UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Facebook, Inc., Instagram LLC
Petitioners

v.

Skky, LLC
Patent Owner

U.S. Patent No. 9,219,810

TITLE: MEDIA DELIVERY PLATFORM

DECLARATION OF TAL LAVIAN, PH.D.

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I, Tal Lavian, Ph.D., declare as follows:

I. INTRODUCTION AND QUALIFICATIONS

A. Qualifications and Experience

1. I have more than 25 years of experience in the networking, telecommunications, Internet, and software fields. I received a Ph.D. in Computer Science, specializing in networking and communications, from the University of California at Berkeley in 2006 and obtained a Master's of Science ("M.Sc.") degree in Electrical Engineering from Tel Aviv University, Israel, in 1996. In 1987, I obtained a Bachelor of Science ("B.Sc.") in Mathematics and Computer Science, also from Tel Aviv University.

2. I am employed by the University of California at Berkeley and was appointed as a lecturer and Industry Fellow in the Center of Entrepreneurship and Technology ("CET") as part of UC Berkeley College of Engineering. I have been with the University of California at Berkeley since 2000 where I served as Berkeley Industry Fellow, Lecturer, Visiting Scientist, Ph.D. Candidate, and Nortel's Scientist Liaison. I have taught several classes on wireless devices and smartphones. Some positions and projects were held concurrently, while others were held sequentially.

3. I have more than 25 years of experience as a scientist, educator and technologist, and much of my experience relates to telecommunication, data

communications, and computer networking technologies. For eleven years from 1996 to 2007, I worked for Bay Networks and Nortel Networks. Bay Networks was in the business of making and selling computer network hardware and software. Nortel Networks acquired Bay Networks in 1998, and I continued to work at Nortel after the acquisition. Throughout my tenure at Bay and Nortel, I held positions including Principal Scientist, Principal Architect, Principal Engineer, Senior Software Engineer, and led the development and research involving a number of networking technologies. I led the efforts of Java technologies at Bay Networks and Nortel Networks. In addition, during 1999-2001, I served as the President of the Silicon Valley Java User Group with over 800 active members from many companies in the Silicon Valley.

4. Prior to that, from 1994 to 1995, I worked as a software engineer and team leader for Aptel Communications, designing and developing wireless technologies, mobile wireless devices and network software products. I worked on development of two-way wireless OFDM technology, in the 915 MHz band, under the FCC part 15. The technology was a continuation of military research for low power, wideband OFDM to reduce wireless transmission detectability.

5. From 1990 to 1993, I worked as a software engineer and team leader at Scitex Ltd., where I developed system and network communications tools (mostly in C and C++).

6. I have extensive experience in communications technologies including wireless technologies, routing and switching architectures and protocols, including Multi-Protocol Label Switching Networks, Layer 2 and Layer 3 Virtual Private Networks, and Pseudowire technologies. Much of my work for Nortel Networks (mentioned above) involved the research and development of these technologies. For example, I wrote software for Bay Networks and Nortel Networks switches and routers, developed network technologies for the Accelar 8600 family of switches and routers, the OPTera 3500 SONET switches, the OPTera 5000 DWDM family, and the Alteon L4-7 switching product family. I wrote software for Java-based device management, including a software interface for device management and network management in the Accelar routing switch family's network management system. I have also worked on enterprise Wi-Fi solutions, wireless mobility management, and wireless infrastructure.

7. I am named as a co-inventor on more than 100 issued patents and I co-authored more than 25 scientific publications, journal articles, and peer-reviewed papers. Furthermore, I am a member of a number of professional affiliations,

including the Association of Computing Machinery ("ACM") and the Institute of Electrical and Electronics Engineers ("IEEE") (senior member). I am also certified under the IEEE WCET (Wireless Communications Engineering Technologies) Program, which was specifically designed by the IEEE Communications Society (ComSoc) to address the worldwide wireless industry's growing and ever-evolving need for qualified communications professionals.

8. From 2007 to the present, I have served as a Principal Scientist at my company TelecommNet Consulting Inc., where I develop network communication technologies and provide research and consulting in advanced technologies, mainly in computer networking and Internet technologies. In addition, I have served as a Co-Founder and Chief Technology Officer (CTO) of VisuMenu, Inc. from 2010 to the present, where I design and develop architecture of visual IVR technologies for smartphones and wireless mobile devices in the area of network communications.

9. I have worked on wireless and cellular systems using a variety of modulation technologies including time-division multiple-access (TDMA), code-division multiple-access (CDMA), and orthogonal frequency-division multiplexing (OFDM). I have additionally worked on various projects involving the transmission and streaming of digital media content.

10. The above outline of my experience with communications systems is not comprehensive of all of my experience over my years of technical experience. Additional details of my background are set forth in my curriculum vitae, attached as **Exhibit A** to this Declaration, which provides a more complete description of my educational background and work experience.

11. I am being compensated for the time I have spent on this matter at the rate of $400 per hour. My compensation does not depend in any way upon the outcome of this proceeding. I hold no interest in the Petitioners (Facebook, Inc. and Instagram LLC) or the Patent Owner (Skky, LLC).

B. Materials Considered

12. The analysis that I provide in this Declaration is based on my education and experience in the telecommunications and information technology industries, as well as the documents I have considered, including U.S. Patent No. 9,219,810 ("'810" or "'810 patent") **[Ex. 1001]**, which states on its face that it issued from an application filed on October 18, 2013, in turn claiming priority back to an earliest application filed on June 27, 2001. For purposes of this Declaration, I have assumed June 27, 2001 as the effective filing date for the '810 patent. I have cited to the following documents in my analysis below:

Exhibit No.	Title of Document
1001	U.S. Patent No. 9,219,810 to John Mikkelsen et al.

Exhibit No.	Title of Document
1003	U.S. Patent No. 5,815,811 to Patrick Pinard et al.
1004	U.S. Patent No. 6,956,833 to Satoru Yukie et al.
1005	Alan Gatherer et al., *DSP-Based Architectures for Mobile Communications: Past, Present and Future*, IEEE Communications Magazine (January 2000)
1006	U.S. Patent No. 5,726,978 to Carl Magnus Frodigh et al.
1013	U.S. Patent No. 6,714,968 to Mitch Prust
1060	U.S. Patent No. 8,996,698 to James P. Tagg
1061	Bob O'Hara et al., *802.11 Handbook: A Designer's Companion*, IEEE Press (1999)`

13. I have also read the "Declaration of William H. Beckmann, Ph.D.," dated October 13, 2016, in support of the Petition for Covered Business Method (CBM) Review of U.S. Patent No. 9,219,810 ("Beckmann Declaration"). I am informed that the Beckmann Declaration was submitted by counsel for Facebook and Instagram in connection with a separate petition on the '810 patent. Although I agree with the opinions provided by Dr. Beckmann, I will provide my own discussion to emphasize points that I find pertinent to my analysis of the claims and the prior art addressed in this Declaration. To the extent the analysis in the Beckmann Declaration is informative or applicable to my opinions, I will refer to or incorporate it in my analysis below.

II. PERSON OF ORDINARY SKILL IN THE ART

14. Part III of the Beckmann Declaration includes a discussion of a person of ordinary skill in the art. I agree with the points made by Dr. Beckmann, but I will provide my own discussion to emphasize points that I find pertinent to my analysis of the claims and the prior art addressed in this Declaration.

15. I understand that an assessment of claims of the ’810 patent should be undertaken from the perspective of a person of ordinary skill in the art as of the earliest claimed priority date, which I understand is June 27, 2001. In my opinion, a person of ordinary skill in the art as of June 2001 would have possessed at least a bachelor’s degree in computer science, computer engineering, or electrical engineering (or equivalent degree or experience) with at least four years of experience with wireless communications systems and at least two years of experience with the communication of digital media.

16. My opinions regarding the level of ordinary skill in the art are based on, among other things, my over 25 years of experience in computer science and network communications, my understanding of the basic qualifications that would be relevant to an engineer or scientist tasked with investigating methods and systems in the relevant area, and my familiarity with the backgrounds of colleagues, co-workers, and employees, both past and present.

17. Although my qualifications and experience exceed those of the hypothetical person having ordinary skill in the art defined above, my analysis and opinions regarding the ’810 patent have been based on the perspective of a person of ordinary skill in the art as of June 2001.

III. RELEVANT TECHNOLOGY BACKGROUND

18. Part IV of the Beckmann Declaration includes an overview of the underlying technology of the ’810 patent. Although I agree with Dr. Beckmann’s summary, I will provide my own overview to emphasize points that I find pertinent to my analysis of the claims and the prior art addressed in this Declaration.

19. The ’810 patent, entitled “Media Delivery Platform,” purports to disclose and claim a system and method for delivering digital media files to an electronic device. (’810, Abstract.) In this section, I provide a brief background discussion on technologies pertinent to the ’810 patent prior to June 2001.

A. Cellular Telephones

20. The first commercial cellular service was launched in 1979 in Japan, over 20 years before the earliest filing date to which the ’810 patent could claim priority. By the 1980s, cell phones were in widespread commercial use. For example, the Motorola “DynaTAC” cell phone was launched in the United States as early as 1983. Typical of early cell phones, the Motorola DynaTAC was designed to communicate over “1G” or “first generation” networks known as the

Advanced Mobile Phone System (AMPS). Similar cellular phones and networks were also deployed in other countries throughout the 1980s.

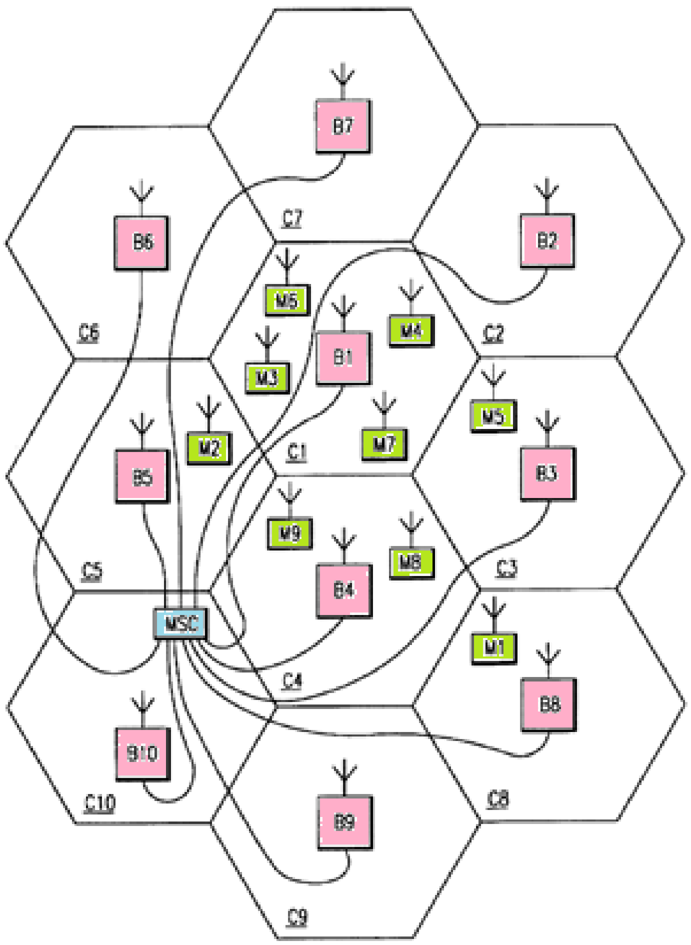

FIG. 1

21. Networks designed for cell phones, such as AMPS mentioned above, are referred to as "cellular" networks because they utilize the concept of "cells." A "cell" is a geographical region within which wireless coverage is provided by a corresponding base station or access point. Accordingly, the base station or access point enables wireless communication between a cell phone (within the corresponding cell) and the rest of the world. This is shown in Figure 1 of U.S. Patent No. 5,726,978 to Carl Magnus Frodigh et al. ("Frodigh") **[Ex. 1006]**, reproduced above. (Frodigh, Fig. 1 (highlighting added).) As shown, "[a]ssociated with and located within each of the cells **C1-C10** is a base station designated as a corresponding one of a plurality of base stations **B1-B10**,"

highlighted in pink above. (*Id.*, 5:64-66.) The base stations include equipment enabling wireless communication with mobile stations (shown in green) within their respective cells. (*Id.*, 5:66-6:1, 6:15-16.) Because a single base station may communicate with more than one mobile station at any given time, as shown in cells **C1** and **C4** above, "multiple access" techniques are employed that allow a base station's communication bandwidth to be shared among multiple mobile stations. (*See id.*, 7:51-63; Fig. 2.)

22. Moreover, as shown in Figure 1 above, each base station is connected to a mobile station switching center (MSC) (shown in blue), which couples the cellular network to other networks (e.g., PSTN) via communication links such as cables or radio communication. These communication links can be based on PSTN services, ISDN, and other radio links. (*Id.*, 6:33-47.) As Frodigh makes clear, the cellular phone and networking techniques discussed above were "well known" prior to June 2001. (*Id.*, 6:1, 6:42.) Various methods for providing "multiple access," such as TDMA, CDMA, and OFDM, were also well known. (EP 1039683 A2 **[Ex. 1007]**, at ¶¶ 0002-08; U.S. Patent No. 5,815,488 **[Ex. 1008]**, 1:12-16, 3:38-42; *see also* Cheong Yui Won et al., *A Real-time Sub-carrier Allocation Scheme for Multiple Access Downlink OFDM Transmission*, IEEE

(1999) **[Ex. 1009]**; Wonjong Rhee et al., *Increase in Capacity of Multiuser OFDM System Using Dynamic Subchannel Allocation*, IEEE (2000) **[Ex. 1010]**.)

23. Although cell phones were originally designed for voice communications, techniques were developed to allow them to transmit and receive non-voice data. For example, it was also well-known that cell phones could be used to download and playback digital media. The Background Art section of the ’810 patent acknowledges, for example, the existence of cell phones that can play music in a compressed format such as MP3. (’810, 1:36-40.) Cell phones with media download and playback features are also discussed in prior art publications including EP 1033894 A2 **[Ex. 1011]**, U.S. Patent No. 6,423,892 **[Ex. 1012]**, U.S. Patent No. 6,956,833 to Satoru Yukie et al. (“Yukie”) **[Ex. 1004]**, and Alan Gatherer, *DSP-Based Architectures for Mobile Communications: Past, Present and Future*, IEEE Communications (Jan. 2000) (“Gatherer”) **[Ex. 1005]**. I discuss Yukie and Gatherer in detail in **Parts V.A** and **V.B.1** below.

B. Digital Signal Processors

24. A digital signal processor, or “DSP,” is a specialized microprocessor. It can be programmed to perform a wide variety of computations, and is particularly suited for functions related to digital signal processing including numerical operations. Off-the-shelf DSPs including NEC’s µPD7720, TI’s

TMS32010, and Motorola's DSP56000 had been available since at least the early 1980s. And by the turn of the century, DSPs had become immensely popular. As explained in Gene Frantz, *Digital Signal Processor Trends,* IEEE Micro (2000) **[Ex. 1014]** ("Frantz"):

> The mass-storage industry depends on DSPs to produce hard-disk drives and digital versatile disc players. Ever-increasing numbers of digital subscriber line and cable modems, line cards, and other wired telecommunications equipments are based on DSPs. Digital still cameras, hearing aids, motor control, consumer audio gear such as Internet audio are just some of the many mass market applications in which DSPs are routinely found today. More specialized DSP applications include image processing, medical instrumentation, navigation, and guidance.

(*Id.*, at p. 52, left column.)

25. The popularity of DSPs was driven by a number of factors, including their favorable size, performance, power consumption, and price. (*Id.*, at p. 55, left column ("[I]n the 1990s, DSPs were entering the realm of price, performance, and power consumption making them appropriate for high-volume applications."); Gatherer, p. 86, left column ("Architecture design, and process enhancements are producing new generations of processors that provide high performance while maintaining the low power dissipation necessary for battery-powered

applications.”).) Like many other computer technologies, DSPs only got better – and were expected to continue to get better – with time. (Gatherer, Figs. 3 & 4.) This is succinctly summarized in Table 1 in Frantz below.

Table 1. Two decades of DSP market integration (typical DSP figures).

	1982	1992	2002
Die size (mm)	50	50	50
Technology size (microns)	3	0.8	0.18
MIPS	5	40	5,000
MHz	20	80	500
RAM (words)	144	1,000	16,000
ROM (words)	1,500	4,000	64,000
Price (dollars)	150	15	1.50
Power dissipation (mW/MIPS)	150	12.5	0.1
Transistors	50,000	500,000	5 million
Wafer size (inches/mm)	3 / 75	6 / 150	12 / 300

(Frantz, p. 55, Table 1.)

26. By the time of the alleged invention, DSPs were standard components in cell phones. As explained in Frantz, “the entire digital wireless industry operate[d] with DSP-enabled handsets.” (*Id.*, p. 52, left column.) Gatherer likewise described the presence of DSPs in cell phones as “**pervasive**.” (Gatherer, at p. 84, left column.) DSPs provided much of the processing required, such as

modulation/demodulation and speech coding/decoding. (*Id.*, Fig. 1.) And as their processing power improved, DSPs were also considered for newer features provided by cell phones, including the processing of "audio and visual entertainment." (*Id.*, p. 89, left column; *see also id.* Fig. 7.) Moreover, it was well known that DSPs were designed and optimized to process signals transmitted using modulation techniques, including orthogonal frequency-division multiplexing (OFDM), which I explain below. (E. Lawrey, *Multiuser OFDM*, Fifth International Symposium on Signal Processing and its Applications (Aug. 1999) **[Ex. 1015],** at p. 761, left column ("[A] test hardware solution is presented using SHARC® Digital Signal Processors (DSP) demonstrating the feasibility of a simple multiuser OFDM system."); U.S. Patent No. 5,732,113 (published Mar. 1998) **[Ex. 1016]**, 4:26-44 ("DSP 100 performs a variety of operations on the in-phase and quadrature samples of the received OFDM signal."); U.S. Patent No. 6,711,221 (filed Feb. 2000) **[Ex. 1017]**, 3:33-48.)

C. Orthogonal Frequency-Division Multiplexing (OFDM)

27. Orthogonal frequency-division multiplexing, or "OFDM," is a particular type of frequency-division multiplexing ("FDM"), which refers to a technique in which discrete signals can be combined within a shared frequency band used for communication.

28. The basic concept of FDM can be explained using the familiar concept of FM radio, in which a user turns a radio receiver to a particular frequency (e.g. 97.1 MHz) to listen to a radio broadcast. FDM divides up an available frequency band (characterized by a particular "bandwidth") into a number of frequency "sub-bands," sometimes referred to as "sub-channels." To reduce interference, these sub-bands usually do not overlap. To use the FM radio example, FM radio stations use a frequency band that ranges from 87.5 to 108 MHz of the radio spectrum. By dividing the available bandwidth into sub-bands, FDM allows multiple signals to be transmitted simultaneously because each sub-band can carry a distinct signal. This is essentially how "frequency division multiplexing" gets its name. FDM was used with the telegraph more than a century ago and continues to be used in numerous applications including, as noted, radio signals broadcast over the air.

29. OFDM is a more advanced variant of FDM. In broad overview, OFDM differs from ordinary FDM in that OFDM uses frequency sub-bands that overlap, but are centered at precise intervals and result in an "orthogonal" property, in which the electromagnetic waves have reduced interference with each other. The basic difference between conventional FDM and OFDM is illustrated in

Figure 1.10 of Richard Van Nee et al., *OFDM for Wireless Multimedia Communications* (2000) **[Ex. 1018]** ("Van Nee"):

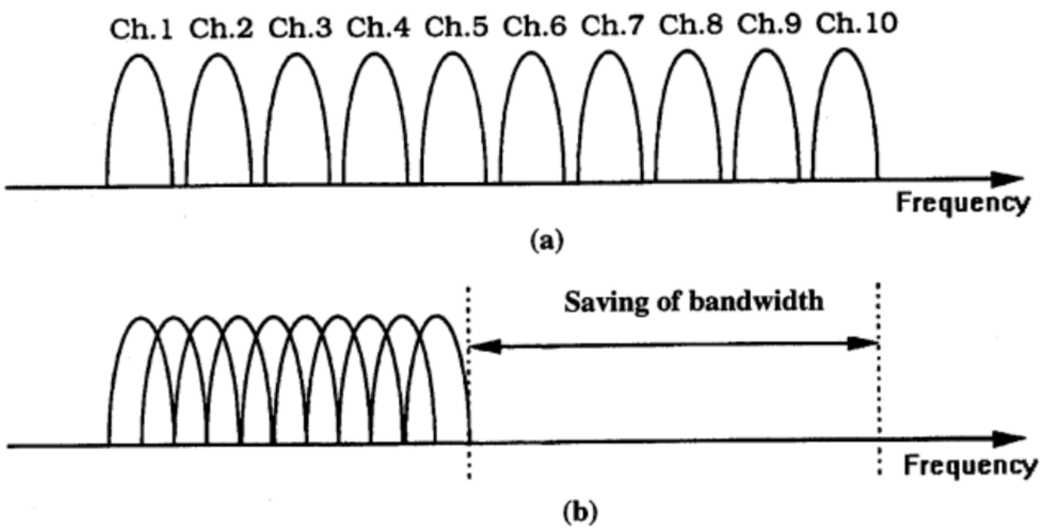

Figure 1.10 Concept of OFDM signal: (a) Conventional multicarrier technique, and (b) orthogonal multicarrier modulation technique.

