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. 9,215,310

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. 9,215,310 ("'310" or "'310 patent") **[Ex. 1001]**, which states on its face that it issued from an application filed on March 31, 2014, 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 '310 patent. I have cited to the following documents in my analysis below:

Exhibit No.	Title of Document
1001	U.S. Patent No. 9,215,310 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)
1069	Terrence Chan, *UNIX System Programming Using C++* (1997)

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. 9,215,310 ("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 '310 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 ’310 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 ’310 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 ’310 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 ’310 patent, entitled “Media Delivery Platform,” purports to disclose and claim a system and method for delivering digital media files to an electronic device. (’310, Abstract.) In this section, I provide a brief background discussion on technologies pertinent to the ’310 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 ’310 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.

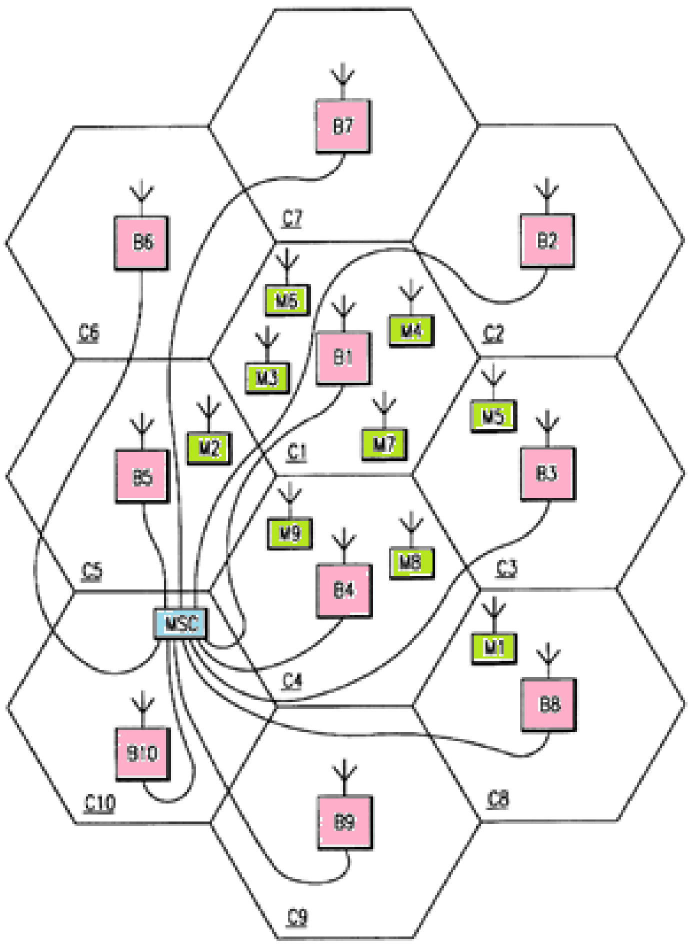

FIG. 1

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 ’310 patent acknowledges, for example, the existence of cell phones that can play music in a compressed format such as MP3. (’310, 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"):

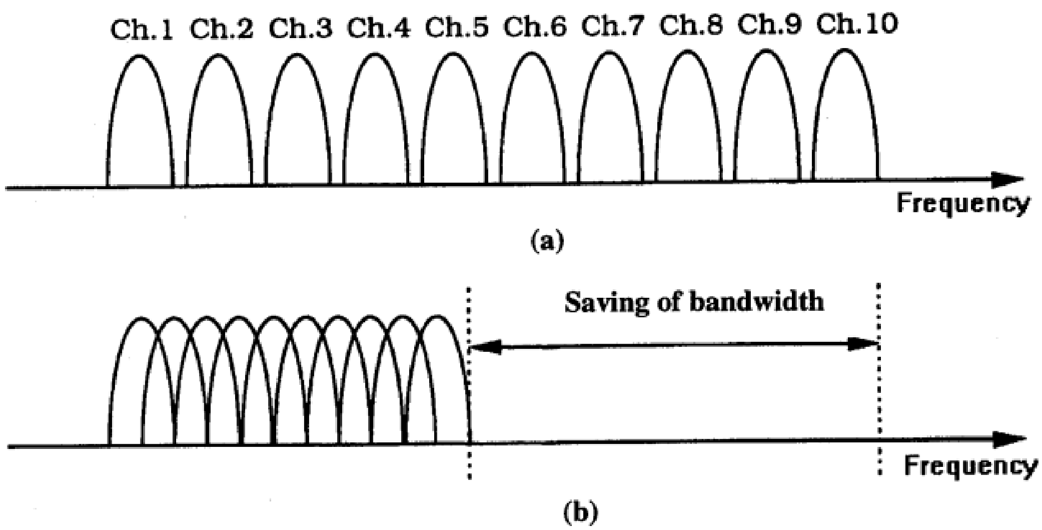

Figure 1.10 Concept of OFDM signal: (a) Conventional multicarrier technique, and (b) orthogonal multicarrier modulation technique.

(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);

[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 '310 PATENT

A. The Specification

38. Part V of the Beckmann Declaration includes a section containing an overview of the specification of the '310 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 '310 patent purports to describe a system and method for delivering digital media files to an electronic device. ('310, 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**. ('310, 14:13-19, 14:36-38.) On the left side is a server **206**, which includes server software **207**. ('310, 14:25-26.)

