponding *first radio* and associated antenna are *used for* relatively lower power *premises* network communication.

Id., 69:19-24 (emphasis added).

182. Mahany's Figure 48 illustrates an example of such an access device, in particular an access server 4801 that includes:

- (1) “transceiver circuitry 4803 and associated antenna 4805 for participating in the premises [LAN]” and
- (2) “another transceiver, a transceiver circuit 4807, and associated antenna 4809 [that] might be added ... to support WAN or cellular communications.” *Id.*, 75:8-20.



Id., Fig. 48 (WWAN and WLAN transceivers annotated in red and blue, respectively).

FIG. 48 is a schematic diagram of the access servers of FIGS. 46a-b illustrating an exemplary circuit layout which supports the functionality described in reference to FIGS. 47a-b. In particular, a typical access server, an access server 4801, is configured with *transceiver circuitry 4803 and associated antenna 4805* for participating in the *premises*, peripheral and/or wide area networks. In addition, *another transceiver, a transceiver circuit 4807, and associated antenna 4809* might be added, for example, *to support WAN* or cellular communications. Although not shown, interface circuitry for other wireless or wired communication links may be included in the access server configuration when needed.

Id., 75:8-20 (emphasis added).

B. Claims 1-4 and 6

183. As I explained above for Ground 1, claims 1-4 and 6 are anticipated and/or obvious over Palmer.

184. To the extent Palmer alone is deemed not to disclose or render obvious any aspect of these claims, such aspects are still trivial as taught by Mahany and, therefore, these claims are obvious over Palmer and Mahany.

185. For example, to the extent claims 1 and/or 6 are deemed to require the claimed device be integrated and that Palmer does not disclose such integration,

Mahany discloses a device with integrated first and second wireless transceivers. See discussion of claim 5 below.

186. A POSA would have found it obvious to form Palmer's device as an integrated device based on Mahany's teachings. Indeed, the '794 patent describes that an "integrated" device is formed simply by installing its components in a rack-assembly.

In the exemplary implementation, the integrated access device 24 forms a rack-assembly having expansion slots to receive expansion cards thereat. And, the WLAN transceiver is mounted upon, or is otherwise formed at, an expansion card connectable to the expansion slot of the rack-assembly. Thereby the integrated access device together with the WLAN transceiver form an integrated device providing for two-way communication upon the radio link 16 as well as two-way communication upon the radio link 46.

Ex. 1001 ('794 patent), 8:28-36.

187. However, the use of rack assemblies for housing telecommunications equipment at a location has been known and widely employed for decades. For example:

The 19-inch *rack format* with rack-units of 1.75 inches (44.45 mm) *was established as a standard by AT&T around 1922* in order to reduce the space required for repeater and termination equipment in a telephone company central office.

Ex. 1012 (Wikipedia entry for “Rack Unit”) (emphasis added)³.

188. A POSA would have appreciated that integrating multiple telecommunications equipment into a single enclosure or frame would have been a simple matter of design choice using conventional packaging approaches that incorporates known techniques with expected outcomes and predictable results and benefits. For instance, providing the device as a single dual-function product would have provided a benefit of avoiding the purchase of two separate components.

189. To the extent Palmer is not deemed to describe a “base station” (limitations [1.a], [6.a]), Mahany discloses a wireless base station topology for a WWAN.

³ See also Section IX.B.1 and the reference to Exhibit 1013 as the authoritative source to support the Wikipedia entry.