(Van Nee, Fig. 1.10, at p. 22.) The top portion **(a)** of Figure 1.10 shows a conventional FDM arrangement with 10 signal channels in which each channel occupies a distinct frequency sub-band. The sub-bands in this example do not overlap because each sub-band is separated by what is known as a "guard band," which is an unused portion of the bandwidth designed to reduce interference between neighboring channels.

30. The bottom portion **(b)** of Figure 1.10 shows an OFDM arrangement also having ten signal channels or sub-bands. As shown, the sub-bands overlap, which obviates the need for a guard band and thus results in a more efficient use of

the available bandwidth. The spacing between the center frequency of each sub-band is precisely chosen such that the frequencies are "orthogonal" to each other, a characteristic that reduces interchannel interference notwithstanding the overlapping nature of the sub-bands.

31. Because the sub-bands overlap in OFDM, a mathematical method known as the fast Fourier transform ("FFT") is performed at the receiver to "demodulate" the OFDM signal to recover the individual signals carried within each sub-band. (Van Nee, at p. 47 ("[T]he basic OFDM signal is formed using the IFFT, adding a cyclic extension and performing windowing to get a steeper spectral rolloff. . . . In the receiver, the subcarriers are demodulated by an FFT, which performs the reverse operation of an IFFT.").) As I noted above, digital signal processors are well-suited for mathematical operations such as the FFT.

32. OFDM dates back as far as 1966 to a patent and technical paper by Bell Labs inventor Robert W. Chang. (U.S. Patent No. 3,488,445 entitled "Orthogonal Frequency Multiplex Transmission System" **[Ex. 1019]**; Chang, R.W., *Synthesis of band-limited orthogonal signals for multi-channel data transmission*, Bell Labs Technical Journal, no. 45, pp. 1775-1796 (Dec. 1966) **[Ex. 1020]**.) By June 2001, the OFDM technique was well known to those skilled in the art. In fact, in 1996, the University of Hamburg began hosting an annual

conference known as the International OFDM Workshop, which, as its name suggests, was specifically dedicated to OFDM technology. (Ex. 1021; Ex. 1022; Ex. 1023.)

33. OFDM is well-suited to a shared frequency band such as the radio spectrum used for wireless communication (approximately 3 Hz to 3 THz), which includes frequency bands used by various cellular systems. Because OFDM allows communication bandwidth to be shared by multiple signals (e.g., sent to different cell phones), OFDM was known by 2000 as one of a number of "multiple access" techniques that can be employed in cellular systems. (Rainer Grünheid et al., *Adaptive Modulation and Multiple Access for the OFDM Transmission Technique*, Wireless Personal Communications (May 2000) **[Ex. 1024]**, Abstract ("Since in OFDM the total bandwidth is divided into a large number of subcarriers, it can be flexibly shared among all the users."); *see also* EP 1039683 A2 **[Ex. 1007]**, at ¶¶ 0001, 0008; Cheong Yui Won et al., *A Real-time Sub-carrier Allocation Scheme for Multiple Access Downlink OFDM Transmission*, IEEE (1999) **[Ex. 1009]**; Wonjong Rhee et al., *Increase in Capacity of Multiuser OFDM System Using Dynamic Subchannel Allocation*, IEEE (2000) **[Ex. 1010]**.)

34. OFDM was deployed in a number of wireless systems prior to June 2001. For example, the ubiquitous wireless LAN technology commercially known

as “Wi-Fi” or “WiFi” uses OFDM. The OFDM air interface was standardized for use in Wi-Fi networks in 1999 in the IEEE 802.11a standard. (IEEE Std 802-11a-1999, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHz Band **[Ex. 1026]**, at 4 (“This subclause describes the PHY services provided to the IEEE 802.11 wireless LAN MAC by the 5 GHz (bands) OFDM system.”).) The commercial Digital Audio Broadcasting and Digital Video Broadcasting systems also used OFDM for wireless transmission. (U.S. Patent No. 6,125,124 **[Ex. 1027]**, at 1:19-23; *see also* U.S. Patent No. 7,133,352 **[Ex. 1028]**, at 1:36-45; U.S. Patent No. 6,108,810 **[Ex. 1029]**, at 1:31-53.) As explained in Ahmad R.S. Bahai, *Multi-Carrier Digital Communications* (1999) **[Ex. 1030]**: “OFDM has been particularly successful in numerous wireless applications, where its superior performance in multi-path environments is desirable.” (*Id.* at p. 14.)

35. As mentioned above, it was well-known that OFDM could be employed in cellular environments, and that there would be advantages to do so. Beyond its superior performance in multi-path environments, OFDM allows the allocated communication bandwidth (e.g., of a particular cell) to be shared among multiple cell phone users. The prior art before June 2001 is replete with references describing the use of OFDM in cellular systems:

- Leonard J. Cimini, Jr., *Analysis and Simulation of a Digital Mobile Channel Using Orthogonal Frequency Division Multiplexing*, IEEE Trans. Commun., Vol. 33, No. 7, pp. 665-675 (July, 1985) **[Ex. 1031]**;
- Giovanni Santella, *Performance Evaluation of Broadband Microcellular Mobile Radio in M-QAM OFDM Systems*, IEEE (1996) **[Ex. 1032]**;
- H. Rohling et al., *Performance of an OFDM-TDMA Mobile Communication System*, IEEE (1996) **[Ex. 1033]**;
- Antti Toskala et al., *Cellular OFDM/CDMA Downlink Performance in the Link and System Levels*, IEEE (1997) **[Ex. 1034]**;
- Fredrik Tufvesson et al., *Pilot Assisted Channel Estimation for OFDM in Mobile Cellular Systems*, IEEE (1997) **[Ex. 1035]**;
- Branimir Stantchev et al., *An Integrated FSK-signaling Scheme for OFDM-based Advanced Cellular Radio*, IEEE (1997) **[Ex. 1036]**;
- J. C-I Chuang, *An OFDM-based System with Dynamic Packet Assignment and Interference Suppression for Advanced Cellular Internet Service*, IEEE (1998) **[Ex. 1037]**;
- Branimir Stantchev et al., *Burst Synchronization for OFDM-based Cellular Systems with Separate Signaling Channel*, IEEE (1998) **[Ex. 1038]**;

- Kevin L. Baum, *A Synchronous Coherent OFDM Air Interface Concept for High Data Rate Cellular Systems*, IEEE (1998) **[Ex. 1039]**;
- Li Ping, *A Combined OFDM-CsDMA Approach to Cellular Mobile Communications*, IEEE Transactions on Communications, Vol. 47, No. 7, pp. 979-982 (July 1999) **[Ex. 1040]**;
- Justin Chuang et al., *High-Speed Wireless Data Access Based on Combining EDGE with Wideband OFDM*, IEEE Communications, Vol. 37, No. 11, pp. 92-98 (Nov. 1999) **[Ex. 1041]**;
- Justin Chuang et al., *Beyond 3G: Wideband Wireless Data Access Based on OFDM and Dynamic Packet Assignment*, IEEE Communications Magazine (July 2000) **[Ex. 1042]**;
- Chi-Hsiao Yih et al., *Adaptive Modulation, Power Allocation and Control for OFDM Wireless Networks*, IEEE (2000) **[Ex. 1043]**;
- Fumilhide Kojima et al., *Adaptive Sub-carriers Control Scheme for OFDM Cellular Systems*, IEEE (2000) **[Ex. 1044]**; and
- Chi-Hsiao Yih et al., *Power Allocation and Control for Coded OFDM Wireless Networks*, IEEE (2000) **[Ex. 1045]**.

36. By the late 1990s, in fact, key players in the wireless industry including Ericsson, Nokia and Sony were publishing technologies and filing patent applications on ways to use OFDM over cellular networks. These include:

- Ericsson's U.S. Patent No. 5,726,978 **[Ex. 1006]**, filed in June 1995 and issuing in March 1998 (*see id.*, 2:38-41);
- Nokia's U.S. Patent No. 5,828,650 **[Ex. 1046]**, filed in July 1996 and issuing in October 1998 (*see id.*, 4:26-30);
- Sony's EP 0786890 A2 **[Ex. 1047]**, filed in January 1997 and published in July 1997 (*see id.*, at p. 4:7-9; p. 5:28-31; *see also id.* at p. 3:20-21);
- Telia's WO 1997030531 A1 **[Ex. 1048]**, filed in January 1997 and published in August 1997 (*see id.* at p. 3:21-32, p. 9:15-17);[1]
- US 6,188,717 **[Ex. 1049]**, filed November 17, 1997 and published February 13, 2001 (*see id.*, Abstract, 1:51-55, 11:15-17 (Claim 17));
- Flarion's (a spin-off from Lucent) U.S. 6,711,120 **[Ex. 1050]**, filed March 11, 1999 (*see id.* at Abstract, 8:2-4);

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[1] The Telia reference specifically notes that "[t]he design and implementation of OFDM systems are well known to those skilled in the art of telecommunications." (Ex. 1048, at p. 9:27-29.)

- Flarion's U.S. 6,553,019 **[Ex. 1051]**, filed December 23, 1999 (*see id.* at 7:7-9);
- Lucent's U.S. 6,922,388 **[Ex. 1052]**, filed February 11, 2000 (*see id.* at 1:24-26);
- Flarion's EP 1039683 A2 **[Ex. 1007]**, filed February 28, 2000 and published September 27, 2000 (*see id.* at ¶ 0009); and
- Toshiba's U.S. 2001/0021182 **[Ex. 1053]**, filed February 26, 2001 (*see id.* at ¶¶ 0003, 0018, 0021).

37. As demonstrated by the numerous prior art publications and patent applications listed above, the communications industry had been actively developing systems for cellular communication using OFDM since at least the mid-1990s, and this continued unabated right up to the time of the alleged invention in 2001. In fact, by 2001, commercialization of cellular systems that use OFDM was already underway. (Laurie Ann Toupin, *Flash-OFDM 'Hops' Wireless Data Communications into the Main Stream* **[Ex. 1054]**.)

IV. THE '810 PATENT

A. The Specification

38. Part V of the Beckmann Declaration includes a section containing an overview of the specification of the '810 patent. To the extent applicable, I have

adopted portions of Dr. Beckmann's analysis, but provided my own overview to emphasize points that I find pertinent here.

39. The '810 patent purports to describe a system and method for delivering digital media files to an electronic device. ('810, Abstract.) The basic architecture is shown in Figure 2, reproduced at right. The right side of the figure shows a cell phone **202** (on the right) that communicates with a cellular service provider **208**. ('810, 14:13-19, 14:36-38.) On the left side is a server **206**, which includes server software **207**. ('810, 14:25-26.) In one embodiment, the patent describes a server (**206**) for storing digital media files. ('810, 15:6-7; *see also id.*, 12:56-57.) Above server **206** is a voice adapter **210** that exchanges audio (sound) signals with a public switched telephone network (PSTN), which in turn communicates with the cellular service provider **208**. ('810, 18:28-36.)

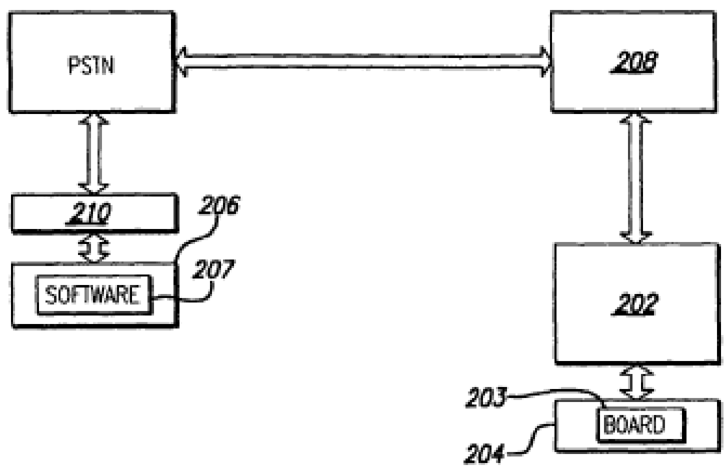


FIG. 2

40. The specification explains that the server can receive requests from the phone ('810, 12:36-59), "which may be given through user voice commands or

commands using the phone keys." ('810, 12:58-59.) If the user requests to download a particular digital media file, the server allows for the file to be transmitted to the cell phone for storage and playback. ('810, 12:47-52, 12:65-13:3, 13:33-34, 14:58-61, 15:32-42.) This is shown in Figure 2 above.

41. The '810 patent further discloses that data files, such as sound recordings, may be uploaded from an electronic device to a "personal storage locker" so that they may be downloaded later to that device or to another device. ('810, 8:33-44, 8:48-60.)

42. The '810 patent discloses that "[a]n orthogonal frequency-division multiplex (OFDM) modulation scheme" can be used for data transmission. ('810, 16:57-58.) Further, in one embodiment, the digital media file can be "compressed into an MPEG Layer 3 bit stream." ('810, 25:34-35; *see also id.*, 14:66-67, 22:31-34 (discussing "buffers" within the device memory for holding sound fragments).)

B. The Claims of the '810 Patent

43. This Declaration addresses independent claim 1, and claims 2-7, which depend, directly or indirectly from claim 1. Claim 1 reads:

> 1. A method of delivering a data file between one or more servers to a user's wireless device, the method comprising:
>
> receiving the data file from the wireless device, the wireless device including a digital signal processor and a receiver

> configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation, wherein the data file is routed through a cellular network;
>
> storing the data file received from the wireless device in the user's virtual storage locker on the the one or more servers;
>
> receiving a request from the wireless device for the data file; and
>
> providing for transmitting the data file to the wireless device using orthogonal frequency-division multiplex modulation based on the received request.

('810, 32:63-33:11 (Claim 1).) I will address the other claims in the '810 patent in my detailed analysis in **Part V** below.

V. APPLICATION OF THE PRIOR ART TO THE CLAIMS

44. I have reviewed and analyzed the prior art references and materials listed in **Part I.B** above. In my opinion, the claims of the '810 patent are invalid based on the following ground: each limitation of claims 1-7 is disclosed and rendered obvious by the teachings in Yukie (Ex. 1004), Gatherer (Ex. 1005), Prust (Ex. 1013), and Frodigh (Ex. 1006).

45. I have also provided an alternative ground below which substitutes the Frodigh (Ex. 1006) reference with Tagg, O'Hara and Pinard (Exs. 1060, 1061, and 1003) for purposes of disclosing the cellular network and OFDM limitations in

claim 1. Under this alternative ground, in my opinion, the claims of the ’810 patent are invalid based on the following ground: each limitation of claims 1-7 is disclosed and rendered obvious by the teachings in Yukie (Ex. 1004), Gatherer (Ex. 1005) and Prust (Ex. 1013), in further view of Tagg, O’Hara, and Pinard (Exs. 1060, 1061, and 1003).

46. I understand that each reference cited in the grounds identified above qualifies as prior art vis-à-vis the claims of the ’810 patent. I am informed that Yukie, Prust, and Tagg qualify as prior art at least because they are U.S. patents that issued from applications filed before June 27, 2001, the filing date of the earliest application to which the ’810 patent could claim priority. I am also informed by counsel that Frodigh, O’Hara, Gatherer, and Pinard qualify as prior art to the ’810 patent because they were published before June 27, 2001. I will provide a brief summary of these references before applying them to the claims.

A. Brief Description and Summary of the Prior Art

1. Brief Summary of Yukie [Ex. 1004]

47. **Yukie**, U.S. Patent No. 6,956,833, entitled “Method, System and Devices for Wireless Data Storage on a Server and Data Retrieval,” describes a method by which a “user device **10** establishes a wireless connection to data server **16** and sends data to data server **16** for storage and later access by user device **10**.” (Yukie, Ex. 1004, 4:23-26.) I cite Yukie as a primary reference that discloses the

majority of the limitations of the challenged claims. The overall system of Yukie is shown in Figure 1, reproduced below:

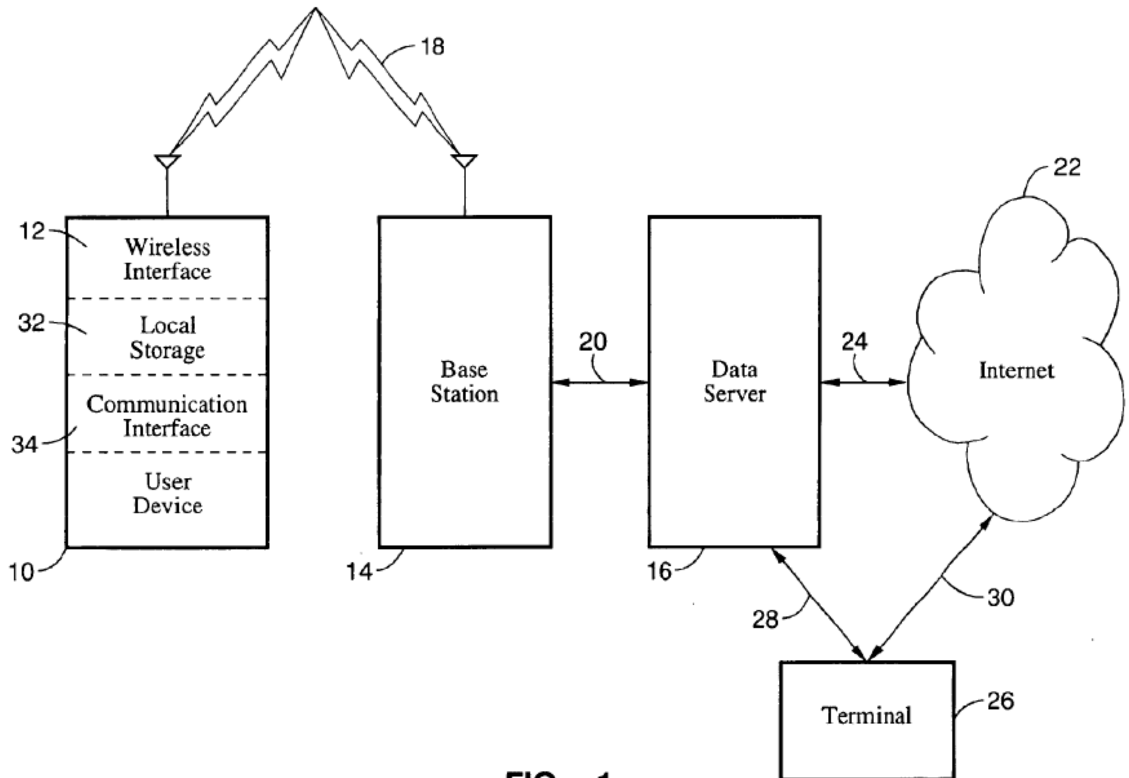


FIG. 1

User device **10** shown in Figure 1 can be "any device which receives, transmits, or otherwise utilizes data in one form or another." (Yukie, 16:67-17:2.) Yukie lists several exemplary categories of devices, including a music player:

> User device **10** can comprise any number of devices, without restriction, such as a music player, a still camera, a video camera, a video display, a car stereo, a telephonic device, a handheld control device, a game device, an appliance, a computer system, a personal digital assistant, or any like device that would ordinarily include, or be connected to, local data storage media **32**.

(*Id.*, 3:42-48.) Yukie specifically discloses that "[u]ser device **10** can also be a telephonic communication device such as a . . . cellular phone." (*Id.*, 10:41-42.) Yukie also notes that a cellular phone can have functionalities of the other categories of user devices listed above. (*Id.*, 16:64-17:6 ("As can be seen, therefore, user device **10** can take the form of a number of embodiments. While several examples have been described, the user devices are unlimited in scope. … Note also that the wireless user devices tend to fall into several categories, …") (underlining added).)

48. Yukie teaches that the user device **10** may include "audio input" components, such that it is capable of recording and storing audio electronic files. (Yukie, 10:41-43, 11:13-19; *see also id.* at 6:16-17, 6:19-20, 6:44-53 (". . . [A] microphone for audio recording . . .").) After personally recording an audio electronic file, the user may either store this file locally, or send this file to a data server **16** via a wireless connection for later retrieval and playback. (*Id.*, 6:44-53, 11:13-22.) Yukie explains that the wireless connection can be implemented in various ways, including using an analog cellular system or "readily available wireless internet protocol (IP) networks." (*Id.*, 5:14-29.)

2. Brief Summary of Gatherer [Ex. 1005]

49. **Gatherer**, entitled "DSP-Based Architectures for Mobile Communications: Past, Present and Future," is an article appearing in the January 2000 issue of the IEEE Communications Magazine. Claim 1 of the '810 patent recites a wireless device that includes a "**digital signal processor**," and dependent claim 3 states that the wireless device is a cell phone. This Declaration cites Gatherer to confirm that digital signal processors, and their use in cell phones, was known prior to June 2001.

50. Gatherer confirms that DSPs were "pervasive" in cell phones at the time of the alleged invention (Gatherer, at p. 84, left column), and that one of ordinary skill in the art would have been motivated to program a DSP to perform a variety of functions provided by the cell phone. (*Id.*, at p. 84, right column ("[O]nce the DSP was included a certain amount of 'mission creep' started to occur. As DSPs became more powerful, they started to take on other physical layer 1 tasks until all the functions in the 'DSP functions' box in Fig. 1 were included."), Fig. 1; *see also id.* at p. 85, left column ("After 1994, a single DSP was powerful enough to do all the DSP functions, making the argument for a DSP-only solution for the baseband even more compelling.").

3. Brief Summary of Prust [Ex. 1013]

51. **Prust**, U.S. Patent No. 6,714,968, entitled "Method and System for Seamless Access to Remote Storage Server Utilizing Multiple Access Interfaces Executing On the Remote Server," describes a technique for creating "virtual storage areas" on a remote server, thus allowing individual users to store and manage their data files. (Prust, 1:38-45, 4:52-61, Fig. 2.) I have cited Prust in connection with the requirement in claim 1 of storing a data file "**in the user's virtual storage locker on the the [sic] one or more servers**."