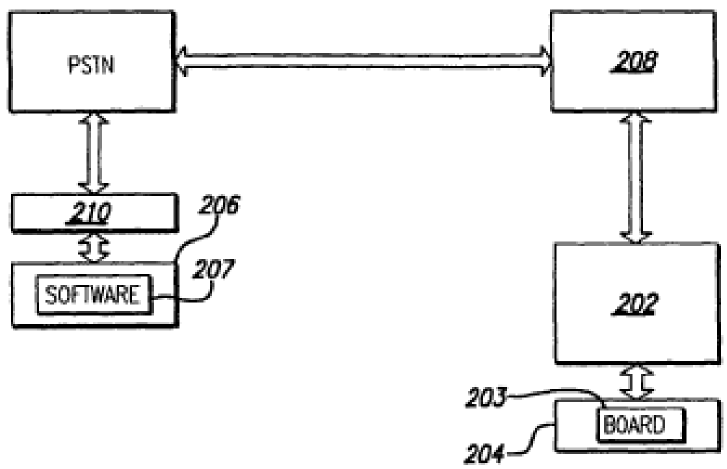

FIG. 2

In one embodiment, the patent describes a server (**206**) for storing digital media files. ('310, 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**. ('310, 18:28-36.)

40. The specification explains that the server can receive requests from the phone ('310, 12:36-59), "which may be given through user voice commands or

commands using the phone keys." ('310, 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. ('310, 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 '310 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. ('310, 8:33-44, 8:48-60.)

42. The '310 patent discloses that "[a]n orthogonal frequency-division multiplex (OFDM) modulation scheme" can be used for data transmission. ('310, 16:57-58.) Further, in one embodiment, the digital media file can be "compressed into an MPEG Layer 3 bit stream." ('310, 25:34-35; *see also id.*, 14:66-15:1, 22:31-34 (discussing "buffers" within the device memory for holding sound fragments).)

B. The Claims of the '310 Patent

43. This Declaration addresses independent claims 1 and 10, and claims 2-3, 5-9 and 11-13, which depend, directly or indirectly from claim 1 or 10. Claim 1 reads:

> 1. A method for wirelessly transmitting over a cellular network a data file between a cellular phone and a server, the server

> comprising a non-transitory virtual storage locker, the method comprising:
>
> creating the virtual storage locker associated with the cellular phone;
>
> receiving a data file from the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation;
>
> storing, in the virtual storage locker, the data file received from the cellular phone;
>
> receiving a request for the data file; and
>
> providing for the transmission of the data file to the cellular phone using orthogonal frequency-division multiplex (OFDM) modulation in response to the received request from the cellular phone.

('310, 32:62-33:13 (Claim 1).)

44. Independent claim 10 is substantially similar to claim 1 but recites a system. Claim 10 reads:

> 10. A system for wirelessly transmitting a digital data file to a cellular phone, the system comprising:
>
> a server including a non-transitory virtual storage locker

configured to store a plurality of data files; and

a cellular communication network operably coupling the server and the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation;

wherein the server is configured to:

create the virtual storage locker associated with the cellular phone;

receive a data file from the cellular phone over the communication network,

store, in the virtual storage locker, the data file received from the cellular phone,

receive a request for the data file over the cellular communication network, and

providing for the transmission of the data file over the cellular communication network using orthogonal frequency-division multiplex modulation in response to the received request.

('310, 34:3-23 (Claim 10).) I will address the other claims in the '310 patent in my detailed analysis in **Part V** below.

V. APPLICATION OF THE PRIOR ART TO THE CLAIMS

45. I have reviewed and analyzed the prior art references and materials listed in **Part I.B** above. In my opinion, the claims of the ’310 patent are invalid based on the following grounds: (1) each limitation of claims 1-3, 5-8 and 10-13 is disclosed and rendered obvious by the teachings in Yukie (Ex. 1004), Gatherer (Ex. 1005), Prust (Ex. 1013), and Frodigh (Ex. 1006); and (2) each limitation of claim 9 is disclosed and rendered obvious by the teachings in Yukie, Gatherer, Prust, and Frodigh, in further view of Chan (Ex. 1069). I have also provided alternative grounds below which substitute the Frodigh (Ex. 1006) reference with Tagg, O’Hara and Pinard (Exs. 1060, 1061, and 1003) for purposes of disclosing the cellular network (or “cellular communication network”) and OFDM limitations in claims 1 and 10. Under this alternative ground, in my opinion, the claims of the ’310 patent are invalid based on the following grounds: (3) each limitation of claims 1-3, 5-8 and 10-13 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); and (4) each limitation of claim 9 is disclosed by and rendered obvious by the teachings in Yukie, Gatherer, Prust, and Chan (Ex. 1069), in further view of Tagg, O’Hara, and Pinard.