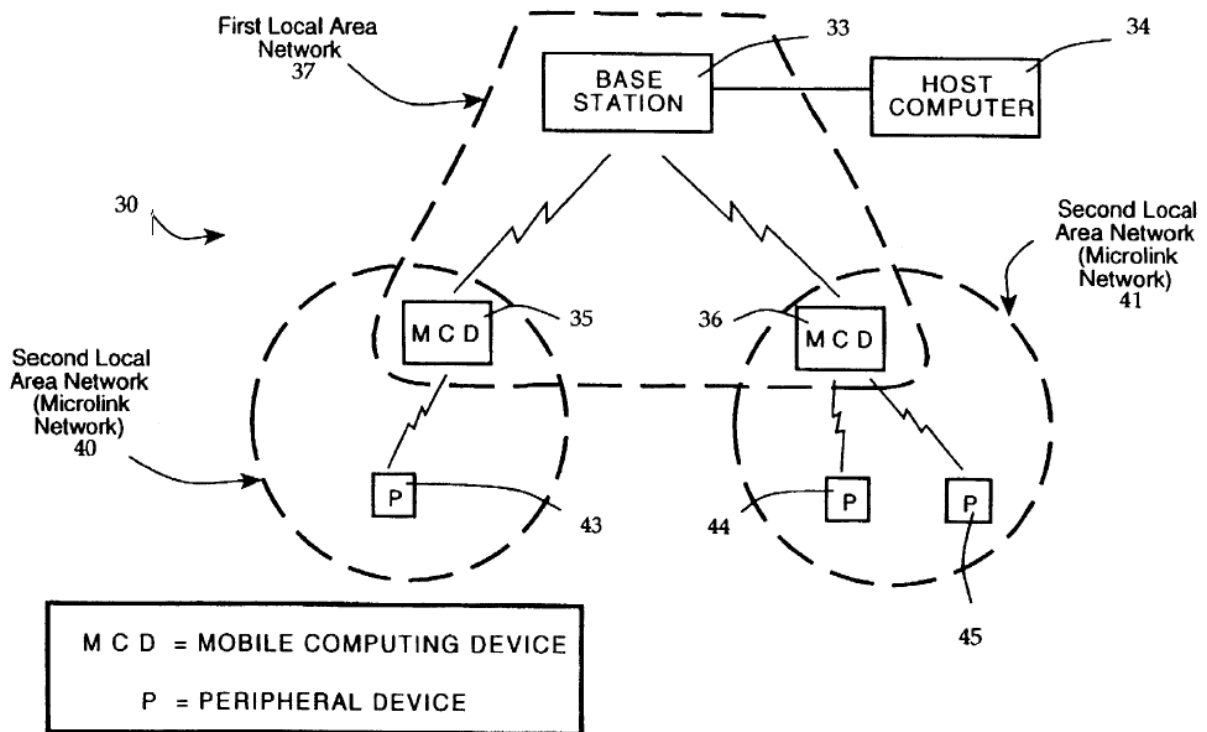


Figure 1b

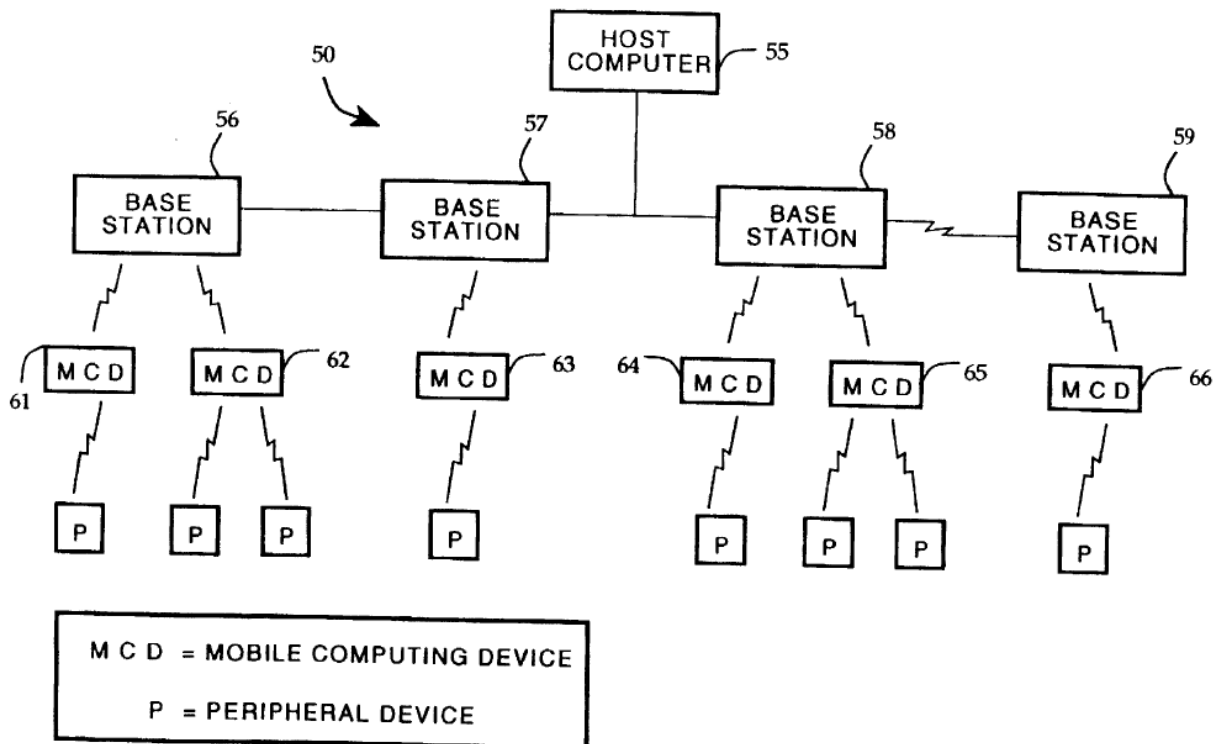


Figure 1c

Ex. 1006, Figs. 1b-1c.