52. Figure 2 (at right) shows computing environment **200** having user computers **205** and storage servers **210**, connected to each other through a global computer network **215** such as the Internet. (Prust, 4:52-57.) The storage servers **210** form a storage network **220**, which in turn "defines a pool of virtual storage areas **225** that can be individually assignable to different users." (*Id.*, 4:59-61 (underlining added).) Each virtual storage area **225** can be accessed by the authorized user, for example, through a username and password. (*Id.*, 4:63-65, 7:64-66, 8:2-7; *see also*

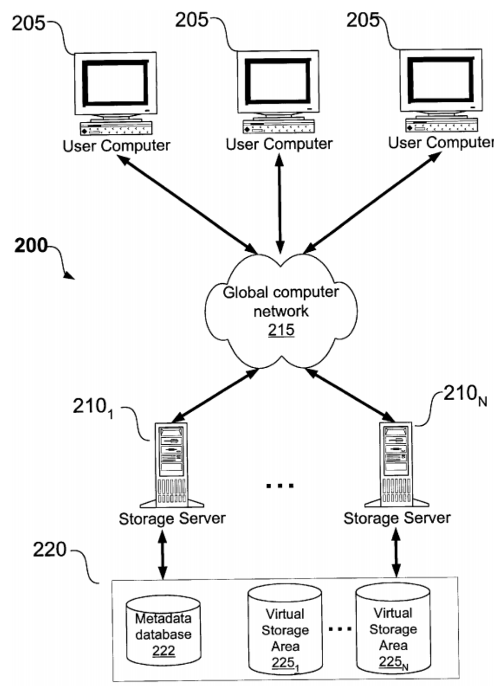


FIG. 2

id. 1:40-42 ("Authorized users can access data files . . . .").) "[S]torage network **220** allocates a storage area **225** to the user such that . . . the user can seamlessly access the corresponding virtual storage area via client computers **205**." (*Id.*, 4:65-5:5.)

53. Prust explains that the computers usable with the alleged invention can include "any server, personal computer, laptop or even a battery-powered, pocket-sized, mobile computer known as a hand-held PC or personal digital assistant (PDA)." (*Id.*, 3:38-41 (underlining added).) The computer can also include a modem **129**, which "is typically used to communicate over wide area networks . . . such as the Global Internet," and "[m]odem **129** may be connected to a network using either a wired or wireless connection." (*Id.* 4:12-15 (emphasis added).) As I will explain in detail, Prust renders the "**virtual storage locker**" limitation of claim 1 obvious in combination with Yukie.

4. Brief Summary of Frodigh [Ex. 1006]

54. **Frodigh**, U.S. Patent No. 5,726,978, entitled "Adaptive Channel Allocation in a Frequency Division Multiplexed System" describes a method and system for cellular communication using OFDM. Claim 1 of the '810 patent recites the transmission of data to a wireless device using "orthogonal frequency-division multiplex modulation," and as noted above, dependent claim 3 states that

the wireless device is a cell phone. This Declaration relies on Frodigh to disclose the OFDM transmission technique and its use with cell phones.

55. As Frodigh explains, "Frequency division multiplexing (FDM) is a method of transmitting data that has application to cellular systems. Orthogonal frequency division multiplexing (OFDM) is a particular method of FDM that is particularly suited for cellular systems." (*Id.*, 1:59-2:18.) Frodigh describes the use of OFDM modulation to transmit voice and data to a mobile station in a cellular system. (*Id.*, 7:51-63; Fig. 2.) Frodigh also discloses a receiver that can be implemented in the mobile station to receive data transmitted by OFDM modulation. (*Id.*, 8:1-9 ("In the downlink the receiver **330** is located in the mobile station … The link receiver **330** and link transmitter communicate over RF channel **380** using a subset of M of the available subcarriers."), 8:10-14, 8:33-63, Fig. 3C.)

5. Brief Summary of O'Hara [Ex. 1061], Tagg [Ex. 1060], and Pinard [Ex. 1003]

56. As I explained above, I have relied upon Frodigh (Ex. 1006) for its disclosures of transmitting information to a cell phone using OFDM. I have also provided an alternative ground in which, instead of Frodigh, I have relied on the teachings of O'Hara, Tagg and Pinard to show the OFDM and cellular network limitations in the claims.

57. Just about anyone who has used a cellular phone or a laptop computer would be familiar with IEEE 802.11 wireless networking, commercially referred to as "WiFi." IEEE 802.11 refers to a series of international standards initially published in the late 1990s by the Institute of Electrical and Electronics Engineers (IEEE). Generally speaking, IEEE 802.11 describes a series of technical standards for providing wireless networking services through one or more wireless "access points" (APs). IEEE 802.11 is a wildly popular technology that has spawned a number of variants, including IEEE 802.11a and 802.11b, the early variants published in the late 1990s, and later variants such as 802.11g, 802.11n, and 802.11ac. IEEE 802.11 is important to my analysis because IEEE 802.11**a** – one of the earlier variants of 802.11 published in the late 1990s – transmits information to mobile devices using OFDM.

58. I have cited O'Hara because, as I explain below, it discloses and confirms that IEEE 802.11a wireless networking involves the transmission of digital information to mobile devices using OFDM. I have cited to Tagg because it discloses that it was known, prior to the alleged invention, to incorporate IEEE 802.11 functionality into a cell phone. It therefore would have been obvious to adapt the user device **10** of Yukie (which can be a cell phone) to receive data files

wirelessly using IEEE 802.11a, thus disclosing transmission of data files using OFDM as recited in the challenged claims.

59. **O'Hara**, published in 1999, provides "a guide for those who will implement interoperable IEEE 802.11 2.4 GHz and 5GHz LAN (WLAN) product." (O'Hara, at p. v (under "Acknowledgment").) O'Hara explains that wireless LANs "are exploding in popularity." (*Id.* at p. viii.) "One of the key drivers of this new market expansion," according to O'Hara, "is the IEEE 802.11 standard." (*Id.*) O'Hara confirms that the IEEE 802.11a variant used OFDM. (*Id.* at p. 143 ("In July of 1998, the IEEE 802.11 Working Group adopted OFDM modulation as the basis for IEEE 802.11a."); *id.* at p. 139 ("The IEEE 802.11a PHY is one of the physical layer (PHY) extensions of IEEE 802.11a and is referred to as the orthogonal frequency division multiplexing (OFDM) PHY. The OFDM PHY provides the capability to transmit PSDU[2] frames at multiple data rates up to 54 Mbps for WLAN networks where transmission of multimedia content is a consideration.").)

[2] The term "PSDU" refers to a PLCP data unit, a basic unit of data for transmission over an IEEE network. (O'Hara, at p. 174 (explaining PSDU acronym), *id.* at p. 141 (Fig. 7-1, showing OFDM header and PSDU).)

60. **Tagg**, entitled "Cooperative Network for Mobile Internet Access," discloses a technique for allowing a mobile device (such as a cellular phone) to communicate over the Internet using a number of IEEE 802.11 access points. I have relied on Tagg for the simple proposition that a cellular phone, such as user device **10** in Yukie, could incorporate IEEE 802.11 wireless networking capability, and use that technology (instead of connections with traditional cell towers) to receive data files. Figure 1 of Tagg provides a basic overview of the system:

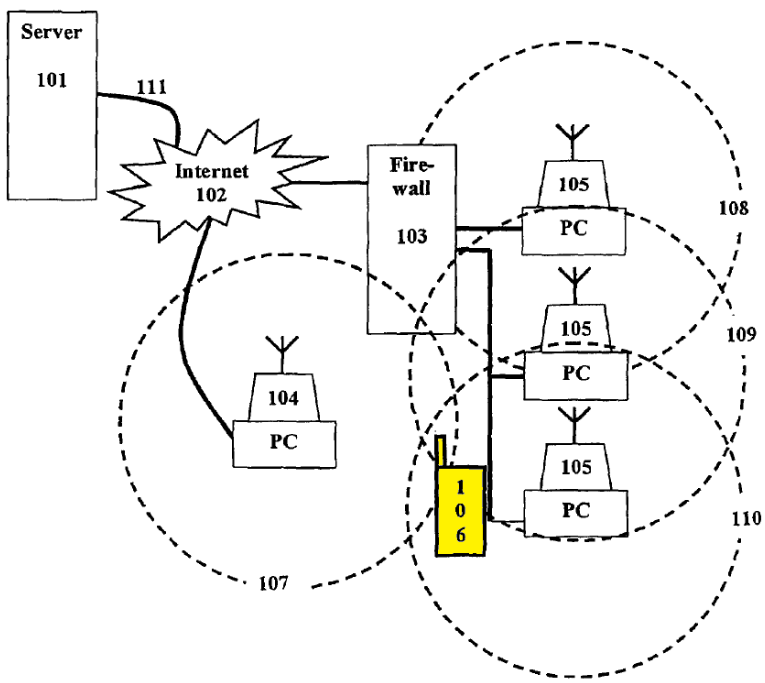


Fig. 1

(Tagg, Fig. 1.) Mobile roaming device **106**, shown highlighted in yellow, may be a "mobile computer, PDA, <u>cellular telephone</u>, or home appliance." (*Id.*, 8:53-66 (underlining added).) The circles shown in Figure 1 (**107-110**) show the range of wireless network access provided by fixed devices **104** and **105**. (*Id.*, 7:63-66.)

61. The gist of the Tagg reference is the ability of the mobile device **106** to switch between a number of available wireless technologies that will provide the best connectivity. As explained in Tagg, "[t]he mobile device determines the connection methodologies available to it and their relative merits and then connects to the host using the best available standards." (*Id.*, 6:67-7:2.) Although Tagg discloses Cooperative Tunneling Agent (CTA) software for evaluating available networks and performing a handoff from one wireless network to another, those details go far beyond the requirements of the challenged claims. I have cited Tagg for the more pedestrian proposition that a cell phone (such as the one in Yukie) can incorporate IEEE 802.11 wireless networking – a proposition that Tagg clearly confirms. In one embodiment in Tagg, for example, a cellular phone can determine when a suitable IEEE 802.11 wireless network is available, and then switch to that network to access the Internet or carry out voice telephone calls. (*Id.*, 5:22-34, 11:20-46 & 11:60-12:26 (describing handoff process from cellular to 802.11 networks); Fig. 9.)

62. Tagg confirms that allowing a cellular phone to alternatively switch to IEEE 802.11 wireless networks has distinct and obvious advantages. For example, Tagg explains that some cellular networks often provided limited potential

connection speeds (*Id.*, 11:24-28 ("9.6 Kbps")), and the greater network throughput provided by alternative wireless networks allows mobile users to take advantage of "high bandwidth services such as MP3 files and movies." (*Id.*, 5:27-29.) The cost savings are, of course, obvious. It was well-known that use of cellular services provided by traditional carriers (such as AT&T), including cellular data services, was potentially costly. Tagg explains, however, that "[a] cell phone located within 100 feet of a fixed host device can connect to the Internet through that device, obtaining phone calls at a fraction of the cost of a regular cellular connection." (*Id.*, 5:31-33; *see also id.*, 5:64-66 ("Our technology sits between the user and the Internet constantly negotiating the most cost effective means by which they can gain access.").)

63. I note that claim 1 further recites that "the data file is routed through a **cellular network**," for which I have cited the **Pinard** reference. The term "cellular network" is often equated by the lay public with large scale commercial cellular telephone providers such as AT&T, T-Mobile, and Sprint. But the term "cellular network" has a more precise and technical definition. As I explained in **Part III.A** above, a cellular network is a network in which wireless communications are provided through a series of "cells," each cell providing network access for a particular geographic area. *See also:*

- *Webster's New Dictionary of the English Language* (2001), Ex. 1055, at p. 84, (definition of "cellular" as "of, relating to, or being a radiotelephone system in which a geographical area is divided into small sections each served by a transmitter of limited range");
- *The Dictionary of Multimedia Terms & Acronyms* (1997), Ex. 1056, at p. 38 ("Describes a means of dividing an area into regions, or cells, so that each region becomes a network in which every point exists within the range of a central transmission facility");
- *Encarta World English Dictionary* (1999), Ex. 1057, at p. 294 ("organized as a system of cells, especially for radio communication");
- *Modern Dictionary of Electronics* (1999), Ex. 1058, at p. 106 ("Type of mobile telephone service in which the geographic serving area is divided into subregions (cells), each with its own antenna and switching node");
- *The Oxford American Desk Dictionary* (1998), Ex. 1059, at p. 91 ("system of mobile radiotelephone transmission with an area divided into 'cells,' each served by its own transmitter");

- *Merriam-Webster's Collegiate Dictionary* (1996), Ex. 1067, at p. 184 ("of, relating to, or being a radiotelephone system in which a geographical area (as a city) is divided into small sections each served by a transmitter of limited range so that any available radio channel can be used in different parts of the area simultaneously");
- *McGraw-Hill Illustrated Telecom Dictionary* (2000), Ex. 1068, at p. 116 ("A wireless local telephone service that operates by dividing a geographical area into sections (*cells*). Each cell has its own transmitter/receiver that tracks and operates with cellular telephones within its area. The dimensions of a cell can range from several hundred feed to several miles.").

64. The term "cellular network" under its broadest reasonable construction, therefore, is not limited to a particular type of wireless networking technology, or technology that provides the same type of wireless range as a commercial cellular carrier.

65. In this regard, I have cited **<u>Pinard</u>** for the simple proposition that a "cellular network" can be built based on IEEE 802.11 wireless access points. Pinard states that it "relates generally to preemptive roaming among cells in a cellular network. In particular the invention relates to a local area wireless

network including a plurality of mobile units and a plurality of access points." (Pinard, 1:21-24.)

66. More specifically, Pinard discloses a technique for improving the way in which a mobile unit selects the access point with which it will associate for purposes of wireless communication. (*Id.*, 2:16-22.) "Each mobile unit may select a group of eligible access points and select the most eligible access point from that group." (*Id.*, 2:45-47.) The selection may be based on the signal strength of the access points and the number of mobile units connected to each access point (the "loading factor"). (*Id.*, 2:30-50.) Pinard expressly confirms that "[t]he cellular communications network may comprise a 1 Mbps frequency-hopping spread spectrum wireless LAN conforming to the IEEE 802.11 draft specification." (*Id.*, 2:50-53.) Pinard refers to the "IEEE 802.11 draft specification" because the standard had not yet been finalized when Pinard was filed in 1995.

67. A person of ordinary skill in the art by June 2001 would have understood "IEEE 802.11," as referenced in Pinard, to include the wider range of IEEE 802.11 technologies available by the time the standard was published, including IEEE 802.11a and its higher bit rates.

68. As I will explain in **Part V.D** below, the OFDM and cellular network limitations of the challenged claims would have been obvious over O'Hara, Tagg, and Pinard.

B. Ground 1: Claims 1-7 Based on Yukie, Gatherer, Prust, and Frodigh

1. Independent Claim 1

69. I have reproduced independent claim 1 below, and divided up the limitations using bracketed notations (e.g. "[a]," "[b]," etc.) to facilitate easier identification of the limitations in my analysis below:

1. A method of delivering a data file between one or more servers to a user's wireless device, the method comprising:

[a] receiving the data file from the wireless device, the wireless device including a digital signal processor and a receiver configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation, wherein the data file is routed through a cellular network;

[b] storing the data file received from the wireless device in the user's virtual storage locker on the the [sic] one or more servers;

[c] receiving a request from the wireless device for the data file; and

[d] providing for transmitting the data file to the wireless device using orthogonal frequency-division multiplex modulation

based on the received request.

('810, 32:63-33:11 (Claim 1).) Each limitation of claim 1 is disclosed and rendered obvious by Yukie in view of Gatherer, Prust, and Frodigh.

70. The preamble of claim 1 recites, "**[a] method of delivering a data file between one or more servers to a user's wireless device**." Assuming the preamble of claim 1 provides a claim limitation, it is fully disclosed by Yukie.

71. As I explained in Part **V.A** above, Yukie discloses a system for allowing a user to upload files to a remote server from a user device. The files can later be retrieved wirelessly from the remote server where they were stored:

> The present invention addresses the limitations associated with relying on local data storage media by employing a wireless communications link to a remote data server. By way of example, and not of limitation, a video camera, still camera, laptop computer, or other device which normally stores data in local memory such as film, disk, random access memory, memory sticks, or other forms of storage would transmit the data to a remote server through a wireless connection. The data would be saved on the remote server for subsequent retrieval through, for example, the Internet or a wireless connection to the server.

(Yukie, 2:31-41 (underlining added).)

72. As noted previously, the user device **10** can be a "cellular phone" or incorporate the capabilities of a cell phone. (*Id.*, 10:41-43 ("User device **10** can also be a telephonic communication device such as a telephone, cellular phone, telephonically enabled personal digital assistant (PDA) . . . .") (underlining added), 3:42-48, 16:64-7:6 ("As can be seen, therefore, user device **10** can take the form of a number of embodiments. While several examples have been described, the user devices are unlimited in scope. … Note also that the wireless user devices tend to fall into several categories, …") (underlining added).) Further details on Yukie's disclosures of wireless retrieval of files are provided in the description of the limitations below. Yukie therefore discloses "[a] method of delivering a data file between one or more servers to a user's wireless device," as recited in the preamble.

a. "receiving the data file from the wireless device, the wireless device including a digital signal processor and a receiver configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation, wherein the data file is routed through a cellular network" (Claim 1[a])

73. In light of the length of this claim limitation, I will divide it into pieces to ensure that I cover all of its elements. As I explain below, this limitation is disclosed by and obvious over Yukie in view of Gatherer, and Frodigh.

"receiving the data file from the wireless device"

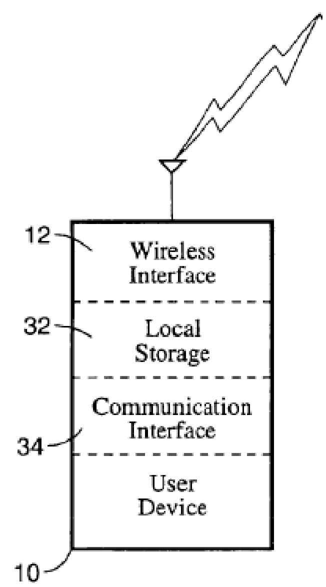
74. Yukie explains that the remote server receives the data file from the wireless device: "According to one mode of operation, user device **10** establishes a wireless connection to data server **16** and sends data to data server **16** for storage and later access by user device **10**." (Yukie, 4:23-26 (underlining added); *see also id.*, 2:31-41 ("The present invention addresses the limitations associated with relying on local data storage media by employing a wireless communications link to a remote data server. By way of example, and not of limitation, a video camera, still camera, laptop computer, or other device which normally stores data in local memory such as film, disk, random access memory, memory sticks, or other forms of storage would transmit the data to a remote server through a wireless connection. The data would be saved on the remote server for subsequent retrieval through, for example, the Internet or a wireless connection to the server.") (underlining added).)

75. Yukie discloses an example in which, in the context of a wireless telephone, the user can create an electronic file containing an audio recording, which can be wirelessly transmitted to data server **16** for storage. (*Id.*, 11:13-19 ("If desired, any of the embodiments of the telephonic device, including the fax machine, could include audio input and output components, available for telephony

functions for audio recording and playback. The device can store audio as audio data in electronic files. The audio data can be stored locally in local storage media **32**, or on data server **16** across the wireless connection, as described above.") (underlining added).)

76. Yukie further discloses examples of user device **10** wirelessly transmitting other types of files to data server **16** for storage. (*Id.*, *e.g.*, 6:44-51 (music player having ability to send audio recordings to server **16** for storage), 6:58-63 (still image camera having ability to send image file to server **16** for storage), 7:37-47 (same; video camera embodiment).) As previously noted, Yukie makes clear that the user device **10** ("wireless device") can be a cellular telephone that incorporates the capabilities of other types of devices, including music players and cameras. (*Id.*, 10:41-43, 3:42-48, 16:64-7:6.) Yukie therefore discloses the step of "receiving a data file from the wireless device."

"the wireless device including a digital signal processor and a receiver"



77. As I explained above, Yukie discloses a "wireless device" in the form of "user device **10**," which can be a cellular telephone. Yukie further explains that the cell phone includes a processor and a receiver. The excerpt of

Figure 1, shown at the right, shows user device **10** including wireless interface **12**. (*Id.*, 10:41-49 ("User device **10** can also be a telephonic communication device such as a telephone, cellular phone, telephonically enabled personal digital assistant (PDA), or fax machine. . . The telephonic device would also include wireless interface **12**, or be compatible with a wireless connection component for wirelessly accessing a network, such as the Internet.") (underlining added).) As explained in Yukie: "Wireless interface **12** can be a receiver only, a transmitter only, or be a transceiver for bi-directional communications." (*Id.*, 3:56-57 (underlining added).) This sentence explains that the wireless interface "can be a receiver, or be a transceiver," the term "transceiver" referring to a device that combines the functions of a transmitter and a receiver. (*Comprehensive Dictionary of Electrical Engineering*, Ex. 1025, p. 647 ("transceiver [:] a device that can serve as both a transmitter and receiver.).) Either way, the wireless device disclosed in Yukie clearly includes "**a receiver**," as recited in the claim.

78. Next, Yukie explains that the cell phone includes a "**processor**." (Yukie, 5:9-12 ("Note also that operation and control of user device **10**, as well as associated peripheral devices, can comprise various forms and be implemented through software executed by hardware including memory and a processor.") (underlining added).)