46. I understand that each reference cited in the grounds identified above qualifies as prior art vis-à-vis the claims of the ’310 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 ’310 patent could claim priority. I am also informed by counsel that Frodigh, O’Hara, Gatherer, Pinard and Chan qualify as prior art to the ’310 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:

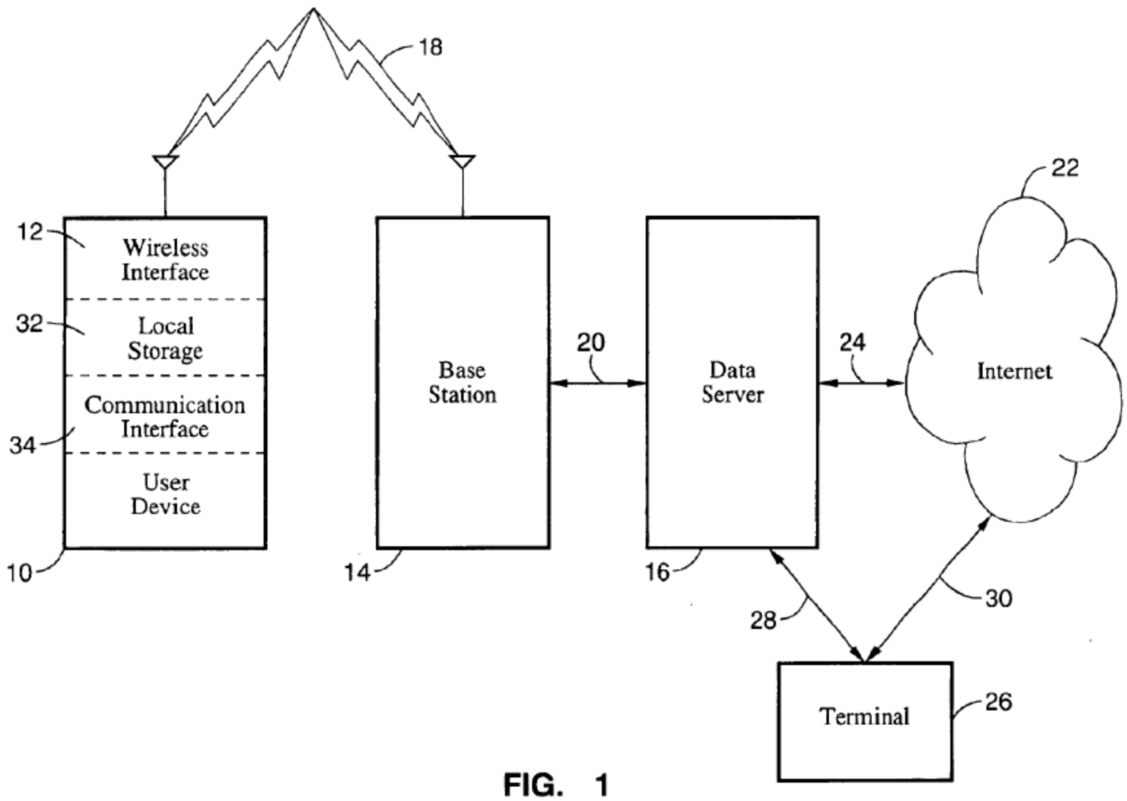

FIG. 1

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 wireless user device **10** can fall into multiple categories, and thus, have the functionalities of multiple types devices. (*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. … <u>Note also that the wireless user devices tend to fall into several categories</u>, …") (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 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. <u>**Gatherer**</u>, 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. Claims 1 and 10 of the '310

patent recite a cellular phone that includes a "**digital signal processor**." 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. **<u>Prust</u>**, 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 primarily cited

Prust in connection with the requirement in claim 1 "**storing, in the virtual storage locker, the data file received from the cellular phone**" and with the requirement in claim 10 that the server is configured to "**store, in the virtual storage locker, the data file received from the cellular phone**."

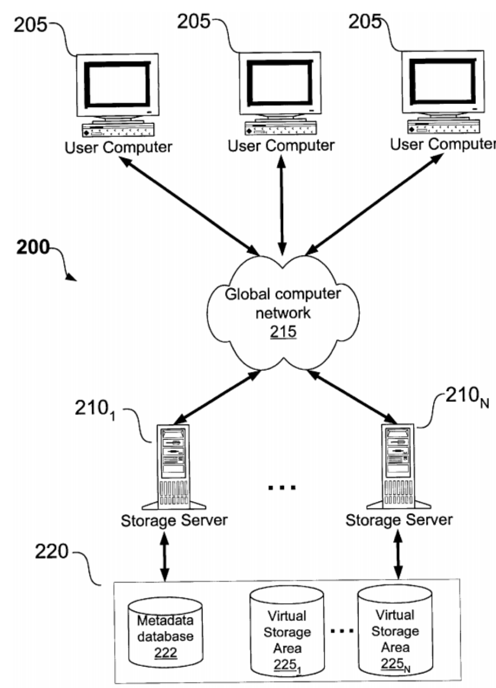

FIG. 2

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 <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.)

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**" limitations of the claims 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. Claims 1 and 10 of the '310 patent recites the transmission of data using "orthogonal frequency-division multiplex modulation." 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. 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. **<u>O'Hara</u>**, 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.").)

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:

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[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).)