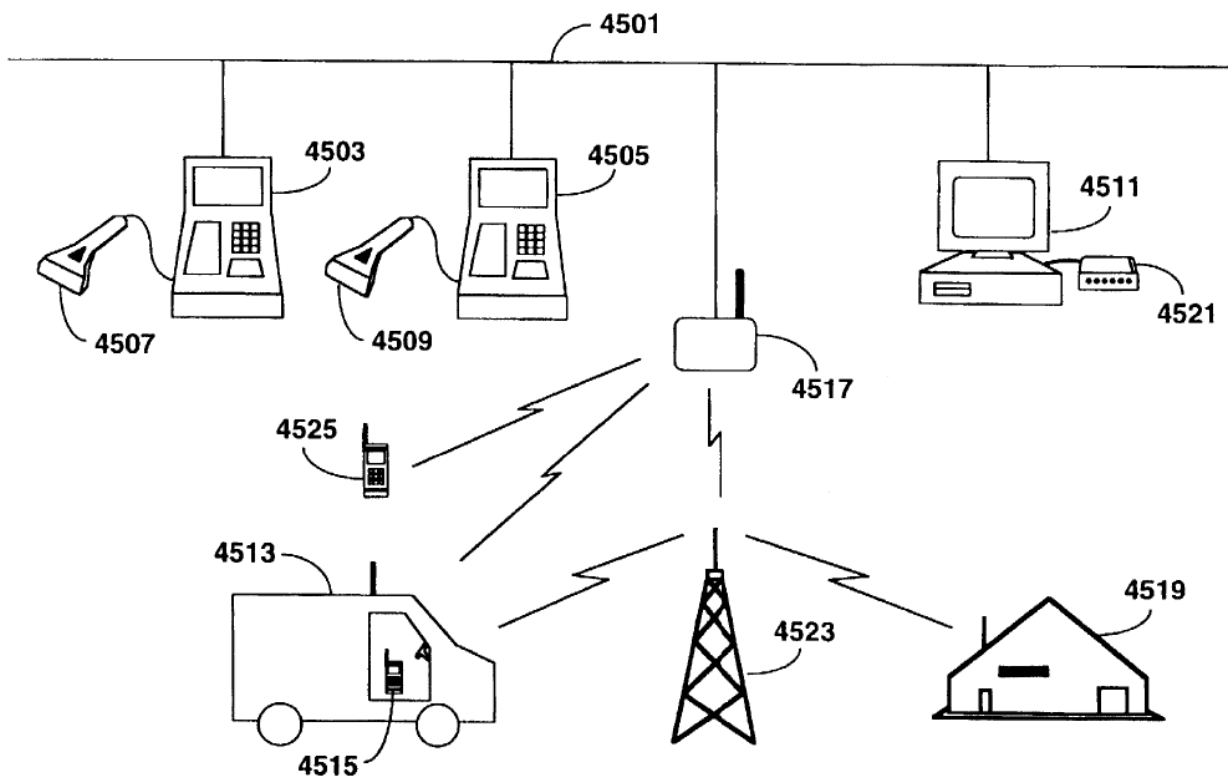


Fig. 45

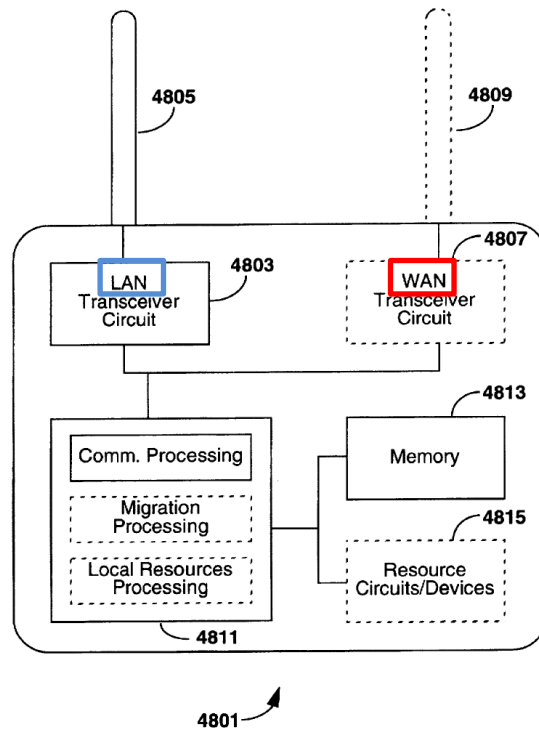
Id., Fig. 45.