79. Yukie does not appear to expressly disclose that the cell phone includes a "**digital signal processor**," but it was well-known to persons of ordinary skill in the art that cell phones of the sort disclosed in Yukie could include one or more digital signal processors, which were advantageously used for functions such as speech coding and noise suppression. Thus, one of ordinary skill in the art would have understood and found it obvious that the cell phone in Yukie could include a digital signal processor. To the extent there is any question, this detail is confirmed and expressly disclosed by **Gatherer**.

80. As Gatherer explains, "[p]rogrammable digital signal processors (DSPs) are pervasive in the wireless handset market for digital cellular telephony." (Gatherer, at p. 84, left column (underlining added).) In fact, according to Gatherer, one historical approach to the implementation of cell phones had "emphasize[d]" programmable DSPs. (Gatherer, at p. 84, left column.) For example, as I mentioned above, "[t]he voice coder is the part of the architecture that most engineers agree should be done on a DSP." (*Id.*, at p. 84, right column (emphasis added).)

81. Gatherer also discloses that digital signal processors were widely used in cell phones for a variety of other functions. (*Id.*, p. 85, Figs 1 & 2 (showing DSP functions as including vocoding, speech coding, noise suppression, echo

cancellation, speech recognition, equalizing, interleaving, channel coding, ciphering, burst formatting, <u>demodulating</u>, equalizing, and PCA).)

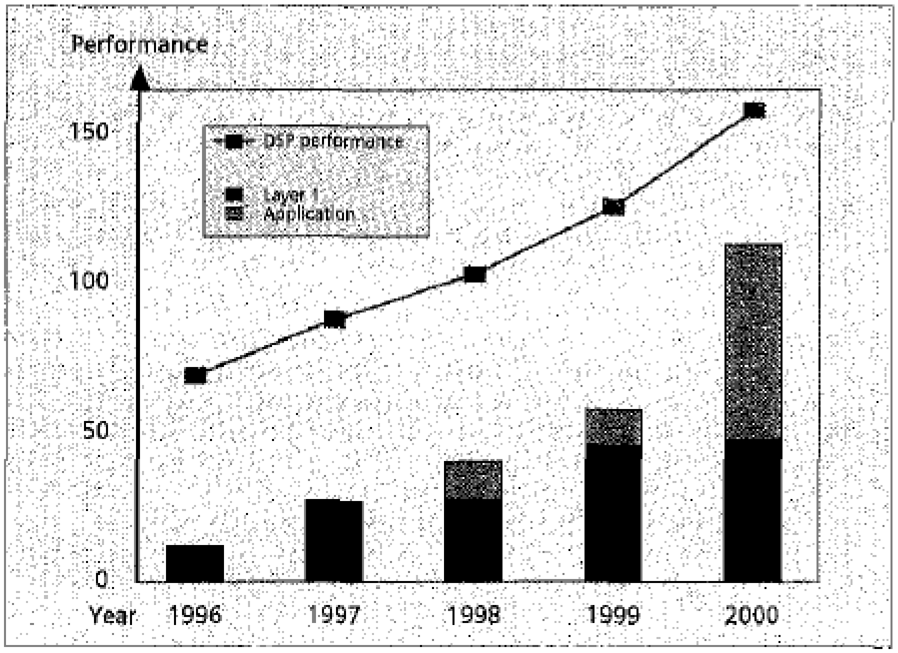
82. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Yukie with Gatherer, predictably resulting in a cell phone that included one or more digital signal processors. Yukie and Gatherer are analogous references in the same field of describing features of cellular phones. In fact, like Yukie, Gatherer recognized that cell phones can be used to download data files. (Gatherer, *e.g.*, at p. 89, left column ("Audio and visual entertainment could be delivered wirelessly to mobile subscribers.").) A person of ordinary skill in the art implementing the cell phone of Yukie would naturally have consulted Gatherer in ascertaining the features and components of cell phones, and would have understood that the two references pertain to the same technology area and are readily combinable.

83. Gatherer also provides express motivations to combine in the manner described above. Gatherer explains that relying on DSPs rather than application-specific integrated circuits (ASICs) to perform the processing required by cell phones provides flexibility because DSPs are programmable. (*Id.*, at p. 84, left column ("We summarize some of the up and coming applications for the new third-generation wireless personal assistants to show that, if anything, <u>flexibility is</u>

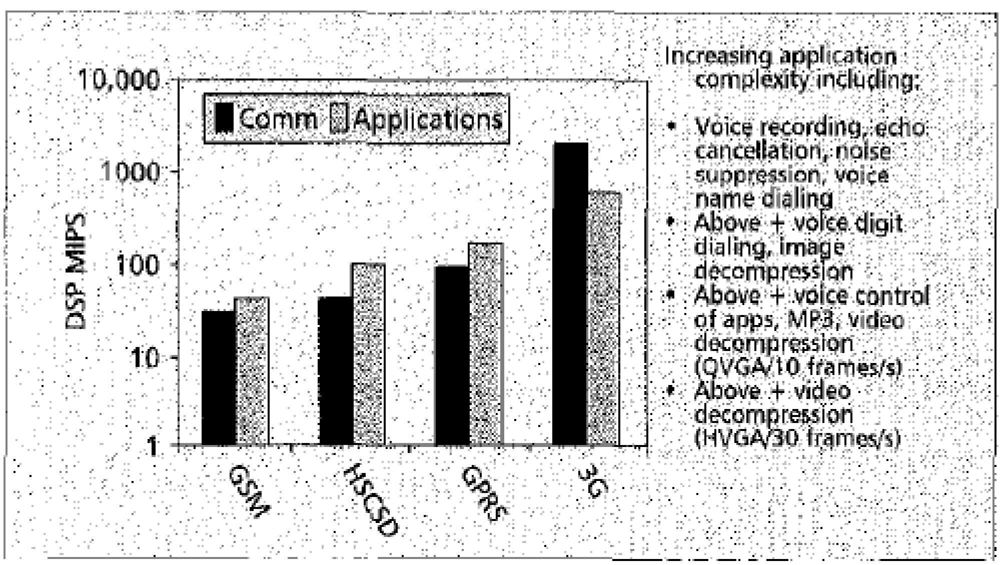
becoming more of an issue, and therefore the programmability offered by DSPs is even more desirable.”); at p. 85, left column (“[E]ach generation of phone had a slightly different physical layer from the previous one, and upgrades to ASIC-based solutions became costly and difficult. Because DSPs were now being designed with low-power wireless applications in mind, the power savings to be had from ASIC implementation of DSP functions was not significant enough that system designers were willing to live with the lack of flexibility.”) (emphasis added).) As such, “programmable DSPs [were] **essential** to provide a cost-effective, flexible upgrade path for the variety of evolving standards.” (*Id.*, at p. 85, right column – p. 86, left column (emphasis added).)

84. The advantages provided by DSPs were not limited to their flexibility. Gatherer notes that DSPs were known for their ever-increasing performance (measured in “MIPS”), and as such, were well suited for applications beyond traditional voice functionality. (Gatherer, at p. 85, left column (“It is also true that as GSM phones have evolved, they have gradually moved beyond the simple phone function, and this has led to an increase in the fraction of the DSP MIPS used by something other than physical layer 1. This evolution is shown in Fig. 3. With the advent of wireless data applications and the increased bandwidth of 3G,

we expect this trend to accelerate.") (underlining added); Figs. 3, 7 (reproduced below).)



■ **Figure 3.** *Layer 1 and application MIPS with time.*



■ **Figure 7.** *Applications drive DSP MIPS.*

85. Accordingly, the advantages offered by DSPs in terms of flexibility and processing power would have motivated a person of ordinary skill in the art to implement the cell phone in Yukie using a digital signal processor. Indeed, Gatherer explicitly predicted that the "power-efficient media processing" and "flexibility and upgradeability" provided by digital signal processors would secure their place in "future data-centric mobile devices." (Gatherer, at p. 89, right column.)

86. One of ordinary skill in the art would also have been motivated to make the proposed combination by the widespread availability of off-the-shelf DSPs. In fact, using DSP for such wireless applications was mainstream in the cellphone industry, and not using DSP could be considered as out of the mainstream, and in some cases even awkward. As Gatherer explains, "because of the growing importance of the wireless market (more than 400 million units projected for 2000), there [were] [then] several DSPs on the market that have been designed with wireless applications in mind, for instance, the Lucent 16000 series and the ADI21xx series. This level of effort by several companies [was] a sign that the collective wisdom of the marketplace has chosen to bet on a programmable DSP future for wireless technology." (Gatherer, at p. 86.) This environment would have motivated a person of ordinary skill in the art to incorporate one or

more digital signal processors into the cell phone described in Yukie. Yukie in combination with Gatherer therefore discloses and renders obvious the requirement that the wireless device include "**a digital signal processor**."

"configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation"

87. As I explained above, Yukie discloses a "user device **10**," which can be a cell phone, that is configured to transmit files over a wireless communication network to a remote server for storage and later retrieval. (Yukie, *e.g.*, 4:23-26, 2:31-41, 11:13-19.) Yukie further discloses that user device **10** is configured for wirelessly retrieving and processing ("handling") digital media transmitted to user device **10** by data server **16**. (*Id.*, 11:2-6 ("With minimal local storage, the telephonic device would use data server **16** across the wireless connection for data storage. The data stored on data server **16** can be accessed on demand by the telephonic device through requests to data server **16**.").)

88. For example, user device **10** can receive audio files, video files, or other types of files from data server **16** and present the received files to the user. (*Id.*, 11:16-22 ("The device can store audio as audio data in electronic files. The audio data can be stored locally in local storage media **32**, or on data server **16** across the wireless connection, as described above. For playback, the device would download audio data in an audio stream from data server **16** and outputs the audio

in real-time."); *see also, e.g.*, 6:28-34 (music file: "In response to a selection by the user, the music player would request an audio file from data server **16** and data server **16** would send the file to the music player across the wireless connection. The music player receives the requested file from data server **16** and plays the file, such as by decoding the file and outputting corresponding audio through a speaker."), 7:14-20 & 8:2-7 (image file: "In response to a selection by the user, the camera would request an image file from data server **16** and the server would send the file to the camera across the wireless connection. The camera would receive the requested file from data server **16** and display the image stored in the file, such as by decoding the file and displaying the image on the display."), 8:49-56 (same; video file).)

89. As noted, the user device **10** can be a cellular telephone that incorporates the capabilities of other types of devices, including music players and cameras. (*Id.*, 10:41-43, 3:42-48, 16:64-7:6.) Yukie therefore discloses that the wireless device is "**configured for the handling of digital media**" that is "**transmitted**" to the device by the server, as claimed.

90. Although Yukie does not disclose transmission of the data files to user device **10** "**by orthogonal frequency-division multiplex modulation**," this would have been obvious in view of Frodigh. As I discussed in **Part V.A** above, Frodigh

describes a data transmission technique called "orthogonal frequency division multiplexing," or "OFDM" for short. (Frodigh, 1:61.) As Frodigh explains:

> Frequency division multiplexing (FDM) is a method of transmitting data that has application to cellular systems. Orthogonal frequency division multiplexing (OFDM) is a particular method of FDM that is **particularly suited for cellular systems**. An OFDM signal consists of a number of subcarriers multiplexed together, each subcarrier at a different frequency and each modulated by a signal which varies discretely rather than continuously. … Generally, N serial data elements modulate N subcarrier frequencies, which are then frequency division multiplexed. …

(*Id.*, 1:59-2:18 (emphasis added).) Frodigh goes on to describe the use of OFDM modulation to transmit voice and data to a "mobile station"[3] in a cellular system. (*Id.*, 7:51-63; Fig. 2.) In particular, Frodigh describes a "receiver **330**" that can be implemented in the mobile station to handle data transmitted by OFDM modulation. (*Id.*, 8:1-9 ("In the downlink the receiver **330** is located in the mobile

[3] A person of ordinary skill in the art would have understood that the term "mobile station" includes a cellular phone. (Frodigh, 1:13-16 ("In a cellular telecommunications system the user of a mobile station communicates with the system through a radio interface while moving about the geographic coverage area of the system.").)

station … The link receiver **330** and link transmitter communicate over RF channel **380** using a subset of M of the available subcarriers.”), 8:10-14, 8:33-63; Fig. 3C.) Frodigh therefore discloses that a cell phone can be configured for handling data transmitted by OFDM.

91. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Yukie with Frodigh, predictably resulting in a cell phone configured to handle digital files, as disclosed in Yukie, in which the files are transmitted to the wireless device by OFDM modulation.

92. Yukie and Frodigh are analogous references in the same field of wireless communication. Yukie specifically discloses that user device **10** could be a cell phone, and could receive both voice and data. (Yukie, 10:41-49 (“User device **10** can also be a telephonic communication device such as a telephone, cellular phone, telephonically enabled personal digital assistant (PDA), or fax machine. The telephonic device would include conventional components for receiving voice communication, such as over the PSTN or over a cellular voice system. The telephonic device would also include wireless interface **12**, or be compatible with a wireless connection component for wirelessly accessing a network, such as the Internet.”), 10:64-66 (“The telephonic device can also include local storage media 32 for storing data, such as directories, documents, or data

downloaded from the Internet.") (underlining added).) Like Yukie, Frodigh recognized that "data," in addition to "voice," can be received by a mobile device. (Frodigh, 7:58-59 ("Voice and data to be transmitted on each link are modulated onto a number (M) subcarriers.") (underlining added).)

93. As such, one of ordinary skill in the art would have found the OFDM transmission technique in Frodigh to be a natural combination with the cellular phone in Yukie.

94. Frodigh also provides express motivations to combine in the manner described above. As noted, Frodigh teaches that OFDM modulation is "particularly suited for cellular systems." (Frodigh, 1:62-63.) Indeed, Frodigh explains in detail the advantages of using OFDM in a cellular system:

> OFDM offers several advantages that are desirable in a cellular system. In OFDM the orthogonality of the subcarriers in the frequency spectrum allows the overall spectrum of an OFDM signal to be close to rectangular. This results in efficient use of the bandwidth available to a system. OFDM also offers advantages in that interference caused by multipath propagation effects is reduced. Multipath propagation effects are caused by radio wave scattering from buildings and other structures in the path of the radio wave. Multipath propagation may result in frequency selective multipath fading. In an OFDM system the spectrum of each individual data element normally occupies only a small part of the available

> bandwidth. This has the effect of spreading out a multipath fade over many symbols. This effectively randomizes burst errors caused by the frequency selective multipath fading, so that instead of one or several symbols being completely destroyed, many symbols are only slightly distorted. Additionally, OFDM offers the advantage that the time period T may be chosen to be relatively large as compared with symbol delay time on the transmission channel. This has the effect of reducing intersymbol interference caused by receiving portions of different symbols at the same time.[4]

(Frodigh, 2:38-60 (underlining added).) One of ordinary skill in the art would have been motivated by the advantages described in Frodigh to use the OFDM modulation technique to transmit data files to cellular phones.

95. Moreover, as I noted in **Part III.C** above, OFDM was one of a finite number of known techniques for enabling "multiple access," a requisite feature of cellular networks. As further noted, the communications industry – including telecom heavyweights Ericsson and Nokia – had actively developed cellular systems employing OFDM for over a decade, and commercialization of such systems was already underway. Under these circumstances, a person of ordinary

[4] I note that the mitigation of intersymbol interference is a benefit of OFDM that the ’810 patent itself acknowledges. (’810, 16:58-60.)

skill in the art would have had every expectation of success in combining Frodigh with Yukie in the manner described above.

96. I acknowledge that the claim presents an ambiguity as to which recited element must be "configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation." For context, claim 1 recites a "<u>wireless device including a digital signal processor and a receiver configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation</u>." There are two reasonable ways to interpret this limitation. First, it could be that the "**wireless device**" is configured as recited. Second, the claim could be interpreted to require that the "digital signal processor and receiver" be configured, respectively, for handling digital media, as recited.

97. In my opinion, it does not matter which interpretation is employed, as neither would give rise to a meaningful distinction over the prior art. Even if the claim requires that the "digital signal processor and receiver" (and not just the wireless device itself) be "configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation," this would nevertheless have been obvious, as I explain below.

<u>Receiver</u>

98. Any requirement that the <u>receiver</u> be configured for the handling of digital media transmitted by OFDM is satisfied by Frodigh. As I mentioned above, Frodigh teaches a "receiver **330**" that can be implemented in a mobile station to receive data transmitted by OFDM modulation. (Frodigh, 8:2-9 ("In the downlink <u>the receiver **330** is located in the mobile station</u> … The link receiver **330** and link transmitter communicate over RF channel **380** using a subset of M of the available subcarriers.").) This receiver is shown in Figure 3C, reproduced below.

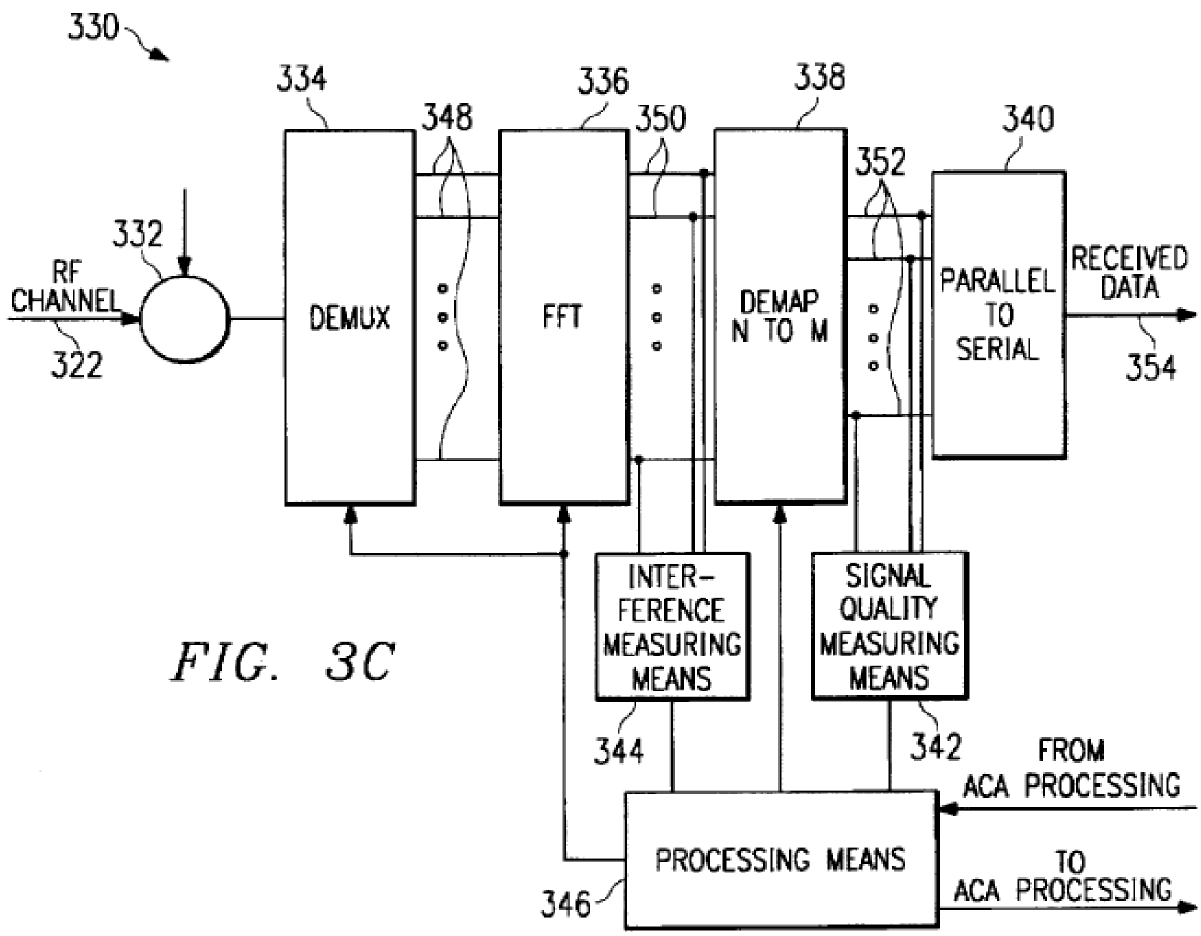


FIG. 3C

(*Id.*, Fig. 3C; *see also id.* 8:10-14.)

99. As Frodigh explains, "[r]eceiver **330** includes demodulator **332**, frequency demultiplexer (DEMUX) **334**, fast fourier transform (FFT) circuitry **336**, de-mapping circuitry (DEMAP) **338**, a parallel to serial converter **340**, interference measuring means **344**, signal quality measurement means **342** and processor **346**." (*Id.*, 8:33-38.) Frodigh describes in detail how the receiver **330** receives and processes data transmitted by OFDM modulation:

> In receiver operation, the system RF carrier is received on the system RF channel **322** and then demodulated at demodulator **332**, and demultiplexed at DEMUX **334** to obtain N samples **348** of the signal containing, the M multiplexed subcarriers. A fast fourier transform (FFT) is then performed by FFT circuitry **336** with the N samples **348** as inputs to generate data signals **350** containing any modulating data that was transmitted on each subcarrier. The N subcarriers demodulated and subjected to the FFT are determined by parameters input to DEMUX **334** and FFT circuitry **336** from processor **346**. … The N received data signals **350** are then input to the de-mapping block **338** where the M data signals **352** received on the M subcarrier frequencies currently assigned to link communications are de-mapped from the N data signals **350**. The de-maping is done according to parameters input to DEMAP block **338** from processor **346**. The M de-mapped data signals **352** are then input to the parallel to serial converter **340** and converted into serial received data **354**. …

(*Id.*, 8:38-63.)