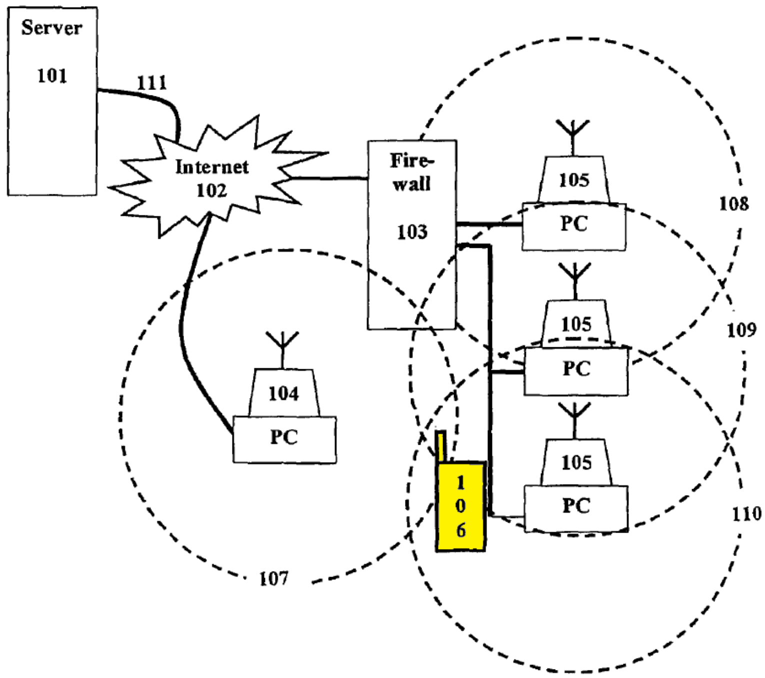

Fig. 1

(Tagg, Fig. 1.) Mobile roaming device **106**, shown highlighted in yellow, may be a "mobile computer, PDA, cellular telephone, or home appliance." (*Id.*, 7:53-66 (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 claims 1 and 10 further recite that the data is transmitted over a "**cellular network**" (or "cellular communication 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. While claim 10 recites a "cellular communication network" instead of a "cellular network," a person of ordinary skill in the art would not regard the two phrases as having any meaningful differences for purposes of my analysis in this Declaration.

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.

6. Brief Summary of Chan [Ex. 1069]

69. **Chan**, a textbook entitled, "UNIX System Programming Using C++" (1997), describes various features of the UNIX operating system. My Declaration

relies on Chan in connection with dependent claim 9, which recites associating the data file (from claim 1) with "**a unique identifier**," which is evaluated and used to identify the data file in response to a request.

70. The term "UNIX" refers to a popular operating system originally developed in the late 1960s. (Chan, at p. 1.) My Declaration focuses on aspects of the UNIX operating system, described in Chan, relating to the way UNIX stores and retrieves data files. Those techniques disclosed in Chan, as shown below, disclose association of a "**unique identifier**" as recited in claim 9.

71. In order to keep track of data files stored on disk, the UNIX operating system maintains a collection of data known as "inode table," which contains a number of "inode" records. (Chan, at pp. 136-137, § 6.4.) For each file, a corresponding inode record stores critical attributes associated with the file, such as the address where the file's data is physically stored on disk. (*Id.*, at p. 136.) An inode record also contains a unique "**inode number**," which is a unique identifier associated with the file. As explained in Chan: "Each entry of the inode table is an inode record which contains all the attributes of a file, including <u>an unique inode number</u> and the physical disk address where the data of the file is stored. Thus <u>if a kernel needs to access information of a file with an inode number</u>

of, say 15, it will scan the inode table to find an entry which contains an inode number of 15, in order to access the necessary data." (*Id.* (underlining added).)

72. Chan also confirms that when a new data file is received and stored, UNIX associates that file with a new inode record containing a unique inode number: "Whenever a new file is created in a directory, the UNIX kernel allocates a new entry in the inode table to store the information of the new file. Moreover, it will assign a unique inode number to the file and add the new file name and inode number to the directory file that contains it." (*Id.* at p. 137 (underlining added).)

73. UNIX maintains other attributes about a data file beyond its inode number, such as its file type, access permissions, and a "file owner user ID" (UID). (*Id.* at p. 134-35, § 6.3.) Chan explains that the file owner can be set using a standard UNIX system call or command known as "chown." (*Id.* at p. 136.) As I will explain in my discussion of claim 9 below, the limitations recited in dependent claim 9 do nothing more than recite well-known and basic concepts of operating system storage of data files. Those limitations are fully disclosed, and rendered obvious by, the teachings of Chan.

B. Ground 1: Claims 1-3, 5-8 and 10-13 Based on Yukie, Prust, Gatherer and Frodigh

1. Independent Claim 1

74. 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 for wirelessly transmitting over a cellular network a data file between a cellular phone and a server, the server comprising a non-transitory virtual storage locker, the method comprising:

[a] creating the virtual storage locker associated with the cellular phone;

[b] receiving a data file from the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation;

[c] storing, in the virtual storage locker, the data file received from the cellular phone;

[d] receiving a request for the data file; and

[e] providing for the transmission of the data file to the cellular phone using orthogonal frequency-division multiplex (OFDM) modulation in response to the received request from the cellular

phone.

('310, 32:62-33:13 (Claim 1).) Each limitation of claim 1 is disclosed and rendered obvious by Yukie in view of Prust, Gatherer and Frodigh.

75. The preamble of claim 1 recites, "**[a] method for wirelessly transmitting over a cellular network a data file between a cellular phone and a server, the server comprising a non-transitory virtual storage locker**." Assuming the preamble of claim 1 provides a claim limitation, it is fully disclosed by Yukie, Prust and Frodigh. I will first address how Yukie discloses "**[a] method for wirelessly transmitting . . . a data file between a cellular phone and a server**." I will then address the "cellular network" and "virtual storage locker" aspects of the preamble.