Alternately, the communication pathway might also utilize the WAN directly from the radio terminal 4515 to the warehouse 4519 via the *antenna tower 4523*. Moreover, the antenna tower 4523 is merely representative of a *backbone network for the WAN*. Depending on the specific WAN used, the tower 4523 may actually be comprised of a plurality of towers using microwave links to span the distance between the retail premises and the warehouse 4519. Similarly, satellite relaying of the communications might also be used.

Id., 63:63-64:5 (emphasis added).

190. A POSA would have found it obvious to configure Palmer's central antenna 32 as a "base station" (*e.g.*, using a cellular network) based on Mahany's teachings, inasmuch as a base-station topology was already well established and commonly utilized in the telecommunications industry, including for wireless communications. *See* Ground 1, limitation [1.a], above.

191. To the extent the first wireless transceiver's communications in Palmer is deemed not to involve a wide area wireless communication protocol (limitations [1.a], [6.a]) and/or the second wireless transceiver's communications is deemed not to involve a local area wireless communication protocol (limitations [1.b], [6.b]), Mahany discloses and/or suggests such distinctive protocols, as Mahany describes transceiver circuitry 4803 being a wireless "LAN" transceiver circuit while transceiver circuit 4807 being a wireless "WAN" transceiver circuit:



Ex. 1006, Fig. 48 (annotated).

192. Additionally, Mahany describes using individual protocols for each of the wireless LAN and WAN.

Thus, the hierarchical communication system of the present invention provides a series of tightly coupled *radio LANs and WANS with* radio transceiver and *communication protocol designs* which take into consideration such factors as cost, weight, power conservation, channel loading, response times, interference, communication flow, etc., as modified by a primary factor of multiple participation.

Id., 10:22-28 (emphasis added).

FIG. 42 illustrates further detail of some of the storage requirements of the memory 3522 of FIG. 37 according to one

embodiment of the present invention. To control the radio, the control processor 3503 (FIG. 37) accesses the information in the memory 3522 needed for radio setup and operation on a plurality of LANs/WANs. Among other information, the memory 3522 stores: 1) a *plurality of software protocols, one for each LAN/WAN* to be supported, which *define how the radio is to participate* on the corresponding LAN[/WAN]; and 2) an overriding control set of routines which govern the selection, use and interaction of the plurality of protocols for participation on desired LANs/WANs.

Id., 59:55-67 (emphasis added).

However, the operation of the peripheral LAN is adapted for integration with the premises LAN so that a radio transceiver and *protocol designed* for operation on the *premises LAN* includes features which allow concurrent or sequentially concurrent operation on the peripheral LAN.

Id., 10:62-67 (emphasis added).

As described in more detail below, such transceiver and *protocol analysis* also takes place when considering additional multiple participation in the vehicular *LAN and WAN environments*.

Id., 12:60-63 (emphasis added).

193. A POSA would have found it obvious to utilize WLAN and WWAN protocols based on Mahany's teachings, especially given Palmer explicitly

contemplates its communication system covering a set of buildings or even spanning an entire “city” (Ex. 1004, 4:53-57), which would have prompted use of wide area protocols to cover such distances, while also prompting use of local area protocols within a building for easier connection to individual wireless devices. A POSA would have appreciated that using a wide area wireless communication protocol would have been a simple matter of design choice that incorporates known techniques with expected outcomes, and would have been appropriate for transmission between buildings or across a city, as described in Palmer. And, a POSA would have likewise appreciated that using a local area wireless communication protocol would have been a simple matter of design choice that incorporates known techniques with expected outcomes, and would have been appropriate for transmission within a building, as described in Palmer.

C. Claim 5

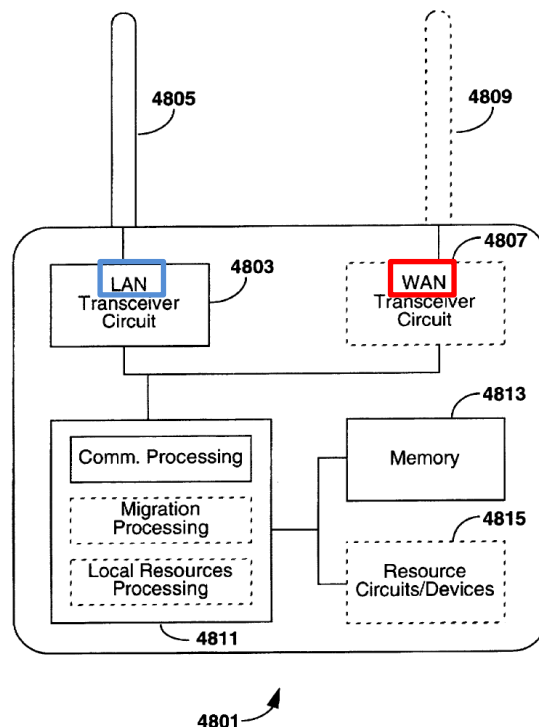
194. Claim 5 recites:

The wireless communication device of claim 1, wherein the first wireless transceiver and the second wireless transceiver are part of an integrated device.