100. As noted, Frodigh makes clear that the data received and processed by the receiver **330** can include non-voice data. (*Id.*, 7:58-59 ("Voice and data to be transmitted on each link are modulated onto a number (M) subcarriers.") (underlining added).) Frodigh therefore discloses and renders obvious a receiver "configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation," to the extent this is required by the claim. The rationale and motivation for adapting the OFDM receiver of Frodigh to the cell phone in Yukie is provided above.

Digital Signal Processor

101. Any requirement that the digital signal processor be configured for the handling of digital media transmitted by OFDM is also satisfied by the prior art. As I explain below, it would have been obvious in view of Gatherer that a digital signal processor included in the cell phone could handle data transmitted by OFDM modulation, thus satisfying any requirement imposed by the claim that the digital signal processor be configured for "the handling of digital media transmitted by orthogonal frequency-division multiplex modulation."

102. As I mentioned above, Gatherer discloses that a desirable feature of digital signal processors is their programmability. (Gatherer, at p.84, left column

("[F]lexibility is becoming more of an issue, and therefore the programmability offered by DSPs is even more desirable.").) Gatherer further explains that as digital signal processors became more powerful, they were used to implement a growing number of functions performed by cell phones. (*Id.*, at p.84, right column ("[O]nce the DSP was included a certain amount of 'mission creep' started to occur. As DSPs became more powerful, they started to take on other physical layer 1 tasks until all the functions in the 'DSP functions' box in Fig. 1 were included."); *id.*, at p. 85, Fig. 1 (showing that DSP functions include GSM vocoder, channel codec, interleaving/deinterleaving, ciphering/deciphering, burst formating, demodulator, and equalizer); *see also id.* at p.85, left column ("After 1994, a single DSP was powerful enough to do all the DSP functions, making the argument for a DSP-only solution for the baseband even more compelling.").) As such, one of ordinary skill in the art would have understood and found it obvious that, when included in a cell phone that receives digital files transmitted by OFDM modulation, the digital signal processor could handle the OFDM signals.

103. One of ordinary skill in the art would have had ample motivations to implement functions of the OFDM receiver using a digital signal processor. To begin with, it was well known that DSPs could be programmed to handle OFDM signals. (E. Lawrey, *Multiuser OFDM*, Fifth International Symposium on Signal

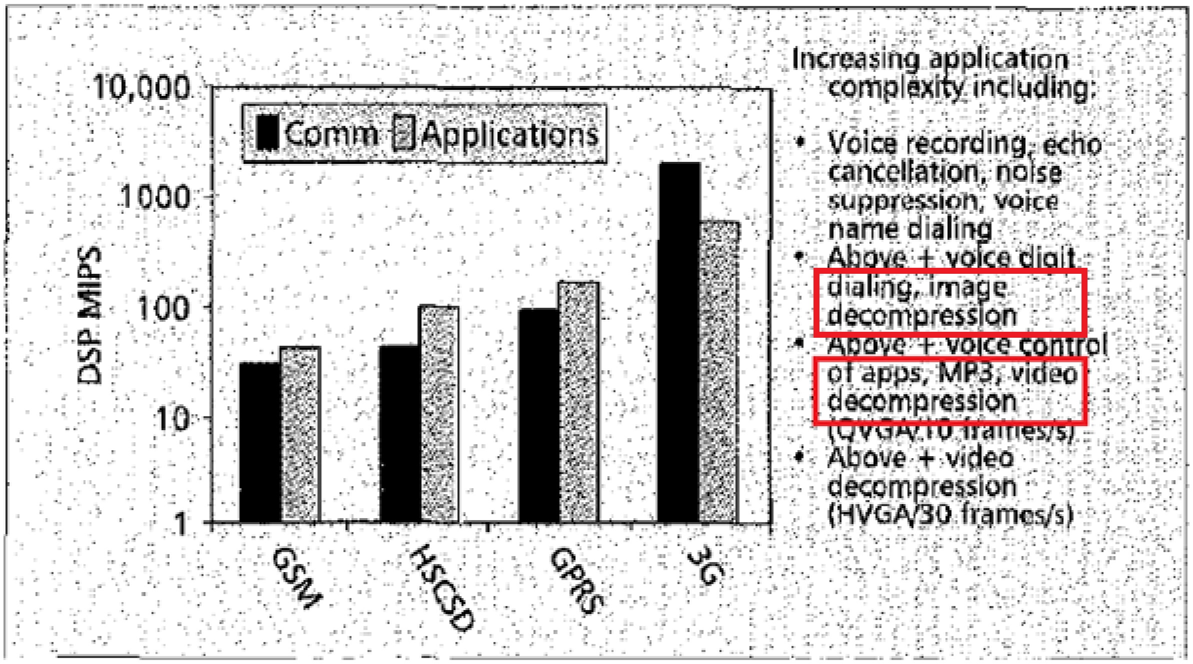
Processing and its Applications (Aug. 1999), Ex. 1015, at p.761, left column ("[A] test hardware solution is presented using SHARC® Digital Signal Processors (DSP) demonstrating the feasibility of a simple multiuser OFDM system."); U.S. Patent No. 5,732,113 (published Mar. 1998), Ex. 1016, 4:26-44 ("DSP 100 performs a variety of operations on the in-phase and quadrature samples of the received OFDM signal."); *see also* U.S. Patent No. 6,711,221 (filed Feb. 2000), Ex. 1017, 3:33-48.)

104. In fact, a person of ordinary skill in the art would have been motivated to use a DSP to perform the functions of the OFDM receiver because she would have appreciated that DSPs can efficiently implement the mathematical algorithms involved in the processing of OFDM signals, such as the Fast Fourier Transform (FFT). (Frodigh, 8:34-35.) Indeed, Gatherer provides express suggestions for doing so. (Gatherer, at p. 86, right column ("Another strategy used by DSP designers is to add instructions that, although fairly generic in themselves, allow efficient implementation of algorithms important to wireless applications.").)

105. Gatherer provides additional express motivations for implementing functions of the OFDM receiver using a digital signal processor. Gatherer explains that DSPs have traditionally performed tasks of the "physical layer" in cell phones. (*Id.*, at p.84, right column ("As DSPs became more powerful, they started to take

on other physical layer 1 tasks until all the functions in the 'DSP functions' box in Fig. 1 were included."); *see also id.* p. 85, Fig. 1.) Because the handling of OFDM signals would be physical layer tasks in cell phones, one of ordinary skill in the art would have found DSPs to be a natural candidate for performing functions of the OFDM receiver. Moreover, as Gatherer explains, "[a] DSP-based baseband approach can cope better with different radio frequency (RF) and mixed-signal offerings which occur due to technology improvements and market changes." (*Id.*, at p.85, right column.) One of ordinary skill in the art would therefore have appreciated that DSPs are well-suited for evolving OFDM technologies developed for cellular systems, discussed at length in **Part III.D** above. Accordingly, it would have been obvious to configure a digital signal processor included in a cell phone to handle digital media transmitted by OFDM modulation.

106. A person of ordinary skill in the art would also have been motivated to implement functions of the media player using a digital signal processor. As Gatherer explains, digital signal processors "can provide power-efficient <u>media processing</u>." (*Id*., at p.89, right column (underlining added).) Gatherer specifically discloses in Figure 7 (shown below) that DSPs can be also used in cell phones for image, MP3 and video decompression.



■ **Figure 7.** *Applications drive DSP MIPS.*

(*Id*., Fig. 7 (red emphasis added).) It would therefore have been obvious that the digital signal processor could be configured to receive and handle for playback the digital media that was transmitted to the cell phone by OFDM modulation.

107. Accordingly, the prior art satisfies the limitation "the wireless device including a digital signal processor and a receiver configured for the handling of digital media transmitted by orthogonal frequency-division multiplex modulation."

"wherein the data file is routed through a cellular network"

108. Yukie and Frodigh disclose that "the data file is routed through a cellular network." For example, Figure 1 of Yukie discloses that user device **10** communicates with data server **16** through an intermediate base station **14**:

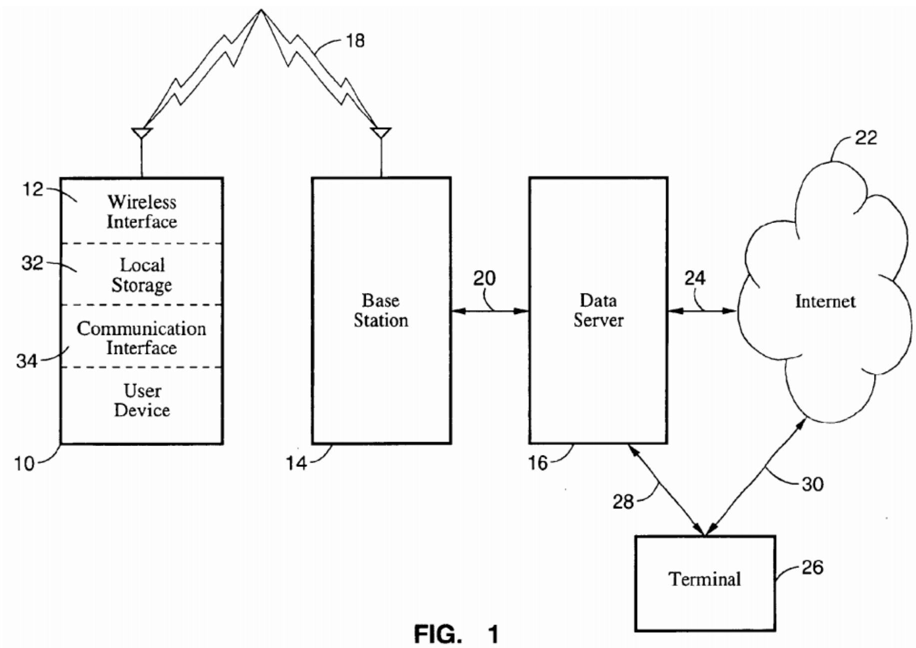


FIG. 1

(Yukie, Fig. 1.)

109. One of ordinary skill in the art would have recognized that the simplified arrangement in Figure 1 could represent use of a cellular network that includes base station **14** (which serves the function of a cell tower) that receives data wirelessly from user device **10** and facilitates communication with data server **16**. As explained in Yukie, "[u]ser device **10** communicates with base station **14** over a wireless connection **18**, and base station **14** communicates with data server **16** over a landline, wireless, or other communications link **20**." (*Id.*, 3:32-35.) Yukie does not limit wireless connection **18** (between user device **10** and base

station **14**) to a particular type of connection (*id.*, 5:14-16), and specifically discloses that "different wireless systems can also be used for the connection, such as an analog cellular system." (*Id.*, 5:25-27 (underlining added).)[5] Yukie therefore discloses that "**the data file is routed through a cellular network**," as claimed.

110. Frodigh also separately discloses this limitation. As I discussed above, Frodigh explains that "[f]requency division multiplexing (FDM) is a method of transmitting data that has application to cellular systems. Orthogonal frequency division multiplexing (OFDM) is a particular method of FDM that is

[5] Although Yukie refers to an exemplary wireless connection as an "analog cellular system," Yukie makes clear that the wireless connection is used to transmit and receive digital data between user device **10** and data server **16**. (Yukie, 4:23-26 ("According to one mode of operation, user device **10** establishes a wireless connection to data server **16** and sends data to data server **16** for storage and later access by user device **10**."), 17:15-16 ("To access data on server **16,** the user device would establish a wireless connection to data server **16**.").) The "analog cellular system," in fact, is similar to the analog cellular embodiment in the '810 patent. ('810, 13:30-33 ("Examples of telephone systems utilizing the method of the present invention include a cellular phone which may utilize an analogue (voice-only) system or a digital system"), 14:13-15.)

particularly suited for cellular systems." (Frodigh, 1:59-63 (underlining added).) A "cellular telecommunications network" that uses OFDM is shown in Figure 1, reproduced below. (*Id.*, 5:29-30.)

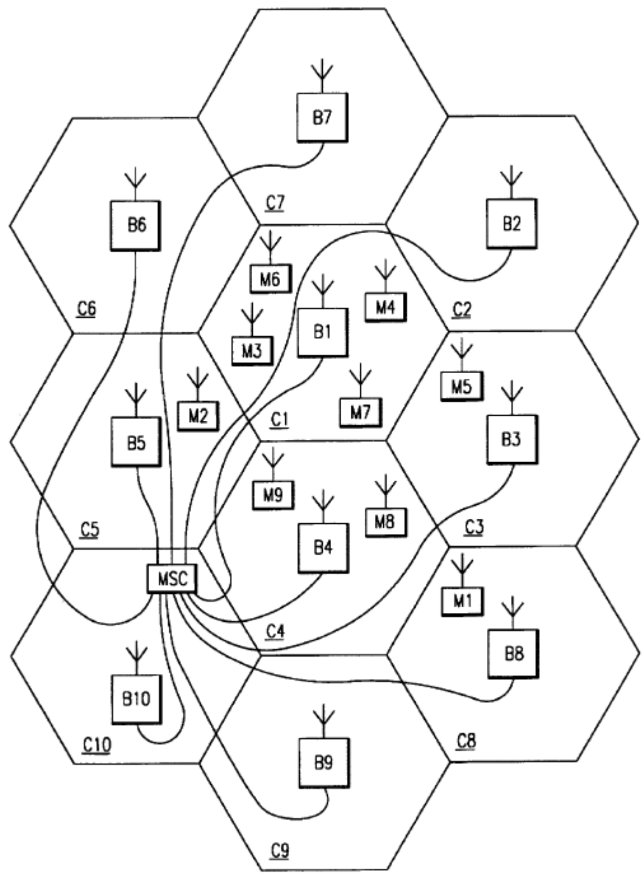


FIG. 1

(*Id.*, Fig. 1.) Frodigh makes clear that the cellular network provides "uplink" channels that allow data to be routed through the cellular network from a mobile station to a base station:

> Base station **200** communicates with mobile station **202** over downlink **206** and uplink **208**. Base station **200** also communicates with mobile station **204** over downlink **210** and uplink **212**.

> Transmissions on links **206**, **208**, **210** and **212** are made over the system RF channel. Voice and data to be transmitted on each link are modulated onto a number (M) subcarriers. The M subcarriers are then modulated onto the system RF carrier for transmission over the system RF channel.

(*Id.*, 7:53-57 (underlining added); *see also id.* 7:51-63, 9:38-45 ("The necessary data transfer between the mobile stations, base stations and MSCs of the system may be accomplished by known methods.").) The routing of data from mobile stations to the base station using uplink channels **208** and **212** is shown in Figure 2, reproduced below.

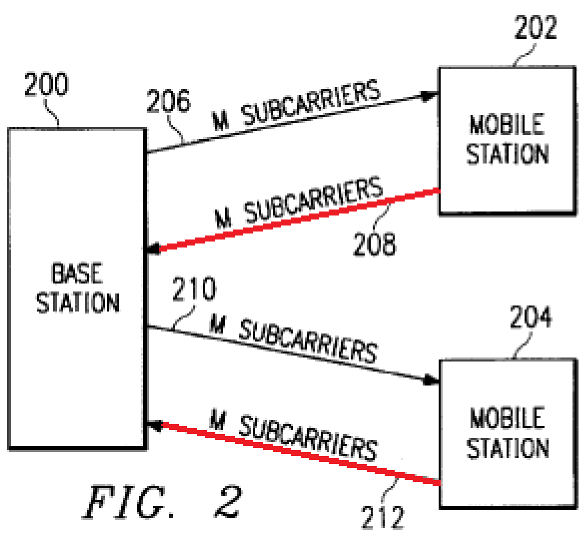


FIG. 2

(Fig. 2 (red emphasis added).) It therefore would have been obvious to provide for the routing of the data file through a cellular network using OFDM, as disclosed in Frodigh. The rationale and motivations to combine Yukie with Frodigh, discussed above with respect to transmitting data **to** the cell phone by OFDM modulation, applies with full force here to routing data **from** the cell phone.

b. "storing the data file received from the wireless device in the user's virtual storage locker on the [sic] the one or more servers" (Claim 1[b])

111. As noted previously, Yukie discloses that the data file sent by user device **10** is stored on data server **16**. (Yukie, 4:23-26 ("According to one mode of operation, user device **10** establishes a wireless connection to data server **16** and <u>sends data to data server **16** for storage</u> and later access by user device **10**."), 11:16-19 ("The device can store audio as audio data in electronic files. The audio data can be stored locally in local storage media **32**, <u>or on data server **16** across the wireless connection</u>, as described above."), 6:60-63 ("When the user desires to store the image (e.g., by pressing a 'shutter' button), the camera <u>would send the image data across the wireless connection to data server **16** for storage as an image file</u>."), 7:41-46 (same, video file) (underlining added to all).) Yukie therefore discloses "**storing the data file received from the wireless device**" on "**the one or more servers**," as claimed.

112. Yukie, alone or in combination with Prust, further renders obvious storage of the received data file "**in the user's virtual storage locker**" on the one or more servers, as recited in the claim. The specification of the '810 patent makes

clear that a "virtual storage locker" is simply a storage area that is associated with a user. ('810, 8:33-36 ("The website may further include a virtual personal locker or storage area for storing a selection of clips personal to a user which can be accessed on the website by a unique user identification name or code.") (underlining added).)[6]

113. Yukie discloses that "[d]ata server **16** can be a personal server of the user for storing a user's personal data files. The data server can be secure, such as by using encryption and/or password access, to protect the user's data." (Yukie, 4:1-4 (underlining added).) Yukie also explains that "[d]ata can be stored on the server in numerous ways, such as encoded electronic files organized by data author or owner." (*Id.*, 20:54-56 (underlining added).)[7]

[6] It is not clear from the '810 patent whether the term "locker" requires that the virtual storage area be private and/or secure. However, it is unnecessary to address this question because any such requirement is fully satisfied by Yukie and Prust for the reasons I have provided in the text.

[7] Yukie makes clear that the term "data author or owner" in this passage quoted in the text is not limited to copyright holders (e.g., of commercial media). The next paragraph in Yukie explains that the content stored on data server **16** can include user-provided content such as video and images from a camera, audio recordings

114. These disclosures render obvious storage of files "**in the user's virtual storage locker**," as recited in the claim. Yukie explains that data server **16** is a computer system that includes a number of components, including fixed disk **124** for data storage. (*Id.*, 21:34-51, Fig. 4.) Yukie specifically discloses that data server **16** may be "a <u>personal server of the user for storing a user's personal data files</u>," and "can be secure, such as by using encryption and/or password access, <u>to protect the user's data</u>." (*Id.*, 4:1-4 (underlining added).) Under this embodiment, the storage area provided on data server **16** (a "personal server of the user") qualifies as a "**virtual storage locker**" for the user because that storage space is private, secure, and reserved for the user. I note that claim 1 recites only a single user and does not impose any requirement that the server be accessible to or capable of storing files provided by other users.

115. I acknowledge that Yukie does not describe the details about how data server **16** allocates storage space and separates storage space allocated to users. In

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and dictations, "[s]torage, such as data supplied by the user (e.g., images, audio, or other data stored in files)," "[p]ersonal information, such as address information, identification, verification information," user billing information, and other types of user-specific and user-provided content. (Yukie, 20:56-21:23.)

the event it is argued that Yukie fails to disclose the virtual storage locker limitation, it would have been obvious in view of **<u>Prust</u>**.

116. As explained in **Part V.A** above, Prust describes a technique for creating "virtual storage areas" for individual users on a remote server. (Prust, 1:38-45, 4:52-61, Fig. 2.) Figure 2 (at right) shows computing environment **200** having user computers **205** and storage servers **210**, connected to each other through a global computer network **215** such as the Internet. (Prust, 4:52-57.) The storage servers **210** form a storage network **220**, which in turn "defines a pool of <u>virtual storage areas **225** that can be individually assignable to different users</u>." (*Id.*, 4:59-61 (underlining added).) Each virtual storage area **225** can be accessed by the authorized user, for example, through a username and password. (*Id.*, 4:63-65, 7:64-66, 8:2-7; *see also id.* 1:40-42 ("Authorized users can access data files . . . .").) "[S]torage network **220** allocates a storage area **225** to the user such that . . . the user can seamlessly access the corresponding virtual storage area via client computers **205**." (*Id.*, 4:65-5:5; *id.*, 7:59-8:7 (explaining allocation and access to remote storage area).)

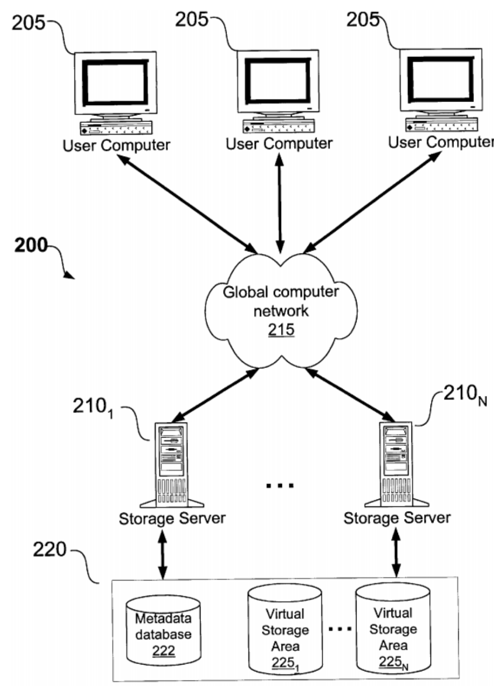

FIG. 2

117. Prust describes a number of techniques for allowing users to store data files in their virtual storage areas. For example, Figure 6 shows a web browser embodiment in which "the user can browse the directories within virtual storage area **225** and can perform many common file management operations including uploading, downloading and deleting files, as well as creating and removing directories." (*Id.*, 7:3-6.) Prust therefore discloses storage of a data file in a user's "**virtual storage locker**" on a server.