76. As I explained in Part **V.A** above, Yukie discloses a system for allowing a user to wirelessly transmit 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); *see also 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." (underlining added)).)

77. 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).)

78. Further details on Yukie's disclosures of wireless transmission of files are provided in the description of the limitations below. Yukie therefore discloses

"[a] method for wirelessly transmitting . . . a data file between a cellular phone and a server," as recited in the preamble.

"transmitting over a cellular network"

79. Yukie, alone or with **Frodigh**, further discloses that the data file is "transmitt[ed] over 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**:

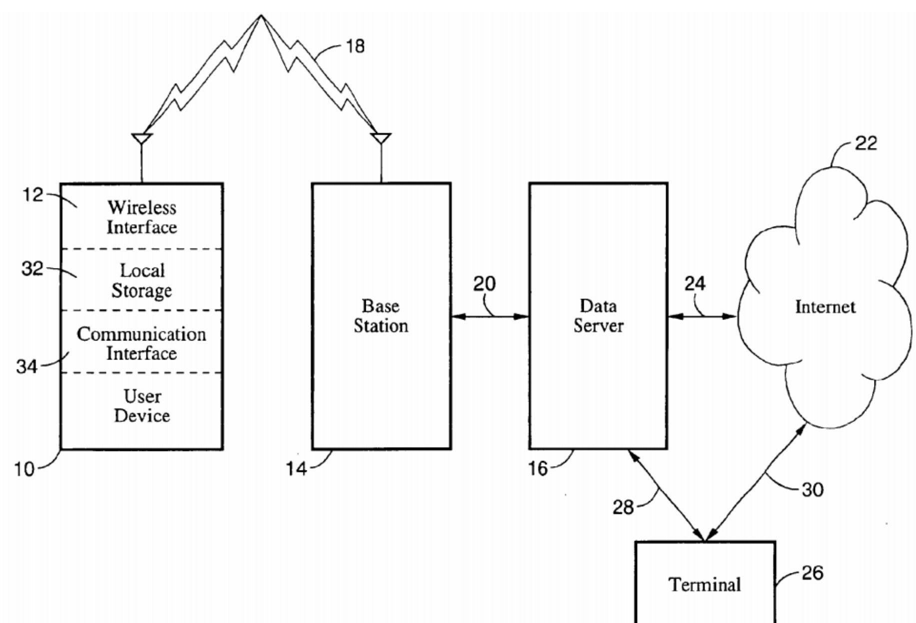

FIG. 1

(Yukie, Fig. 1.)

80. 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 <u>analog cellular system</u>." (*Id.*, 5:25-27 (underlining added).)[3] Yukie therefore discloses that the data file is "**transmitt[ed] over a cellular network**," as recited.

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[3] 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

81. This portion of the preamble is also separately disclosed by **Frodigh**. I discuss Frodigh in more detail below regarding limitations related to orthogonal frequency division multiplexing. 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 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.)

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cellular system," in fact, is similar to the analog cellular embodiment in the '310 patent. ('310, 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.)

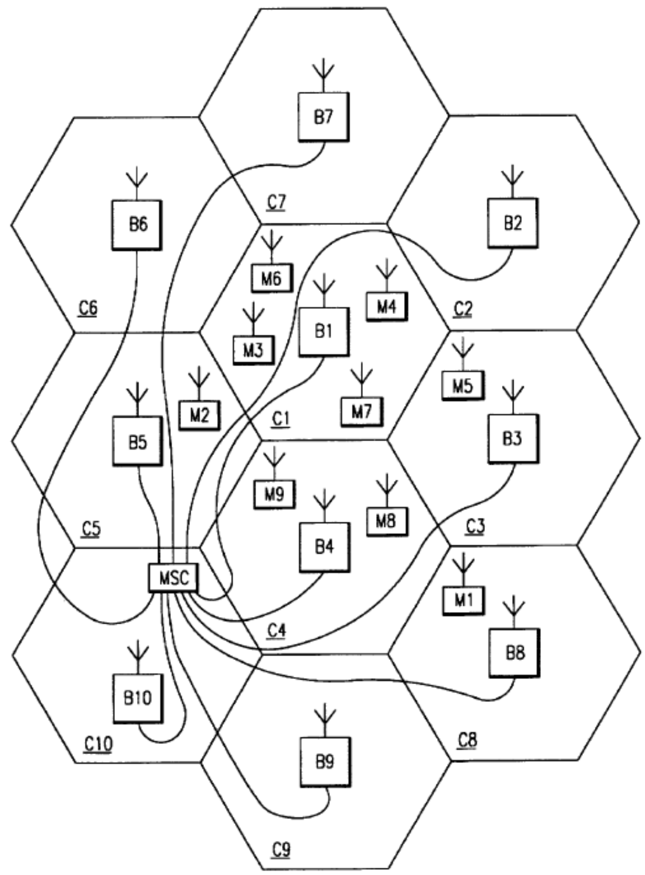


FIG. 1

(*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.