195. To the extent Palmer is deemed not to describe the first and second wireless transceivers are part of an integrated device, Mahany discloses and/or suggests this limitation, and this claim is obvious over Palmer and Mahany.

196. Like Palmer, Mahany describes a communications system involving WANs and LANs, including access devices that route and relay data throughout the network. Ex. 1006, 8:61-9:17, 4:7-18, 8:61-9:3, 10:48-58, 25:55-62, 43:59-62.

197. Mahany describes one such access device 4801 that includes a first wireless transceiver 4807/4809 (“WAN transceiver circuit” and associated antenna) to communicate with a WAN, and a second wireless transceiver 4803/4805 (“LAN transceiver circuit” and associated antenna) to communicate with a wireless LAN. As depicted in Fig. 48, Mahany’s WAN and LAN transceiver circuits are part of an integrated device (*e.g.*, access device 4801).



Ex. 1006, Fig. 48 (annotated).

FIG. 48 is a schematic diagram of the access servers of FIGS. 46a-b illustrating an exemplary circuit layout which supports the functionality described in reference to FIGS. 47a-b. In particular, a typical access server, an access server 4801, is configured with transceiver circuitry 4803 and associated antenna 4805 for participating in the premises, peripheral and/or wide area networks. In addition, another transceiver, a transceiver circuit 4807, and associated antenna 4809 might be added, for example, to support WAN or cellular communications. Although not shown, interface circuitry for other wireless or wired communication links may be included in the access server configuration when needed.

Id., 75:8-20.

198. A POSA would have had reason to implement Palmer's remote antenna 34 and one of its access points 40 as an integrated device, as taught by Mahany. First, a POSA would have understood and appreciated that forming separate components as an integrated device is well known and merely a matter of obvious engineering choice that incorporates known techniques with expected outcomes and predictable results and benefits. Second, a POSA would have recognized that implementing Palmer's remote antenna 34 and one of its access points 40 as a single integrated device would have provided a benefit of avoiding the purchase of two separate components as a design choice.

199. A POSA would have also had a reasonable expectation of success in integrating the two Palmer components, given the teachings of Mahany and since combining multiple networking functionalities into a single device (*e.g.*, combining a router and wireless access point into a single wireless router) or in a common enclosure/frame is a common implementation for networking devices.

200. Indeed, the '794 patent describes that an “integrated” device is formed simply by installing its components in a rack-assembly.

In the exemplary implementation, the integrated access device 24 forms a rack-assembly having expansion slots to receive expansion cards thereat. And, the WLAN transceiver is mounted upon, or is otherwise formed at, an expansion card connectable to the expansion slot of the rack-assembly. Thereby the integrated access device together with the WLAN transceiver form an integrated device providing for two-way communication upon the radio link 16 as well as two-way communication upon the radio link 46.

Ex. 1001 ('794 patent), 8:28-36.

201. However, the use of rack assemblies for housing telecommunications equipment at a location has been known and widely employed for decades. For example:

The 19-inch *rack format* with rack-units of 1.75 inches (44.45 mm) *was established as a standard by AT&T around 1922* in

order to reduce the space required for repeater and termination equipment in a telephone company central office.

Ex. 1012 (Wikipedia entry for “Rack Unit”) (emphasis added)⁴.

202. A POSA would have appreciated that integrating multiple telecommunications equipment into a single enclosure or frame would have been a simple matter of design choice using conventional packaging approaches that incorporates known techniques with expected outcomes and predictable results and benefits. For instance, providing the device as a single dual-function product would have provided a benefit of avoiding the purchase of two separate components.