118. ***Rationale and Motivation to Combine:*** It would have been obvious to combine the disclosures of Prust with Yukie, with no change in their respective functions. This combination would have predictably resulted in the system of Yukie with the ability to assign a "virtual storage area" on data server **16** for storing data files transmitted by the user from her wireless device.

119. A person of ordinary skill in the art would have had several reasons to make this combination. To begin with, the "virtual storage locker" limitation itself refers to a basic and elementary concept of computer file storage that was already within the knowledge of a person of ordinary skill in the art. For example, a person of ordinary skill in the art would have understood that the claimed virtual storage locker could have been implemented by simply storing the data files uploaded by each user in a separate folder or directory on the server. The

Background section of Prust confirms that "[n]umerous companies provide a wide range of an [sic] Internet data storage services for remotely storing and managing files." (Prust, 1:20-22.) Accordingly, it would have been plainly obvious that data server **16** of Yukie could have been modified to allocate separate "virtual storage areas," as disclosed in Prust, to users who have wirelessly transmitted data files to the server.

120. As noted previously, Yukie discloses that data server **16** may be "a personal server of the user for storing a user's personal data files," and "can be secure, such as by using encryption and/or password access, to protect the user's data." (Yukie, 4:1-4.) A person of ordinary skill in the art would have appreciated that, by applying the virtual storage area techniques of Prust, the "personal server" of Yukie could have been transformed into a "personal virtual storage area" by dividing the storage space on data server **16** into a series of user-specific storage areas. This would provide the benefit of allowing more than one user to store files on data server **16**, resulting in more efficient use of storage space on data server **16** while still maintaining the security and privacy of the "personal server" embodiment. Yukie itself confirms that data server **16** may be "accessible to multiple users for storage" (Yukie, 4:4-6), and that files stored on data server **16** may be organized by author or owner (*Id.*, 20:54-56).

121. Moreover, a person of ordinary skill in the art would have found Yukie and Prust to be analogous and in the same field of facilitating storage and access to data files on a remote server. For example, like Yukie, Prust specifically contemplates use of a mobile and wireless device to transmit files for storage on a server. For example, Prust states that devices usable with the alleged invention can include "a <u>battery-powered, pocket-sized, mobile computer known as a hand-held PC or personal digital assistant (PDA)</u>." (Prust, 3:38-41 (underlining added).) The device can also include a modem **129**, which "is typically used to communicate over wide area networks . . . such as the global Internet," and which "may be connected to a network using either a wired or <u>wireless connection</u>." (*Id.*, 4:12-15 (underlining added).) Prust further describes a technique in which access to a remote virtual storage area can be accomplished using a web browser. (*Id.*, 6:59-7:6.) This is consistent with Yukie, which explains that "[t]he telephonic device can include software for accessing content on the Internet, such as web-browsing software" (Yukie, 10:50-51), and can be a "telephonically enabled personal digital assistant (PDA)." (*Id.*, 10:41-43). A person of ordinary skill in the art would have interpreted these disclosures as confirming the complementary nature of these references, and the combinability of their techniques for facilitating remote file storage on a server.

122. A person of ordinary skill in the art implementing the system of Yukie would have found the technique of Prust attractive for yet another reason. Prust explains that many existing systems for providing remote file access "require that a user load proprietary software on his computer in order to communicate data files to the remote storage." (Prust, 1:24-26.) Prust attempts to address this problem by "providing a variety of access methods," which "can be configured to easily and seamlessly interact with a user's computer without requiring proprietary software." (*Id.*, 1:32-37.) For example, in one embodiment of Prust, "the user can invoke conventional communication applications and utilities such as a web browser, . . . to access [the] virtual storage area." (*Id.*, 6:47-51 (underlining added).) In another embodiment, "access to the virtual storage area is fully integrated with an operating system executing on a client's computer for seamless access using standard file management routines provided by the operating system." (*Id.*, 1:43-46.) This seamless access technique, according to Prust, allows use of preexisting software to access the virtual storage area on the server. (*Id.*, 6:22-24 ("One particular advantage of this embodiment is that software applications **136** executing on computer **100** can access virtual storage area **225** without modification.").)

123. A person of ordinary skill in the art would have found this advantage particularly useful to the system of Yukie for a straightforward reason – Yukie identifies more than 10 different types of wireless user devices that can transmit data to data server **16** for storage. (Yukie, 3:42-48 ("User device **10** can comprise any number of devices, without restriction, such as a music player, a still camera, a video camera, a video display, a car stereo, a telephonic device, a handheld control device, a game device, an appliance, a computer system, a personal digital assistant, or any like device that would ordinarily include, or be connected to, local data storage media **32**."); *see also, id*., 6:44-51 (music player), 6:60-67 (still image camera), 7:41-44 (video camera), 9:20-24 (video display), 10:13-16 (car stereo), 11:13-19 (telephonic device), 11:51-60 (handheld control device), 13:23-27 (game device), 14:38-42 (appliance device), 15:42-46 (computer system).) Each different type of device could potentially require a person of ordinary skill in the art to write new and specialized software to carry out the functions of the device. By incorporating the "seamless access" techniques of Prust into user device **10** of Yukie, a person of ordinary skill in the art could allow user device **10** to access virtual storage areas without having to adapt the software for each device category to perform that function. (Prust, 6:22-24 ("One particular advantage of this embodiment is that software applications **136** executing on computer **100** can

access virtual storage area **225** without modification.”).) This would have resulted in decreased implementation complexity by reducing differences between the software for each type of device, an advantage that would have been particularly important given the highly diverse range of user devices identified in Yukie that can transmit data files to data server **16**.

c. “receiving a request from the wireless device for the data file” (Claim 1[c])

124. Yukie also discloses that data server **16** receives a request from user device **10** (the “wireless device”) for the data file. In particular, “user device **10** can determine what data is available on data server **16** by querying data server **16** across the wireless connection.” (Yukie, 17:31-33.) Thereafter, “user device **10** could send a <u>request to data server **16** for specific data and then receive the data sent from data server **16**</u>. The received data may include some or all of the data previously sent by user device **10** for storage on data server **16** or may include data derived from the stored data, such as file size or storage date.” (Yukie, 17:48-53 (underlining added).) For example, data server **16** can receive a request from the wireless device for audio, image, video and other types of data files. (*Id.*, *e.g.*, 6:28-31 (“In response to a selection by the user, <u>the music player would request an audio file from data server **16**</u> and data server **16** would send the file to the music player across the wireless connection.”), 7:14-17 (same, image file), 8:2-4 & 8:49-

52 (same, video file), 11:4-6 ("The data stored on data server **16** can be accessed on demand by the telephonic device through requests to data server **16**.") (underlining added to all).)

d. "providing for transmitting the data file to the wireless device using orthogonal frequency-division multiplex modulation based on the received request" (Claim 1[d])

125. As noted in the preceding limitation, in response to receiving the request for the data file, data server **16** wirelessly sends the requested file to user device **10**. (*Id.*, 17:48-53 (" . . . user device **10** could send a request to data server **16** for specific data and then receive the data sent from data server **16**"), 11:4-6 ("The data stored on data server **16** can be accessed on demand by the telephonic device through requests to data server **16**."), 11:19-22, ("For playback, the device would download audio data in an audio stream from data server **16** and outputs the audio in real-time."), 6:28-31 (" . . . the music player would request an audio file from data server **16** and data server **16** would send the file to the music player across the wireless connection"), 7:14-17, 8:2-4 & 8:49-52.) Yukie therefore discloses the step of "**providing for transmitting the data file to the wireless device . . . based on the received request**," as claimed.

126. Although Yukie does not disclose that the transmission of the data file to the wireless device occurs "**using orthogonal frequency-division multiplex**

modulation," this would have been obvious in view of Frodigh for the reasons expressed above. As explained previously, Frodigh describes both the transmission of data and receipt by a wireless device. The disclosures of Frodigh with respect to the "orthogonal frequency-division multiplex modulation" limitation and the rationale for combining are explained at length above, and apply equally here. Yukie and Frodigh therefore disclose "providing for transmitting the data file to the wireless device using orthogonal frequency-division multiplex modulation based on the received request," as recited in the claim.

127. Accordingly, Yukie in view of Gatherer, Prust, and Frodigh disclose and render obvious claim 1. In brief summary, with respect to claim 1[a] and 1[b], Yukie discloses delivering a data file, such as an audio recording, from a wireless device, such as a cell phone, to a server for storage. Yukie discloses that the server can be a personal server for storing a user's personal data files, can be secured to protect the user's data, and that the files can be organized in various ways, such as by data author or owner. With respect to claim 1[c] and 1[d], Yukie discloses that audio recordings stored on the server can be transmitted to the wireless device in response to a request from the wireless device. To the extent Yukie does not disclose a "virtual storage locker" as claimed, it is disclosed by and obvious in view of the virtual storage area teachings of Prust. And although Yukie does not

specifically disclose a DSP as recited in the claim, that requirement is obvious in view of Gatherer. Likewise, transmission and receipt of a data file using OFDM and routing a data file through a cellular network would have been obvious to a person of ordinary skill in the art in view of Frodigh.

2. Dependent Claim 2: "The method of claim 1, further providing for selection of the data file from a library associated with the virtual storage locker for transmission to the wireless device."

128. Claim 2 depends from claim 1 and recites "[t]he method of claim **1**, further providing for selection of the data file from a library associated with the virtual storage locker for transmission to the wireless device." In my opinion, for purposes of applying the prior art, this claim limitation does not add a further meaningful limitation.

129. As I explained above, Yukie discloses a "**virtual storage locker**" of the user in the form of storage area in a "personal server [**16**] of the user for storing a user's personal data files." (Yukie, 4:1-2.) Yukie makes clear that this personal server can store <u>multiple files</u> that are personal to the user. (*Id.* ("Data server **16** can be a personal server of the user for storing a user's personal data file<u>s</u>.") (underlining added); *see also id.*, 6:25-27 ("To play an audio file, the music player would connect to data server **16** and query data server **16** about what audio file<u>s</u> are available.); 7:10-13 & 7:65-67 (same; image file<u>s</u>); 8:45-48 (same; video file<u>s</u>).

These files can also be organized in various ways. (*Id.*, 20:54-56 ("Data can be stored on the server in numerous ways, such as encoded electronic files organized by data author or owner.") (underlining added).) The multiple "personal data files" stored on the user's personal server thus corresponds to the "**library associated with the virtual storage locker**."

130. Yukie discloses providing for the selection of a particular data file from the multiple data files stored on the server, for transmission to the wireless device. (*Id.*, 17:47-53 ("[U]ser device **10** could send a request to data server **16** for specific data and then receive the data sent from data server **16**. The received data may include some or all of the data previously sent by user device **10** for storage on data server **16** or may include data derived from the stored data, such as file size or storage date."), 6:25-27 ("To play an audio file, the music player would connect to data server **16** and query data server **16** about what audio files are available. The music player would then display the server's response to the user. In response to a selection by the user, the music player would request an audio file from data server **16** and data server **16** would send the file to the music player across the wireless connection.") (underlining added).) Yukie therefore discloses "providing for selection of the data file from a library associated with the virtual storage locker for transmission to the wireless device," as recited in claim 2.

131. The additional limitation in claim 2 would also have been obvious in view of Prust. Prust discloses that files stored in the user's virtual storage locker can be organized chronologically (Prust, Fig. 3), alphabetically (*id.*, Fig. 4), and according to user-created categories and sub-categories in the form of folders and sub-folders (*id.*, Fig. 6). Each of these ways of organizing the files in the user's virtual storage area provide an example of a "**library associated with the virtual storage locker**," as recited in the claim.

132. The combination of Yukie and Prust would therefore have predictably resulted in the user of Yukie being able to select a data file from a library associated with a virtual storage area as described in Prust. The motivation and rationale for combining Yukie and Prust discussed with respect to the "virtual storage locker" limitation, including the advantages of "seamless access" provided by Prust, apply here with full force. It is self-evident, moreover, that providing an organization scheme for files uploaded by the user would facilitate ease of access by the user, and this would be particularly advantageous as the number of files stored in the user's virtual storage locker increases.

3. Dependent Claim 3: "The method of claim 1, wherein the wireless device is a cell phone."

133. Claim 3 depends from claim 1 and recites "[t]he method of claim **1**, wherein the wireless device is a cell phone." As I explained above, claim 1 is

disclosed by and obvious over Yukie, Gatherer, Prust, and Frodigh. The additional limitation added by claim 3 is disclosed by Yukie. As I already explained for claim 1, Yukie discloses that the user device **10**—the "wireless device"—may be a cellular phone. (Yukie, 10:41-43 ("User device **10** can also be a telephonic communication device such as a telephone, cellular phone, telephonically enabled personal digital assistant (PDA), or fax machine.") (underlining added).) Accordingly, claim 3 would have been obvious in view of the prior art.

4. Dependent Claim 4: "The method of claim 3, further comprising storing at least a portion of the data file on the cell phone."

134. Claim 4 depends from claim 3 and recites "[t]he method of claim **3**, further comprising storing at least a portion of the data file on the cell phone." As I explained above, claim 3 is disclosed by and obvious over Yukie, Gatherer, Prust, and Frodigh. The additional limitation added by claim 4 is disclosed by Yukie.

135. Yukie discloses multiple embodiments in which the data file, or a portion of it, is stored on the wireless device. For example, with respect to an audio file transmitted from data server **16** to the wireless device:

> The music player receives the requested file from data server **16** and plays the file, such as by decoding the file and outputting corresponding audio through a speaker. The music player would download and play the received

> audio data immediately as an audio stream. Alternatively, or in addition, the music player can store the entire audio file, or a portion, and play the file immediately or at a later time.

(Yukie, 6:32-38 (underlining added).) Although Yukie describes the functionality above in connection with a music player, a person of ordinary skill in the art would have appreciated that the same functionality could have been applied to Yukie's cellular phone embodiment.

136. It would have been obvious to a person of ordinary skill in the art to apply the music player feature described above to the cellular phone embodiment in Yukie. This would have predictably resulted in the cellular phone of Yukie being able to "store the entire audio file, or a portion" (*id.*, 6:37-38), on the cell phone's local memory.

137. Yukie expressly discloses that the wireless user device categories listed are not exhaustive and can be combined. Yukie explains that "[w]hile several examples have been described, the user devices are unlimited in scope," and further notes that wireless user devices "tend to fall into several categories." (*Id.*, 16:65-66, 17:3-4). In this case, the cellular phone embodiment in Yukie shares a key feature with the music player – the cellular phone allows the user to create audio recordings, wirelessly transmit them to data server **16** for storage, and

then subsequently download them from data server **16** for retrieval and playback. (*Id.*, 11:13-22.)

138. A person of ordinary skill in the art would therefore have found it obvious that the ability to "store the entire audio file, or a portion" (*id.*, 6:37-38) would have been as equally applicable to the cellular phone as the music player. Moreover, one of ordinary skill in the art would have appreciated that the ability to store the data file locally on the cell phone (in addition to retrieval on demand from the server) provides advantages because it allows the user to subsequently access the data file during times when a data connection with the server cannot be established. Accordingly, claim 4 would have been obvious.

5. Dependent Claim 5: "The method of claim 1, further comprising charging a fee for transmitting the data file to the wireless device."

139. Claim 5 depends from claim 1 and recites "[t]he method of claim 1, further comprising charging a fee for transmitting the data file to the wireless device." As I explained above, claim 1 is disclosed by and obvious over Yukie, Gatherer, Prust, and Frodigh. The additional limitation added by claim 5 is disclosed by Yukie, which discloses the ability to "**charg[e] a fee**":

> Data server **16** can be a personal server of the user for storing a user's personal data files. … Alternatively, data server **16** can be a public server, such as a server accessible to multiple users for storage, or a

> commercial server where <u>downloading data incurs a fee</u> to the user through identification passed from user device **10** to data server **16**. <u>A user can be billed for the service in various ways or combinations of ways, including</u> a monthly basis, <u>a content basis</u> (per song, per movie, etc.), <u>a data access basis</u> (e.g., an amount of money per megabit of data sent to the user), a service basis (e.g., the number and/or type of channels and/or monitoring services designated in the user profile), and a registration basis (e.g., the number and/or type of devices registered with the server, such as for customized download). The server can provide data to a user on a rental (limited use, such as a finite number of times) or purchase (unlimited use) basis.

(Yukie, 4:1-18 (underlining added).) Thus, a fee can be charged on a "content basis," a "data access basis," or a "combination" of the two. As I explained above, Yukie discloses that content stored on the server **16** and transmitted to the wireless device can include data files previously uploaded from the wireless device. One of ordinary skill in the art would have understood and found it obvious that, where a previously uploaded data file is transmitted to the wireless device, charging a fee on a "content basis" and/or "data access basis" qualifies as charging a fee "**for transmitting the data file to the wireless device**." Accordingly, claim 5 would have been obvious in view of the prior art.

6. Dependent Claim 6: "The method of claim 1, wherein transmitting the data file based on the received request comprises transmitting the data file to a device other than the wireless device."

140. Claim 6 depends from claim 1 and recites "[t]he method of claim **1**, wherein transmitting the data file based on the received request comprises transmitting the data file to a device other than the wireless device." As I explained above, claim 1 is disclosed by and obvious over Yukie, Gatherer, Prust, and Frodigh. This additional limitation is also disclosed by Yukie.

141. I note that this claim merely requires that the transmitting step of claim 1 further comprise the sub-step of "**transmitting the data file to a device other than the wireless device**." This sub-step does not require that the other device itself be a cell phone, or that it be a mobile or even a wireless device.

142. As I explained previously, Figure 1 of Yukie discloses that user device **10** communicates with data server **16** through base station **14**:

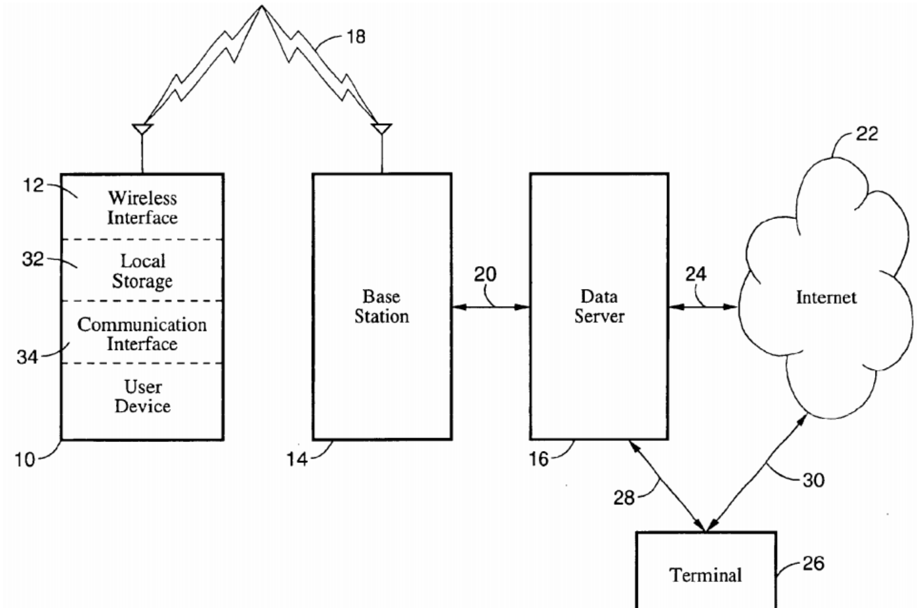

FIG. 1

(Yukie, Fig. 1.)

143. The base station **14** in Figure 1 above is "**a device other than the wireless device**," as recited in the claim. Figure 1 shows that data server **16** sends data to user device **10** by first sending it to intermediate base station **14**. As explained in Yukie, "[u]ser device **10** communicates with base station **14** over a wireless connection **18**, <u>and base station **14** communicates with data server **16** over a landline, wireless, or other communications link **20**</u>." (*Id.*, 3:32-35 (underlining added).) Accordingly, when the data server **16** retrieves and transmits a data file based on a request from user device **10**, data server **16** <u>first transmits the file to base station **14** (through wired or wireless connection)</u>, which then wirelessly transmits the requested data file to user device **10**. (*Id.*)

144. In addition, I observe that transmission of the selected data from the server to an intermediate base station (a device "other than the wireless device") is consistent with the embodiments described in '810 patent. Those embodiments describe a similar arrangement in which the server first transmits a selected sound clip from the server to a cellular service provider **208**, which in turn sends the selected data to the cellular phone **202**:

> Generally, the server software **207** retrieves the selected sound clip from a database **212**, converts it to the special sequence of sounds modulates [sic], transfers codes of these sounds to the voice adapter **210** that converts these codes to actual sounds and transfers these sounds to the phone line **214**. From the phone line **214**, the sounds go to a cellular provider **208** through to a radio channel, and to the cellular phone **202** itself (much like voice sounds are transferred during a normal phone conversation).

('810, 18:28-36 (underlining added).)

145. Although the embodiment above describes to the data over an analog (voice) cellular network, the '810 patent similarly describes routing selected data through cellular provider **208** for digital cellular embodiments. (*Id*., 19:31-41 (describing flow for digital cellular network embodiment in which server uses voiceband modem to send selected data to cellular provider **208**), 20:22-37 (describing flow for digital cellular network embodiment in which server has

dedicated data connection to cellular provider **208**).) Accordingly, Yukie discloses that "transmitting the data file based on the received request comprises transmitting the data file to a device other than the wireless device," as recited in the claim.