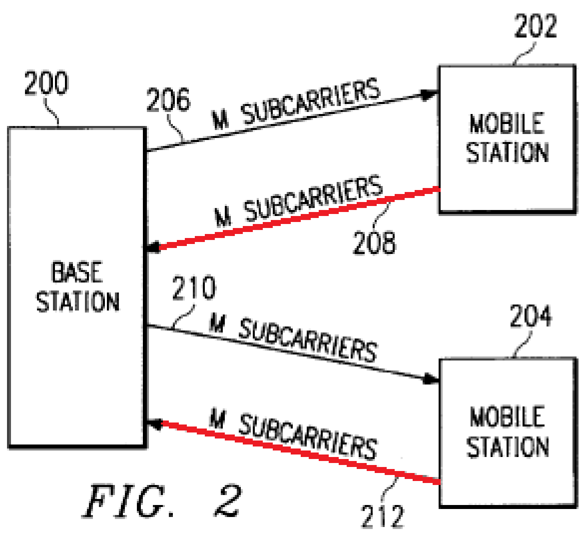


FIG. 2

(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 later recited in the '310 claims), as disclosed in Frodigh. The rationale and motivations to combine Yukie with Frodigh are discussed below for claim 1[b].

"non-transitory virtual storage locker"

82. Yukie, alone or in combination with **Prust**, further discloses and renders obvious a server that comprises a "**non-transitory virtual storage locker**," as recited in the claim. The specification of the '310 patent makes clear that a "virtual storage locker" is simply a storage area that is associated with a user. ('310, 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).)[4]

83. 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

[4] It is not clear from the '310 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.

or owner." (*Id.*, 20:54-56 (underlining added).)[5] Yukie further confirms that storage on the data server **16** is "non-transitory," explaining "when user device **10** stores data for long-term use (e.g., data which is not for immediate operation of the device), user device **10** sends the data to data server **16** through the wireless connection." (*Id.*, 17:27-30 (underlining added).)

84. These disclosures teach and render obvious the "**non-transitory 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 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

[5] 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 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.)

protect the user's data." (*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 "**non-transitory 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.

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

86. 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

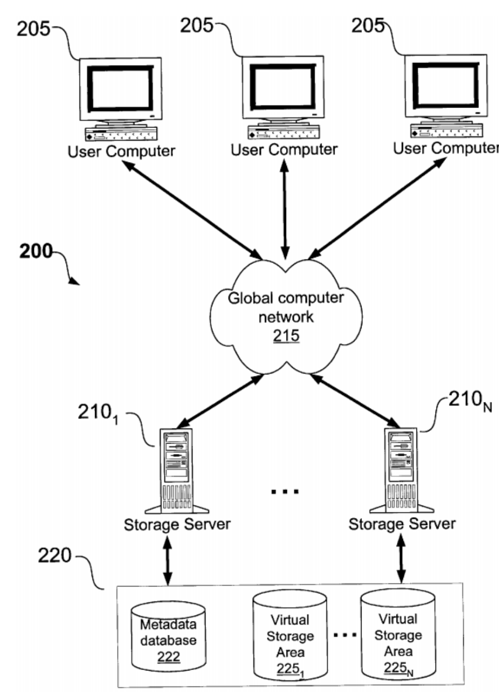


FIG. 2

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 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).)

87. 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.)

88. Prust further confirms that the virtual storage areas provide non-transitory storage, explaining that the storage network **220** that defines the pool of virtual storage areas **225** includes "one or more interconnected storage devices, such as a RAID, for storing data files." (*Id.*, 4:57-61 (underlining added).) As was well-known to persons of ordinary skill in the art, "RAID" or "Redundant Array of

Independent [or Inexpensive] Disks," was a technique for providing fault-tolerant long-term data storage. (*See also id.*, 3:1-3 ("Redundant Array of Independent Disks (RAID)—A high-volume storage device having multiple storage drives and fault recovery procedures.").) Prust therefore discloses a "**non-transitory virtual storage locker**" as claimed.

89. ***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 cellular phone.

90. 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.

91. 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" (*Id.*, 4:4-6), and that files stored on data server **16** may be organized by author or owner (*Id.*, 20:54-56).

92. Moreover, a person of ordinary skill in the art would found have 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 battery-powered, pocket-sized, mobile computer known as a hand-held PC or personal digital assistant (PDA)." (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 wireless connection." (*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.

93. 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.").)

94. 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

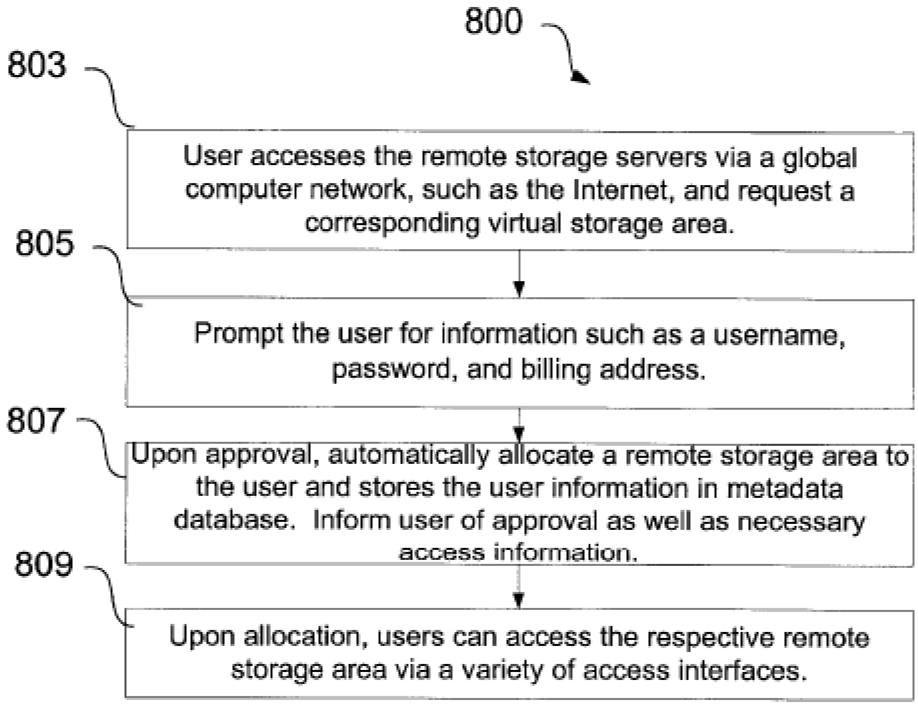
data to data server **16** for storage. (Yukie, 3:42-48 ("User device **10** can comprise any number of devices, without restriction, such as a music player, a still camera, a video camera, a video display, a car stereo, a telephonic device, a handheld control device, a game device, an appliance, a computer 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**.