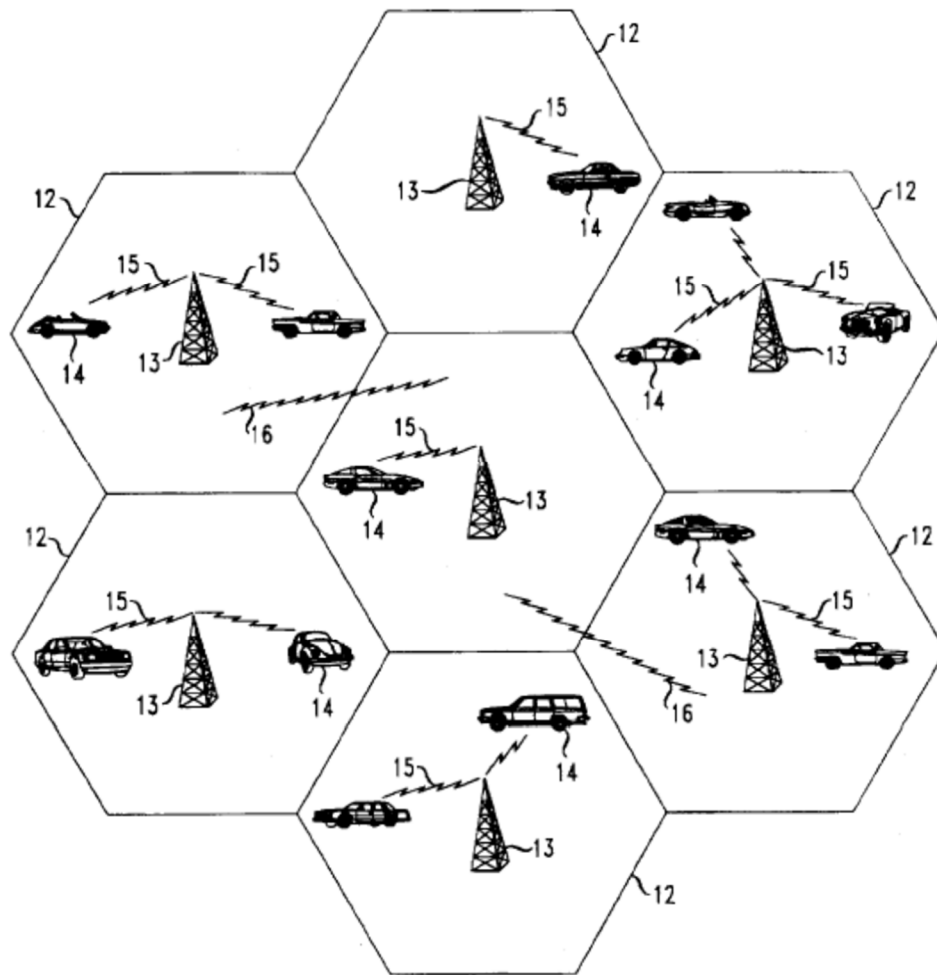
XII. Ground 4: Claims 1-4 and 6 Are Obvious Over Palmer and Agrawal

A. Summary of Agrawal

203. Agrawal describes a mobile wireless communications system including a base station 13 defining a coverage area 12 of wireless coverage for communicating with a plurality of mobile units 14.

⁴ See also Section IX.B.1 and the reference to Exhibit 1013 as the authoritative source to support the Wikipedia entry.

FIG. 1



Ex. 1007, Fig. 1.

FIG. 1 shows a typical cell-based mobile wireless communications environment in which an illustrative embodiment of the present invention may be advantageously employed. The illustrative environment comprises a plurality of hexagonal cells 12, each of which contains therein a corresponding base station 13 placed approximately at the center thereof, and one or more mobile units 14 (e.g., automobiles) located within various ones of the cells. Each mobile unit 14 is

in communication with the base station corresponding to the cell in which the mobile unit is located, the communication being effectuated with use of wireless communications links 15.

Id., 3:51-62.

204. Agrawal's system monitors the quality of the wireless link between a base station 13 and a mobile unit 14. A receiver monitors signal characteristics such as received signal strength, word-error-rate ("WER"), and noise or interference level, and a transmitter uses such monitored signal characteristics to control its transmission.

During a connection, the *receiver periodically monitors the received signal strength and the average WER*. When a connection between a transmitter and a receiver is established, the *transmitter uses the monitored signal strength and the WER* on the channel between the two *for setting the power and the encoding levels*. The choice of the power and encoding levels is performed with the goal of minimizing the power used in transmitting a single information bit for a given quality of service. (The quality of service may be defined in terms of any of several parameters such as, for example, *carrier-to-interference ratio, channel throughput, reliability, BER*, etc.)

Id., 5:24-35 (emphasis added); *see also* 1:29-33 ("BER" as bit-error rate; "WER" as word-error-rate),

The receiver observes the noise or interference level, I_{obs} , by monitoring the channel when it is idle. During transmission, the receiver also monitors the received power level and the word-error-rate. The CIR observed at the receiver is a function of the power observed at the receiver and the noise/interference level seen by the receiver.

Id., 5:47-52.