7. Dependent Claim 7: "The method of claim 1, wherein receiving the request for the data file comprises receiving the request from a device other than the wireless device."

146. Claim 7 depends from claim 1 and recites "[t]he method of claim 1, wherein receiving the request for the data file comprises receiving the request from a device other than the wireless device." As I explained above, claim 1 is disclosed by and obvious over Yukie, Gatherer, Prust, and Frodigh.

147. This claim essentially recites a "reverse direction" to the flow of claim 6 that I discussed above. Whereas claim 6 specifies a sub-step relating transmission of the data file to the wireless device, claim 7 specifies a sub-step relating to receipt of the request for the data file from the wireless device. And just like claim 6, the receiving sub-step in claim 7 does not require that the other device itself be a cell phone, or that it be a mobile or even a wireless device. As I explained previously, base station **14** in Figure 1 is "**a device other than the wireless device**," as recited in the claim. Accordingly, for the same reasons discussed above, when the user device **10** transmits a request for a data file to data server **16**, that request is first <u>received by base station **14**</u>, which then transmits that

request (through wired or wireless connection) to data server **16**. (Yukie, 3:32-35.) Accordingly, Yukie discloses that "receiving the request for the data file comprises receiving the request from a device other than the wireless device."

C. Alternative Ground Based on O'Hara, Tagg, and Pinard

148. In Part **V.B** above, I explained why the claims of the '810 patent are invalid based on the combinations with the primary reference Yukie, and I cited Frodigh for its disclosure of how to send digital information to a wireless device using OFDM and how to route data through a cellular network. I have also been asked to opine on whether the claims of the '810 patent would have been obvious if I were to rely on O'Hara, Tagg and Pinard instead of Frodigh with respect to OFDM and the routing of data through a cellular network. In my opinion, the claims would have been obvious to a person of ordinary skill in the art based on this alternative combination.

149. As I explained in **Part V.A** above, I have cited O'Hara, Tagg and Pinard for three straightforward propositions: that (1) prior art IEEE 802.11a wireless networking transmits digital information to mobile devices using OFDM (O'Hara), (2) IEEE 802.11 wireless networking functionality can be incorporated into a cell phone (Tagg), and (3) a "cellular network," as recited in claim 1, can be built based on IEEE 802.11 wireless networking technology (Pinard).

150. With respect to the first proposition, O'Hara clearly confirms that at least the IEEE 802.11a variant of IEEE 802.11 uses OFDM to wirelessly transmit data. (*Id.* at p. 143 ("In July of 1998, the IEEE 802.11 Working Group adopted OFDM modulation as the basis for IEEE 802.11a."); *id.* at p. 139 ("The IEEE 802.11a PHY is one of the physical layer (PHY) extensions of IEEE 802.11a and is referred to as the orthogonal frequency division multiplexing (OFDM) PHY. The OFDM PHY provides the capability to transmit PSDU[8] frames at multiple data rates up to 54 Mbps for WLAN networks where transmission of multimedia content is a consideration.").) O'Hara further teaches an 802.11a receiver that can be implemented in mobile devices to receive OFDM signals. (*Id.*, at p. 144 ("At the receiver, the carrier is converted back to a multicarrier lower data rate form using an FFT. The lower data subcarriers are combined to form the high rate PPDU[9]. An example of an IEEE 802.11a OFDM PMD[10] is illustrated in Figure 7-2.").) This is shown in Figure 7-2, reproduced in relevant part below.

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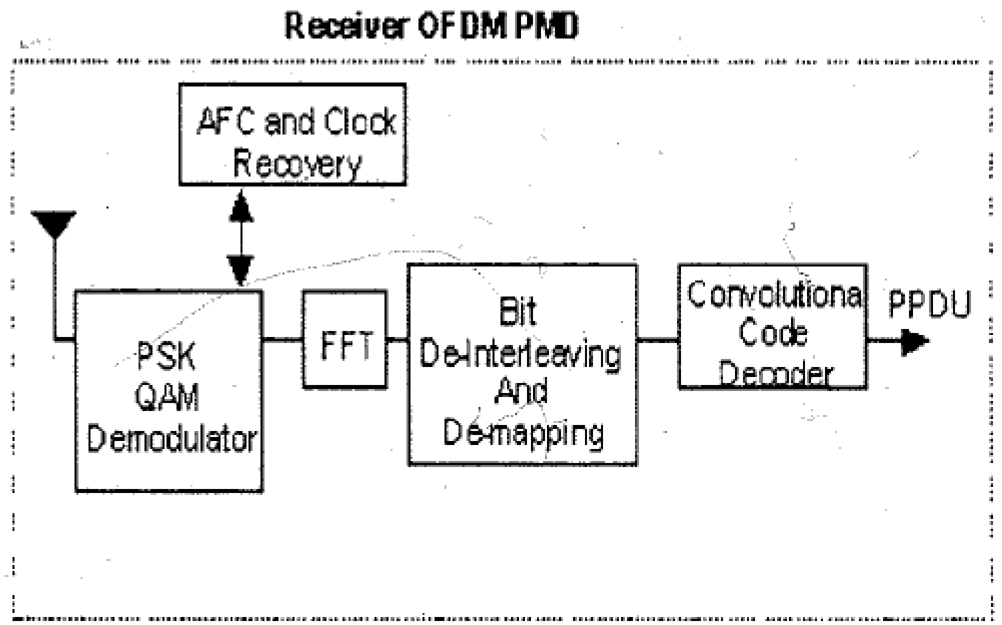
8 The term "PSDU" refers to a PLCP service data unit, a basic unit of data for transmission over an IEEE network. (O'Hara, at p. 174 (explaining PSDU acronym), *id.* at p. 141 (Fig. 7-1, showing OFDM header and PSDU).)

9 The term "PPDU" refers to a PLCP protocol data unit, a unit of data that includes a preamble and header. (O'Hara, at p. 174 (explaining PPDU acronym);



(*Id.*, p. 175, Fig. 7-2.)[11]

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id. at p. 141 (Fig. 7-1, showing OFDM PPDU).)

10 The term "PMD" refers to "Physical Medium Dependent," which is a description of the details of transmission and reception of individual bits on a physical medium. (O'Hara, at p. 174 (explaining PMD acronym).)

11 O'Hara thus satisfies any requirement that the <u>receiver</u> be configured for the handling of digital media transmitted by OFDM. Any requirement that the <u>digital signal processor</u> be configured for the handling of digital media transmitted by OFDM would also have been obvious over the prior art, as explained in **Part V.B.1.a** above.

151. With respect to the second proposition, as I explained in detail in **Part V.A**, Tagg discloses a cell phone that can send and receive data using IEEE 802.11. Figure 1 of Tagg provides a basic overview of the system:

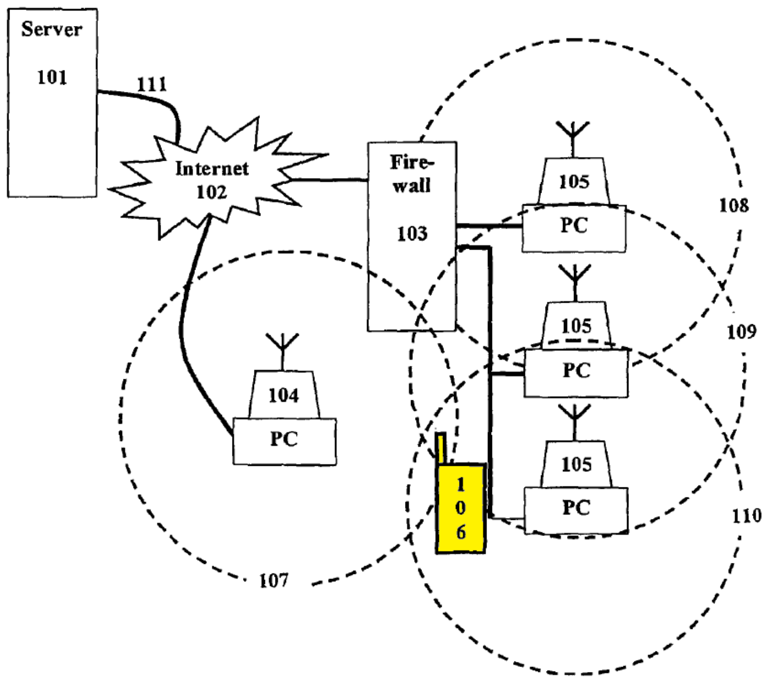

Fig. 1

(Tagg, Fig. 1.) Mobile roaming device **106**, shown highlighted in yellow, may be a "mobile computer, PDA, cellular telephone, or home appliance." (*Id.*, 7:63-66 (underlining added).) The circles shown in Figure 1 (**107-110**) show the range of wireless network access provided by fixed devices **104** and **105**. (*Id.*, 7:63-66.)

152. Tagg confirms that the mobile device **106** can switch between a number of available wireless technologies. As explained in Tagg, "[t]he mobile device determines the connection methodologies available to it and their relative

merits and then connects to the host using the best available standards." (*Id.*, 7:67-8:2.) An example of how this might work is illustrated in Figure 9:

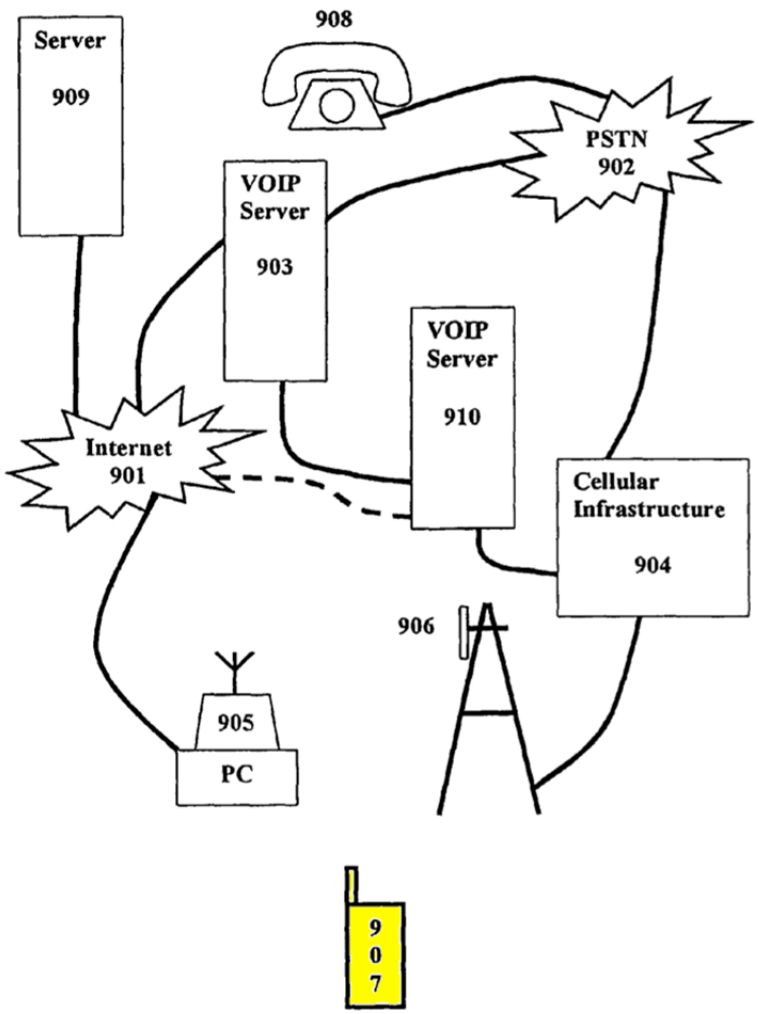

Fig. 9

153. Figure 9 above shows a cellular phone **907**, highlighted in yellow, and illustrates "the handoff between a fixed wireless, Internet based, VOW [voice over WLAN] system and a cellular system. A mobile user **907** is within range of two methods for placing a call; a PC running our cooperative networking service and a

cellular tower. The call might preferentially be placed to either unit based on the user[']s pre-set preferences or based on the current situation." (*Id.*, 11:60-66.) "In the case of connection made over the Internet voice packets are sent over the air using a wireless link such as Bluetooth or IEEE802.11 to the host **905**[.] These packets are routed thru [sic] the Internet **901** to a VOW server **903**. The VOW server converts IP packets to a form suitable for use over the PSTN and handles making and breaking the connection to users." (*Id.*, 11:67-12:6.)

154. Although the example above involves use of voice-over-IP (VOIP), Tagg makes clear that an IEEE 802.11 network can also be used to transmit digital data instead of voice. (*Id.*, 5:22, 5:27-29 ("The link can transport either data or voice. . . The software allows the user to access the Internet, send and receive e-mail and obtain high bandwidth services such as MP3 files and movies.").)

155. As I noted previously, the details of the handoff, and the Cooperative Tunneling Agent (CTA) software for evaluating available networks and performing a handoff from one wireless network to another, is not relevant to my analysis. The disclosures above simply confirm the more basic point that a cell phone can incorporate IEEE 802.11 wireless networking, and use that capability to receive data such as data files.

156. Finally, with respect to the third proposition, as I explained above in **Part V.A**, Pinard teaches that an IEEE 802.11 wireless network is a cellular network. I explained previously that the term "cellular network" simply refers to a network in which wireless communications are provided through a series of "cells," each cell proving network access for a particular geographic area. The term "cellular network" under its broadest reasonable construction, therefore, is not limited to a particular type of wireless networking technology, or technology that provides the same type of wireless range as a commercial cellular carrier.

157. In this regard, I have cited **Pinard** for the simple proposition that a "cellular network" can be built based on IEEE 802.11 wireless technology. Pinard states that it "relates generally to preemptive roaming among cells in a cellular network. In particular the invention relates to a local area wireless network including a plurality of mobile units and a plurality of access points." (Pinard, 1:21-24.)

158. More specifically, Pinard discloses a technique for improving the way in which a mobile unit selects the access point with which it will associate. (*Id.*, 2:16-22.) "Each mobile unit may select a group of eligible access points and select the most eligible access point from that group." (*Id.*, 2:45-47.) The selection may be based on the signal strength of the access points and the number of mobile units

connected to each access point (the "loading factor"). (*Id.*, 2:30-50.) Pinard expressly confirms that "[t]he cellular communications network may comprise a 1 Mbps frequency-hopping spread spectrum wireless LAN conforming to the IEEE 802.11 draft specification." (*Id.*, 2:50-53 (underlining added).) Pinard therefore confirms that a "cellular network" can be built from IEEE 802.11 access points.

159. As noted previously, Pinard refers to the "IEEE 802.11 draft specification" because as of the filing of Pinard in 1995, IEEE 802.11 was still in draft form. It is common for persons of ordinary skill in the art to describe implementations using then-available "draft" standards, with the understanding that the final standard will be used when it becomes available. Accordingly, a person of ordinary skill in the art by June 2001 would have understood the reference to IEEE 802.11 in Pinard to include at least the full range of IEEE 802.11 technologies available by the time the standard was published by 2001, including IEEE 802.11a and its higher bit rates.

160. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Yukie with O'Hara, Tagg, and Pinard, predictably resulting in a user device **10** of Yukie configured to handle digital files transmitted over an IEEE 802.11a cellular network using OFDM modulation. As noted previously, Pinard expressly confirms that a "cellular

communications network" can be built from IEEE 802.11 access points. And Tagg, as noted, specifically discloses the ability to incorporate IEEE 802.11 wireless networking technology into a wireless device such as a cell phone.

161. The system in Yukie is fully consistent with this combination. Figure 1 of Yukie discloses that transmissions between user device **10** and data server **16** are facilitated through an intermediate base station **14**:

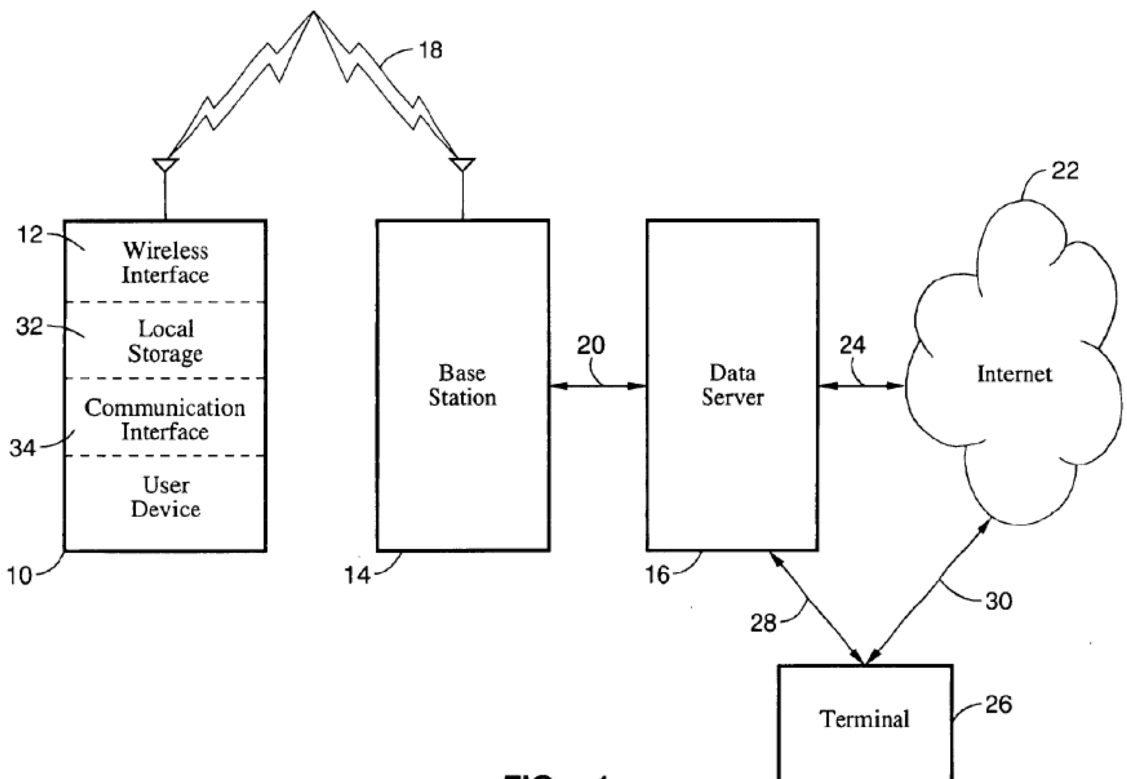

FIG. 1

As explained in Yukie, "[u]ser device **10** communicates with base station **14** over a wireless connection **18**, and base station **14** communicates with data server **16** over a landline, wireless, or other communications link **20**." (*Id.*, 3:32-35.)

162. A person of ordinary skill in the art would have found it obvious that base station **14** could have been an IEEE 802.11 access point. Yukie does not limit the type of wireless connection provided by base station **14**, and in fact, states that "the wireless connection between user device **10** and base station **14** can be implemented in various ways." (*Id.*, 5:14-16.) Tagg confirms that using IEEE 802.11 would have provided two compelling benefits: (a) speed and (b) cost.

163. **<u>Speed</u>**: It was well-known to persons of ordinary skill in the art in June 2001 that IEEE 802.11 wireless networks were capable of much greater network performance than existing cellular data networks provided by traditional carriers (e.g., AT&T). For example, Tagg describes a scenario in which a user switches to a traditional cellular data connection, causing performance to drop to just 9.6 kilobits per second (Kbps). (Tagg, 11:24-28.) But O'Hara confirms that IEEE 802.11a (using OFDM[12]) could transmit digital multimedia content at up to

[12] One of ordinary skill in the art would also have also appreciated that the use of OFDM in IEEE 802.11a offers the advantages explained in Frodigh and discussed above, including reduced intersymbol interference. (*See* O'Hara, at p. 143 ("The basic principal of operation first divides a high-speed binary signal to be transmitted into a number of lower data rate subcarriers. . . . Intersymbol interference is generally not a concern for lower speed carrier, ...").)

54 megabits per second (54 Mbps), which is more than 5,000 times faster than the 9.6 Kbps data rate reported in Tagg. (O'Hara, p. 139 ("The OFDM PHY provides the capability to transmit PSDU frames at multiple data rates up to 54 Mbps for WLAN networks where transmission of multimedia content is a consideration.").) It is therefore no surprise that O'Hara suggests use of short-range wireless networks, such as IEEE 802.11, to allow mobile users to take advantage of "high bandwidth services" such as media files (Tagg, 5:27-29), precisely the use case contemplated in Yukie. Accordingly, a person of ordinary skill in the art would have been amply motivated to incorporate IEEE 802.11 wireless networking into a cell phone (as disclosed in Tagg) to achieve the dramatically improved network performance for multimedia content (as disclosed in O'Hara), which could have reduced download times for selected data files and significantly improved user experience.

164. **<u>Cost</u>**: It was also well-known to persons of ordinary skill in the art that cellular data services provided by traditional carriers (e.g., AT&T) in June 2001 could be costly, with users potentially having to pay based on the amount of time or amount of bandwidth consumed. Tagg makes clear that these types of cellular connection charges can be dramatically reduced by allowing the cell phone to switch a short-range wireless network such as IEEE 802.11. For example, Tagg

explains that "[a] cell phone located within 100 feet of a fixed host device can connect to the Internet through that device, obtaining phone calls at a fraction of the cost of a regular cellular connection." (*Id.*, 5:31-33; *see also id.*, 5:64-66 ("Our technology sits between the user and the Internet constantly negotiating the most cost effective means by which they can gain access.").) A person of ordinary skill in the art would have understood that the same rationale for voice telephone calls would also apply to data transmissions, such as downloads of data files from a server.