95. Therefore, Yukie in view of Frodigh and Prust discloses the preamble of claim 1, "[a] method for wirelessly transmitting over a cellular network a data file between a cellular phone and a server, the server comprising a non-transitory virtual storage locker."

a. "creating the virtual storage locker associated with the cellular phone" (Claim 1[a])

96. As discussed above for the preamble, Yukie, alone or in combination with Prust, discloses a "virtual storage locker." Yukie and Prust also both disclose "**creating**" the virtual storage locker. As I noted previously, Yukie specifically discloses a "virtual storage locker" in the form of the storage area provided on data server **16** (the "personal server of the user"). (Yukie, 4:1-4.) A person of ordinary skill in the art would have understood storage of files on the virtual storage locker, as disclosed in Yukie, requires that the locker have been created.

97. Prust also discloses the step of creating the "virtual storage locker." Figure 8 in Prust discloses a technique for "allocating" virtual storage areas for users:



(Prust, Fig. 8.) Prust explains:

> FIG. 8 is a flow chart **800** that provides a high-level overview of one mode of operation in which storage network **220** allocates remote storage areas **225**. In block **803**, users access storage servers **210** via global computer network **215** and request a corresponding virtual storage area **225**. For each request, storage server **210** prompts the user for information such as a username, password, billing address (block **805**). Upon approval, storage network **220** automatically allocates a corresponding storage area **225** for each user and stores the respective user information in metadata database **222** (block **807**). After a virtual storage area **25** [sic; 225] has been allocated, storage network **220** informs each user of any necessary access information, such as a password, so that the user can access the respective storage

area **225** via the many access interfaces described above (block **809**).

(Prust, 7:59-8:7 (underlining added).)

98. As the figure and passage from Prust above make clear, the process for creating a virtual storage area for a user involves receiving a request from a user, prompting the user for information including username and password, and then actually allocating a storage area for the user. Prust therefore discloses "creating the virtual storage locker."

99. Yukie and Prust also disclose and render obvious the step of creating the virtual storage area "**associated with the cellular phone**," as claimed. As explained above, Yukie and Prust both disclose servers that provide a user-specific virtual storage locker. In Yukie and Prust, the user can access the virtual storage locker using a mobile wireless device such as a cellular phone. (*See* Yukie, 3:38-41 ("… telephonic communication device such as a . . . cellular phone"); *see also* Prust, 3:38-41 ("… a hand-held PC or personal digital assistant (PDA)"), 4:12-15 ("… may be connected to a network using with a wired or wireless connection.").) Because the virtual storage locker is accessed using a cell phone or other wireless device, Yukie and Prust disclose and render obvious creating the virtual storage locker "associated with the cellular phone," as claimed.

100. The combination of Yukie and Prust provides a second way of rendering obvious the "**associated with the cellular phone**" limitation of claim 1[a]. As I explained above, Prust and Yukie explain that the user may be prompted to enter its username and/or password to gain access to its virtual storage area. (Prust, Fig. 8 (805), 7:64-66, Yukie, 4:1-4.) It would have been obvious to substitute the manual entry of a username and/or password with use of a unique and device-specific identifier as disclosed in Yukie. As Yukie explains:

> The user profile would preferably be stored on data server **16** in association with an identification number or "user ID." The user ID can be unique to a particular user device **10**, such as a unique number assigned to the device by the manufacturer and stored in permanent memory of the device. The user ID can also be supplied by the user to user device **10** in various ways. In one embodiment, the user can supply the user ID to user device **10** by direct entry through a keypad or other user input.

(Yukie, 19:41-49.)

101. It would have been obvious to a person of ordinary skill in the art to substitute the entry of a username and/or password with the device-specific "user ID" of Yukie. This would have predictably resulted in the system of Yukie and Prust in which the system uses the device-specific user ID in Yukie to facilitate access to the virtual storage locker on the server. Under this combination, access

to the virtual storage area relies on the device-specific user ID, and tying the virtual storage locker directly to the cell phone, thus satisfying the "**associated with the cellular phone**" limitation under even a narrow interpretation.