205. For instance, in monitoring a downlink signal (*e.g.*, involving “base station sending data to a mobile receiver [unit]”), Agrawal’s mobile unit monitors the WER and if the WER “increases beyond a predetermined upper limit, ... the mobile unit advantageously informs the base station” and the base station controls transmissions accordingly.

If the mobile unit is moving away from the base station and the word-error-rate observed by the mobile [unit] increases beyond a predetermined upper limit, WER_u , the mobile unit advantageously informs the base station of the drop in the channel quality and the base station changes the power level and/or the encoding level based on this feedback.

Id., 5:39-44.

206. Agrawal’s transmitter utilizes the monitored signal characteristics to control transmission, including to “set[] the power and the encoding levels.”

When a connection between a transmitter and a receiver is established, the transmitter uses the monitored signal strength

and the WER on the channel between the two for *setting the power and the encoding levels*.

Id., 5:26-29 (emphasis added).

As the distance between the transmitter and the receiver increases, the signal strength at the receiver decreases (assuming the power transmitted remains constant). Hence, the BER and the WER experienced at the receiver increase. In order to keep the WER within a predetermined threshold value, therefore, the encoding of the data needs to be correspondingly increased. If the encoding is increased, however, the throughput of the wireless channel goes down, i.e., more redundant bits have to be transmitted for the same number of information bits. This can also increase the delay in transmitting a given amount of information.

Id., 2:58-3:1.

207. For example, in response to a “drop in the channel quality” measured by a mobile unit and conveyed to the base station, the transmitter may change the encoding level. *Id.*, 5:26-29. By increasing the encoding level, the transmitter compensates for the drop in signal quality at the sacrifice of reduced “throughput of the wireless channel” as a result of requiring “more redundant bits ... to be transmitted for the same number of information bits.” *Id.*, 2:58-3:1.

When a connection between a transmitter and a receiver is established, the transmitter uses the monitored signal strength

and the WER on the channel between the two for setting the power and the encoding levels.

Id., 5:26-29.

As the distance between the transmitter and the receiver increases, the signal strength at the receiver decreases (assuming the power transmitted remains constant). Hence, the BER and the WER experienced at the receiver increase. In order to keep the WER within a predetermined threshold value, therefore, the encoding of the data needs to be correspondingly increased. If the encoding is increased, however, the *throughput of the wireless channel goes down*, i.e., more redundant bits have to be transmitted for the same number of information bits. This can also increase the delay in transmitting a given amount of information.

Id., 2:58-3:1.

208. Therefore, Agrawal describes a transceiver (base station 13) that directly communicates with first and second mobile stations (mobile units 14), and that monitors first signal characteristics of the second downlink signal of the first mobile station and monitors second signal characteristics of the second mobile station, per limitations [1.d] and [6.d].

B. Claim 1-4 and 6

209. As I discuss above in Ground 1, Palmer describes and/or suggests each limitation of claims 1-4 and 6. However, to the extent Palmer is deemed not to

describe its monitoring as being the second transceiver monitoring first signal characteristics of the second downlink signal of the first mobile station and monitoring second signal characteristics of the second mobile station, Agrawal describes these features, as discussed above.

210. A POSA would have had reason to have Palmer's access point 40 monitor first signal characteristics of the second downlink signal of the first portable terminal 20 and monitor second signal characteristics of the second portable terminal 20, respectively, as taught by Agrawal. Palmer and Agrawal both disclose using monitored signal characteristics to determine whether a downlink connection has degraded so as to necessitate reducing the connection's data rate. Ex.1004, 5:10-49, 6:20-54; Ex. 1007, 5:26-29, 2:58-3:1. Palmer additionally utilizes these monitored signal characteristics to determine whether to switch (*e.g.*, roam) a portable terminal 20 to another access point, while Agrawal describes its monitored signal characteristics indicating "[i]f the mobile unit is moving away from the base station." Ex. 1004, 5:10-49, 6:8-54; Ex. 1007, 5:36-47, 2:7-15.

211. Therefore, a POSA would have looked to incorporate Agrawal's monitoring approach as a substitute for Palmer's monitoring approach, at least because both are used for an overlapping purpose of optimizing the data rate of the wireless connection.

212. In fact, the '794 patent describes the same general approach as Agrawal, where a mobile station measures signal characteristics and reports these measurement results back to the transceiver.

In one implementation signal characteristics are measured, or otherwise determined, at the mobile station and results of such measures or determinations of are reported back to the WLAN transceiver and appropriate control circuitry.

Ex. 1001 ('794 patent), 8:64-9:1.