165. The dual motivations – speed and cost – are also interrelated. Because of the more limited bandwidth of a traditional cellular data connection as compared to IEEE 802.11, the time it would take to download media files over a traditional cellular data connection could be considerable, resulting in even higher connection time charges and an even greater cost disparity. A person of ordinary skill in the art would have been motivated to incorporate IEEE 802.11 into the cell phone of Yukie to obtain these performance and cost benefits.

166. Tagg does not explicitly disclose that the IEEE 802.11 wireless network uses OFDM, but it was well-known and understood that IEEE 802.11**a**, one of the two variants of IEEE 802.11 introduced in the late 1990s, used OFDM. This point was expressly confirmed by O'Hara.

167. It would therefore have been obvious to a person of ordinary skill in the art to incorporate IEEE 802.11a wireless networking into the cell phones of Tagg and Yukie, predictably resulting in those devices receiving media files using OFDM. Although Tagg does not disclose any particular variant of IEEE 802.11 (it simply refers to "802.11" without any "a" or "b" suffix), a person of ordinary skill in the art would have readily understood that IEEE 802.11a was one of a finite number of potential variants of IEEE 802.11. Nothing in Tagg limits IEEE 802.11 to one particular variant or would otherwise prevent the use of IEEE 802.11a.

168. Moreover, a person of ordinary skill in the art would have appreciated that because IEEE 802.11a enabled data rates of up to 54 Mbps (compared to 1Mbps and 2Mbps for the original IEEE 802.11-1997,[13] or 11 Mbps for IEEE 802.11b), the 802.11a variant would have provided enormous advantages in terms of speed, which I explained at length above. (*See* O'Hara, at p. 139 ("In October 1997 .the IEEE 802 Executive Committee approved two projects to for higher rate physical layer (PHY) extensions to IEEE 802.11. The first extension, IEEE 802.11a, defines requirements for a PHY operating in the 5.0 GHz U-NII

[13] In addition to 802.11a and 802.11b, the original 802.11-1997 defined two variants of the IEEE 802.11 standard, one having a data rate of 1 Mbps and one having a data rate of 2 Mbps.

frequency and data rates ranging from 6 Mbps to 54 Mbps. The second extension, IEEE 802.11b, defines a set of PHY specifications operating in the 2.4 GHz ISM frequency band up to 11 Mbps.”).) Finally, by September 2000, inexpensive chipsets for implementing IEEE 802.11a were already commercially available and designed for incorporation into existing IEEE 802.11 products. (Bryan E. Braswell, *Modeling Data Rate Agility in the IEEE 802.11a Wireless Local Area Networking Protocol*, Ex. 1064, at pp. 8-9.)

VI. ENABLEMENT OF THE PRIOR ART

169. I am informed that in an *inter partes* review, the petitioning party does not have a burden to show that the prior art is enabling. Nevertheless, in my opinion, the Frodigh, Gatherer, Prust, Yukie, Tagg, O’Hara and Pinard references provide sufficient detail to enable a person of ordinary skill in the art to practice the limitations of the claims to which they apply without undue experimentation. To begin with, I am informed that, for purposes of assessing the prior art, the disclosures in issued U.S. patents (such as Frodigh, Prust, Yukie, Tagg and Pinard) are presumed enabling, and that this presumption extends to claimed and unclaimed material.

170. Nevertheless, the disclosures in these references are enabling regardless of whether they are issued patents. As I have explained in **Part III**

above, the technological underpinnings of the challenged ’810 patent claims were firmly in place well before June 2001. Cell phones with digital signal processors were well-known and in use by millions of users. (Gatherer, Ex. 1005, at p. 89.) The ’810 patent itself acknowledges that “[t]he cellular telephone **202** may be any commercially available cellular phone” (’810, 14:27-28). As I discussed above, commercially available cell phones were also capable of accessing the Internet and downloading digital content. (*Id.*, 1:36-44.)

171. Orthogonal frequency-division multiplexing (OFDM) was also a well-known transmission technology. (*See* **Part III.C**.) As I explained in **Part III.C** above, the use of OFDM in cellular systems was well known before June 2001. Indeed, as I noted, telecom heavyweights such as Ericsson and Nokia were already developing technologies and systems for using OFDM in cellular networks.

172. Frodigh, Gatherer, Yukie, Prust, O’Hara, and Pinard all pre-date the ’810 patent, and those references themselves treat wireless devices (including cell phones), digital signal processors, and OFDM as firmly in the prior art. As I explained above, a person of ordinary skill in the art would have been motivated to combine their teachings and could have done so, due maturity of those technologies. Additionally, IEEE 802.11 wireless networking described in Tagg, O’Hara and Pinard was well-known and well-documented by the late 1990s, and

by June 2001, a person of ordinary skill in the art would have been able to implement an IEEE 802.11-compliant network without undue experimentation. (O'Hara at p. viii ("By the time you read this, you will be able to purchase an IEEE 802.11-compliant, 11 Mbps consumer WLAN adapter for $99 or less.").) Pinard confirms, in fact, that IEEE 802.11 was available in draft form no later than 1995. (Pinard, 2:50-53.)

173. The ability to add media selection, download, and playback to commercially available wireless devices, such as cell phones, was also known. This is confirmed by Yukie, which describes in detail a system enabling a wireless device user to wirelessly select, download, and play music, using standard equipment. In my opinion, the system described in Yukie could have been implemented using well-known hardware, networking, and software techniques familiar to persons of ordinary skill in the art. Prust also confirms that remote storage and management of data files was well-known by at least February 2000. (Prust, 1:20-22.)

174. In short, by June 2001, each aspect of the disclosures that I have cited from Frodigh, Gatherer, Yukie, Prust, O'Hara, Tagg and Pinard was already well-known and was the subject of extensive public documentation. A person of ordinary skill in the art would not have required disclosures any more detailed than

the disclosures in the prior art to apply the prior art teachings in the manner described in this Declaration.

VII. CONCLUSION

175. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in this proceeding. If required, I will appear for cross-examination at the appropriate time. I reserve the right to offer opinions relevant to the invalidity of the '810 patent claims at issue and/or offer testimony in support of this Declaration.

176. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

Dated: January 5, 2017

Respectfully submitted,

Tal Lavian
5-Jan-2017

Tal Lavian, Ph.D.
Sunnyvale, California

EXHIBIT A

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Research and Consulting:Telecommunications,Network Communications, and Mobile Wireless Technologies

Scientist, educator, and technologist with over 25years of experience; co-author on over 25 scientific publications, journal articles, and peer-reviewed papers; named inventor on over 100 issued and filed patents; industry fellow and lecturer at UC Berkeley Engineering–Center for Entrepreneurship and Technology (CET)

EDUCATION

- **Ph.D.**, Computer Science specializing in networking and communications, UC Berkeley
- **M.Sc.**, Electrical Engineering, Tel Aviv University
- **B.Sc.**, Mathematics and Computer Science, Tel Aviv University

EXPERTISE

Network communications, telecommunications, Internet protocols, and mobile wireless:

- **Communication networks:** Internet protocols; TCP/IP suite; TCP; UDP; IP; VoIP; Ethernet; network protocols; network software applications; data link, network, and transport layers (L2, L3, L4)
- **Internet software:** Internet software applications; distributed computing; cloud computing; Web applications; FTP; HTTP; Java; client server; file transfer; multicast; streaming media
- **Routing/switching:** LAN; WAN; VPN; routing protocols; RIP; BGP; MPLS; OSPF; IS-IS; DNS; QoS; switching; packet switching; network infrastructure; network communication architectures
- **Mobile wireless:** wireless LAN; 802.11; cellular systems; mobile devices; smartphone technologies

ACCOMPLISHMENTS

- Selected as principal investigator for three US Department of Defense (DARPA) projects
- Directed research project on networking computation for the US Air Force Research Lab (AFRL)
- Led and developed the first network resourcescheduling service for grid computing
- Administered wireless research project for an undisclosed US federal agency
- Managed and engineered the first demonstrated transatlantic dynamic allocation of 10Gbs Lambdas as a grid service
- Spearheaded the development of the first demonstrated wire-speed active network on commercial hardware
- Invented over 100 patents; over 50 prosecuted *pro se* in front of the USPTO
- Created and chaired Nortel Networks' EDN Patent Committee

PROFESSIONAL EXPERIENCE

<u>University of California, Berkeley</u>, Berkeley, California 2000-Present
Berkeley Industry Fellow, Lecturer, Visiting Scientist, Ph.D. Candidate, Nortel's Scientist Liaison
Some positions and projects were concurrent, others sequential

- Serves as an industry fellow and lecturer at the Center for Entrepreneurship and Technology (CET).
- Studied network services, telecommunication systems and software, communications infrastructure, and data centers
- Developed long-term technology for the enterprise market, integrating communication and computing technologies
- Conducted research projects in data centers (RAD Labs), telecommunication infrastructure (SAHARA), and wireless systems (ICEBERG)
- Acted as scientific liaison between Nortel Research Lab and UC Berkeley, providing tangible value in advanced technologies
- Earned a Ph.D. in Computer Science with a specialization in communications and networking

<u>TelecommNet Consulting, Inc.</u>(Innovations-IP) Sunnyvale, California 2006-Present
Principal Scientist

- Consults in the areas of network communications, telecommunications, Internet protocols, and smartphone mobile wireless devices
- Provides architecture and system consultation for projects relating to computer networks, mobile wireless devices, and Internet web technologies
- Acts as an expert witness in network communications patent infringement lawsuits

<u>VisuMenu, Inc.</u>, Sunnyvale, California 2010-Present
Co- Founder and Chief Technology Officer (CTO)

- Designs and develops architecture and system of visual IVR technologies for smartphones and wireless mobile devices in the area of network communications
- Designs crawler/spider system for IVR / PBX using Asterisk, SIP, and VoIP
- Deploys the system as cloud networking and cloud computing utilizing Amazon Web Services

<u>Ixia</u>, Santa Clara, California 2008 - 2008
Communications Consultant

- Researched and developed advanced network communications testing technologies:
  • IxNetwork/IxN2X — tested IP routing and switching devices and broadband access equipment. Provided traffic generation and emulation for the full range of protocols: routing, MPLS, layer 2/3 VPNs, carrier Ethernet, broadband access, and data center bridging
  • IxLoad — quickly and accurately modeled high-volume video, data, and voice subscribers and servers to test real-world performance of multiservice delivery and security platforms
  • IxCatapult — emulated a broad range of wireless access and core protocols to test wireless components and systems that, when combined with IxLoad, provides an end-to-end solution for testing wireless service quality
  • IxVeriWave — employed a client-centric model to test Wi-Fi and wireless LAN networks by generating repeatable large-scale, real-world test scenarios that are virtually impossible to create by any other means

• Test automation — provided simple, comprehensive lab automation to help test engineering teams create, organize, catalog, and schedule execution of tests

Nortel Networks, Santa Clara, California 1996 - 2007

Originally employed by Bay Networks, which was acquired by Nortel Networks

Principal Scientist, Principal Architect, Principal Engineer, Senior Software Engineer

- Held scientific and research roles at Nortel Labs, Bay Architecture Labs, and in the office of the CTO

Principal Investigator for US Department of Defense (DARPA) Projects

- Conceived, proposed, and completed three research projects: active networks, DWDM-RAM, and a networking computation project for Air Force Research Lab (AFRL)
- Led a wireless research project for an undisclosed US federal agency

Academic and Industrial Researcher

- Analyzed new technologies to reduce risks associated with R&D investment
- Spearheaded research collaboration with leading universities and professors at UC Berkeley, Northwestern University, University of Amsterdam, and University of Technology, Sydney
- Evaluated competitive products relative to Nortel's products and technology
- Proactively identified prospective business ideas, which led to new networking products
- Predicted technological trends through researching the technological horizon and academic sphere
- Designed software for switches, routers, and network communications devices
- Developed systems and architectures for switches, routers, and network management
- Researched and developed the following projects:
  - Data-Center Communications: network and server orchestration 2006-2007
  - DRAC: SOA-facilitated L1/L2/L3 network dynamic controller 2003-2007
  - Omega: classified wireless project for undisclosed US Federal Agency 2006-2006
  - Open platform: project for the US Air Force Research Laboratory (AFRL) 2005-2005
  - Network resource orchestration for Web services workflows 2004-2005
  - Proxy study between Web/grids services and network services 2004-2004
  - Streaming content replication: real-time A/V media multicast at edge 2003-2004
  - DWDM-RAM: US DARPA-funded program on agile optical transport 2003-2004
  - Packet capturing and forwarding service on IP and Ethernet traffic 2002-2003
  - CO2: content-aware agile networking 2001-2003
  - Active networks: US DARPA-funded research program 1999-2002
  - ORE: programmable network service platform 1998-2002
  - JVM platform: Java on network devices 1998-2001
  - Web-based device management: network device management 1996-1997

Technology Innovator and Patent Leader

- Created and chaired Nortel Networks' EDN Patent Committee
- Facilitated continuous stream of innovative ideas and their conversion into intellectual property rights
- Developed intellectual property assets through invention and analysis of existing technology portfolios

Aptel Communications, Netanya, Israel 1994-1995

Software Engineer, Team Leader

Start-up company focused on mobile wireless CDMA spread spectrum PCN/PCS

- Developed a mobile wireless device using an unlicensed band [Direct Sequence Spread Spectrum (DSSS)]
- Designed and managed a personal communication network (PCN) and personal communication system (PCS), which are the precursors of short text messages (SMS)
- Designed and developed network communications software products (mainly in C/C++)
- Brought a two-way paging product from concept to development

Scitex Ltd.,Herzeliya, Israel 1990-1993

Software Engineer, Team Leader

Software and hardware company acquired by Hewlett Packard (HP)

- Developed system and network communications (mainly in C/C++)
- Invented Parallel SIMD Architecture
- Participated in the Technology Innovation group

Shalev, Ramat-HaSharon, Israel 1987-1990

Start-up company

Software Engineer

- Developed real-time software and algorithms (mainly in C/C++ and Pascal)

PROFESSIONAL ASSOCIATIONS

- IEEE senior member
- IEEE CNSV co-chair, Intellectual Property SIG (2013)
- President Next Step Toastmasters (an advanced TM club in the Silicon Valley) (2013-2014)
- Technical co-chair, IEEE Hot Interconnects 2005 at Stanford University
- Member, IEEE Communications Society (COMMSOC)
- Member, IEEE Computer Society
- Member, IEEE Systems, Man, and Cybernetics Society
- Member, IEEE-USA Intellectual Property Committee
- Member, ACM, ACM Special Interest Group on Data Communication (SIGCOM)
- Member, ACM Special Interest Group on Hypertext, Hypermedia, and Web (SIGWEB)
- Member, IEEE Consultants' Network (CNSV)
- Global Member, Internet Society (ISOC)
- President Java Users Group – Silicon Valley Mountain View, CA,1999-2000
- Toastmasters International

ADVISORY BOARDS

- Quixey –search engine for wireless mobile apps
- Mytopia – mobile social games
- iLeverage – Israeli Innovations

PROFESSIONAL AWARDS

- Top Talent Award – Nortel
- Top Inventors Award – Nortel EDN
- Certified IEEE-WCET - Wireless Communications Engineering Technologies
- Toastmasters International - Competent Communicator (twice)
- Toastmasters International - Advanced Communicator Bronze

Patents and Publications

(Not an exhaustive list)

Patents Issued

US 9,184,989	Grid proxy architecture for network resources	Link
US 9,083,728	Systems and methods to support sharing and exchanging in a network	Link
US 9,021,130	Photonic line sharing for high-speed routers	Link
US 9,001,819	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,949,846	Time-value curves to provide dynamic QoS for time sensitive file transfers	Link
US 8,929,517	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,903,073	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,898,274	Grid proxy architecture for network resources	Link
US 8,880,120	Device and method for providing enhanced telephony	Link
US 8,879,703	System method and device for providing tailored services when call is on-hold	Link
US 8,879,698	Device and method for providing enhanced telephony	Link
US 8,867,708	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,787,536	Systems and methods for communicating with an interactive voice response system	Link
US 8,782,230	Method and apparatus for using a command design pattern to access and configure network elements	Link
US 8,762,963	Translation of programming code	Link
US 8,762,962	Methods and apparatus for automatic translation of a computer program language code	Link
US 8,745,573	Platform-independent application development framework	Link
US 8,731,148	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,688,796	Rating system for determining whether to accept or reject objection raised by user in social network	Link
US 8,619,793	Dynamic assignment of traffic classes to a priority queue in a packet forwarding device	Link
US 8,572,303	Portable universal communication device	Link
US 8,553,859	Device and method for providing enhanced telephony	Link

US 8,548,131	Systems and methods for communicating with an interactive voice response system	Link
US 8,537,989	Device and method for providing enhanced telephony	Link
US 8,341,257	Grid proxy architecture for network resources	Link
US 8,161,139	Method and apparatus for intelligent management of a network element	Link
US 8,146,090	Time-value curves to provide dynamic QoS for time sensitive file transfer	Link
US 8,078,708	Grid proxy architecture for network resources	Link
US 7,944,827	Content-aware dynamic network resource allocation	Link
US 7,860,999	Distributed computation in network devices	Link
US 7,734,748	Method and apparatus for intelligent management of a network element	Link
US 7,710,871	Dynamic assignment of traffic classes to a priority queue in a packet forwarding device	Link
US 7,580,349	Content-aware dynamic network resource allocation	Link
US 7,433,941	Method and apparatus for accessing network information on a network device	Link
US 7,359,993	Method and apparatus for interfacing external resources with a network element	Link
US 7,313,608	Method and apparatus for using documents written in a markup language to access and configure network elements	Link
US 7,260,621	Object-oriented network management interface	Link
US 7,237,012	Method and apparatus for classifying Java remote method invocation transport traffic	Link
US 7,127,526	Method and apparatus for dynamically loading and managing software services on a network device	Link
US 7,047,536	Method and apparatus for classifying remote procedure call transport traffic	Link
US 7,039,724	Programmable command-line interface API for managing operation of a network device	Link
US 6,976,054	Method and system for accessing low-level resources in a network device	Link
US 6,970,943	Routing architecture including a compute plane configured for high-speed processing of packets to provide application layer support	Link
US 6,950,932	Security association mediator for Java-enabled devices	Link
US 6,850,989	Method and apparatus for automatically configuring a network switch	Link

US 6,845,397	Interface method and system for accessing inner layers of a network protocol	Link
US 6,842,781	Download and processing of a network management application on a network device	Link
US 6,772,205	Executing applications on a target network device using a proxy network device	Link
US 6,564,325	Method of and apparatus for providing multi-level security access to system	Link
US 6,175,868	Method and apparatus for automatically configuring a network switch	Link
US 6,170,015	Network apparatus with Java co-processor	Link
US 8,687,777	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,681,951	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,625,756	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,594,280	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,548,135	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,406,388	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,345,835	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,223,931	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,160,215	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,155,280	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,054,952	Systems and methods for visual presentation and selection of IVR menu	Link
US 8,000,454	Systems and methods for visual presentation and selection of IVR menu	Link
EP 1,905,211	Technique for authenticating network users	Link
EP 1,142,213	Dynamic assignment of traffic classes to a priority queue in a packet forwarding device	Link
EP 1,671,460	Method and apparatus for scheduling resources on a switched underlay network	Link
CA 2,358,525	Dynamic assignment of traffic classes to a priority queue in a packet forwarding device	Link

Patent Applications Published and Pending
(Not an exhaustive list)

US 20150058490	Grid Proxy Architecture for Network Resources	Link
US 20150010136	Systems and Methods for Visual Presentation and Selection of IVR Menu	Link
US 20140379784	Method and Apparatus for Using a Command Design Pattern to Access and Configure Network Elements	Link
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US 20140012991	Grid Proxy Architecture for Network Resources	Link
US 20130080898	Systems and Methods for Electronic Communications	Link
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- Web Services and OGSA
- WINER Workflow Integrated Network Resource Orchestration.
- Technology & Society
- Abundant Bandwidth and how it affects us?
- Active Content Networking(ACN)
- DWDM-RAM:Enabling Grid Services with Dynamic Optical Networks
- Application-engaged Dynamic Orchestration of Optical Network Resources
- A Platform for Data Intensive Services Enabled by Next Generation Dynamic Optical Networks
- Optical Networks
- Grid Optical Network Service Architecture for Data Intensive Applications
- Optical Networking & DWDM
- OptiCal Inc.
- OptiCal & LUMOS Networks
- Optical Networking Services
- Business Models for Dynamically Provisioned Optical Networks
- Business Model Concepts for Dynamically Provisioned Optical Networks
- Optical Networks Infrastructure
- Research Challenges in agile optical networks
- Services and Applications' infrastructure for agile optical networks
- Impact on Society
- TeraGrid Communication and Computation
- Unified Device Management via Java-enabled Network Devices
- Active Network Node in Silicon-Based L3 Gigabit Routing Switch
- Active Nets Technology Transfer through High-Performance Network Devices
- Programmable Network Node: Applications
- Open Innovation via Java-enabled Network Devices
- Practical Considerations for Deploying a Java Active Networking Platform
- Open Java-Based Intelligent Agent Architecture for Adaptive Networking Devices

- Java SNMP Oplet
- Open Distributed Networking Intelligence: A New Java Paradigm
- Open Programmability
- Active Networking On A Programmable Networking Platform
- Open Networking through Programmability
- Open Programmable Architecture for Java-enabled Network Devices
- Integrating Active Networking and Commercial-Grade Routing Platforms
- Programmable Network Devices
- To be smart or not to be?