213. A POSA would have recognized and appreciated that Agrawal's approach of monitoring downlink signal characteristics at the mobile unit and reporting the results back to the transceiver (*e.g.*, base station in Agrawal) would have provided Palmer's system with continuous monitoring of the condition of the downlink channel as a "feedback loop" (Ex. 1007, 8:16-19, 5:39-45), including continued monitoring when the downlink channel "is idle," which would have smoothened Palmer's handoff procedure. *Id.*, 4:34-37, 5:48-51. A POSA would have appreciated that such monitoring approach would have been a simple matter of design choice that incorporates Agrawal's techniques with expected outcomes, and would have been appropriate for the WLAN transmissions described in Palmer.

214. A POSA would also have had a reasonable expectation of success in implementing such monitoring. Palmer already discloses such monitoring of signal quality being performed in its system, so incorporating the particular monitoring

approach of Agrawal would have been a straightforward adaptation of existing monitoring operations already being performed in Palmer.

XIII. Ground 5: Claim 5 Is Obvious Over Palmer, Agrawal, and Mahany

215. Claim 5 recites:

The wireless communication device of claim 1, wherein the first wireless transceiver and the second wireless transceiver are part of an integrated device.

216. Claim 5 is obvious over Palmer, Agrawal, and Mahany for at least the reasons I discuss above in Ground 1 (addressing parent claim 1) and Ground 3 (addressing claim 5's limitations).

XIV. Ground 6: Claims 1-6 Are Obvious Over Hohnstein and Agrawal

217. As I discuss above in Ground 2, Hohnstein describes and/or suggests various limitations of claims 1-6.

218. In Ground 2, Hohnstein was presented to supplement various teachings in Palmer that relate to the second wireless transceiver monitoring first signal characteristics of the second downlink signal of the first mobile station and monitoring second signal characteristics of the second mobile station. As I discuss above in Ground 4, Agrawal discloses these limitations.

219. Thus, in this Ground, Agrawal replaces Palmer for this aspect of claim 1. As I already discuss above in Ground 2, Hohnstein is applied against the reminder of the claims.

220. A POSA would have had reason to have Hohnstein's access system 564 monitor first signal characteristics of the second downlink signal of a first subscriber unit 26 and monitor second signal characteristics of a second subscriber unit 26, as taught by Agrawal, so as to route information to the first and second subscriber units 26, respectively, based on the first signal characteristics and the second characteristics (as well as for other reasons set forth above in Ground 2).

221. Hohnstein and Agrawal both disclose using monitored signal characteristics to determine whether a downlink connection has degraded so as to necessitate reducing the connection's data rate. Ex. 1005, 5:1-29 (reducing "information rate" if "noise increases," "conditions continue to worsen," or "subscriber unit 26 moves between coverage areas 24"); Ex. 1007, 5:26-29, 2:58-3:1).

222. Hohnstein additionally describes handing off a subscriber unit 26 to another access point as the subscriber unit 26 moves between coverage areas 24, while Agrawal describes its monitored signal characteristics indicating "[i]f the mobile unit is moving away from the base station." Ex. 1005, 13:25-39, 5:1-21, 8:7-31; Ex. 1007, 5:36-47, 2:7-15.

223. A POSA would have recognized and appreciated that Agrawal's approach of monitoring downlink signal characteristics at the mobile unit and reporting the results back to the transceiver (*e.g.*, base station in Agrawal) would

have provided Hohnstein's system with continuous monitoring of the condition of the downlink channel as a "feedback loop" (Ex. 1007, 8:16-19, 5:39-45), including continued monitoring when the downlink channel "is idle," which would have smoothened Hohnstein's handoff procedure. *Id.*, 4:34-37, 5:48-51. A POSA would have appreciated that such monitoring approach would have been a simple matter of design choice that incorporates Agrawal's techniques with expected outcomes, and would have been appropriate for the WLAN transmissions described in Hohnstein.

224. A POSA would also have had a reasonable expectation of success in implementing such monitoring. Hohnstein already discloses such monitoring of signal quality being performed in its system, so incorporating the particular monitoring approach of Agrawal would have been a straightforward adaptation of existing monitoring operations already called for in Hohnstein.

225. Indeed, because Hohnstein calls for monitoring, a POSA would have looked to existing monitoring techniques so as to perform the functions called for in Hohnstein, with Agrawal being a preferred and suitable way of doing so.

XV. Secondary Considerations

226. From my work in the field, I am not aware of any secondary considerations, let alone ones that would affect the strong case of obviousness. I understand that secondary considerations are the Patent Owner's burden to identify.

XVI. Conclusion

227. For the foregoing reasons, it is my opinion that claims 1-6 of the '794 patent recite subject matter that is anticipated and/or would have been obvious to a POSA.

228. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 28, 2023



Dr. Kevin C. Almeroth