102. Additionally, a person of ordinary skill in the art would have found it trivial to adapt Prust and Yukie to rely on the device-specific user ID to facilitate access of the user's virtual storage area. To begin with, it was known to persons of ordinary skill in the art that communications devices could be assigned unique identifiers, such as the MAC addresses and IMEI numbers well-known in the art. A person of ordinary skill in the art would have appreciated that relying on a device-specific user ID to facilitate access to a remote server was a known alternative to requiring manual entry of user information. Yukie itself confirms this, as it discloses that the user ID can be a device-specific user ID <u>or</u> manually entered "by direct entry through a keypad or other user input" (Yukie, 19:46-49), the latter being similar to technique employed in Prust for entering user identification information. (Prust, Fig. 8 (805) ("Prompt the user for information such as a username, password, and billing address.").)

103. A person of ordinary skill in the art would therefore have regarded a device-specific ID is a known and acceptable substitute for manual entry of user identification information. It would have been obvious to adapt the "personal

private server" of Yukie, or the virtual storage area of Prust, to use a device-specific ID to facilitate access to the server instead of manual entry of username and/or password information. (Yukie, 4:1-4 (explaining that personal server "can be secure, such as by using encryption and/or password access, to protect the user's data."); Prust, 7:64-66 ("[S]torage server **210** prompts the user for information such as a username, password, billing address (block **805**).").) Linking the virtual storage locker to the device ID of Yukie would also have freed the user from having to manually enter identification information when access to the virtual storage locker is requested. This would have resulted not only in improved user experience but, by eliminating reliance on a user-supplied password that could be compromised, provided potentially greater security.

104. The rationale for combining Yukie and Prust was provided in my discussion of the preamble of claim 1 and applies with equal force to this limitation.

b. "receiving a data file from the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation" (Claim 1[b])

105. 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 a data file from the cellular phone"

106. Yukie explains that the remote server receives the data file from a wireless device: "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**." (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 <u>would transmit the data to a remote server through a wireless connection</u>. <u>The data would be saved on the remote server</u> for subsequent retrieval through, for example, the Internet or a wireless connection to the server.") (underlining added).)

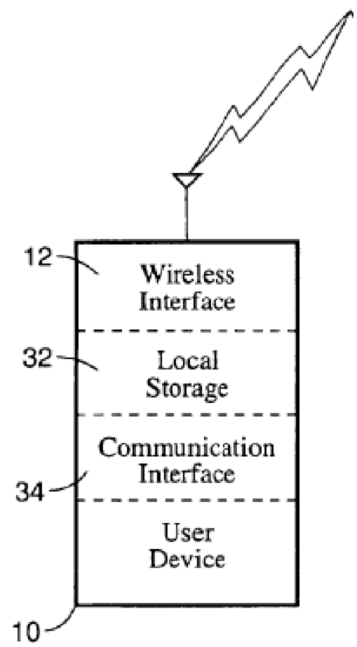
107. As noted previously, Yukie discloses that the wireless device may be a "telephonic communication device such as a . . . cellular phone." (*Id.*, 10:41-42 (underlining added).) Yukie further discloses an example in which, in the context of a cellular telephone, the user can create an electronic file 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).)

108. Yukie further discloses other 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 cellular phone."

"said cellular phone including a receiver and a digital signal processor"

109. 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. . . <u>The telephonic device would also include wireless interface **12**</u>, 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** <u>can be a receiver</u> only, a transmitter only, or be a <u>transceiver</u> 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.

110. 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).) 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**.

111. 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).) 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, demodulating, equalizing, and PCA).)

112. ***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.

113. 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, flexibility is 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).)

114. 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).)

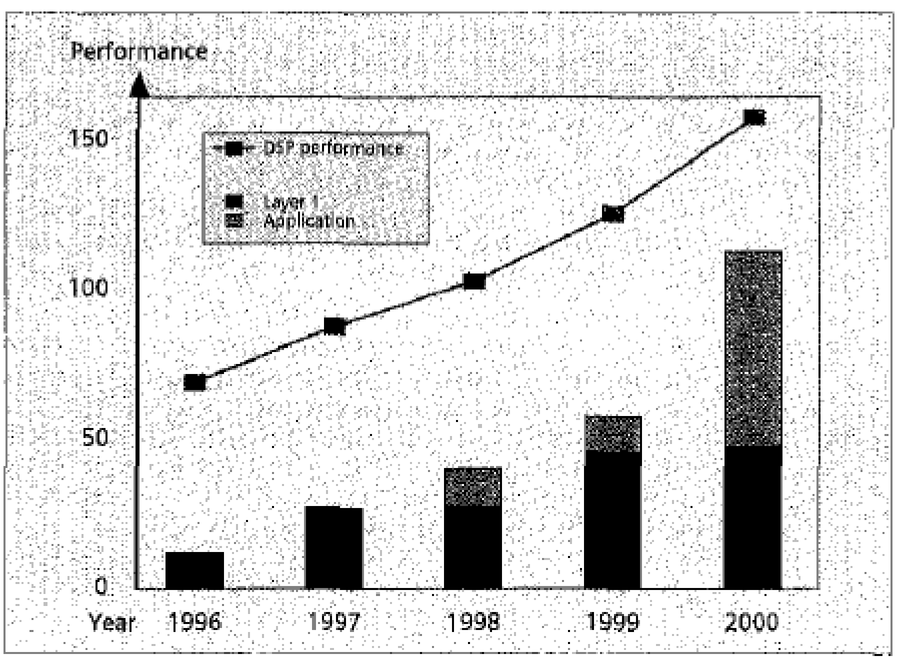
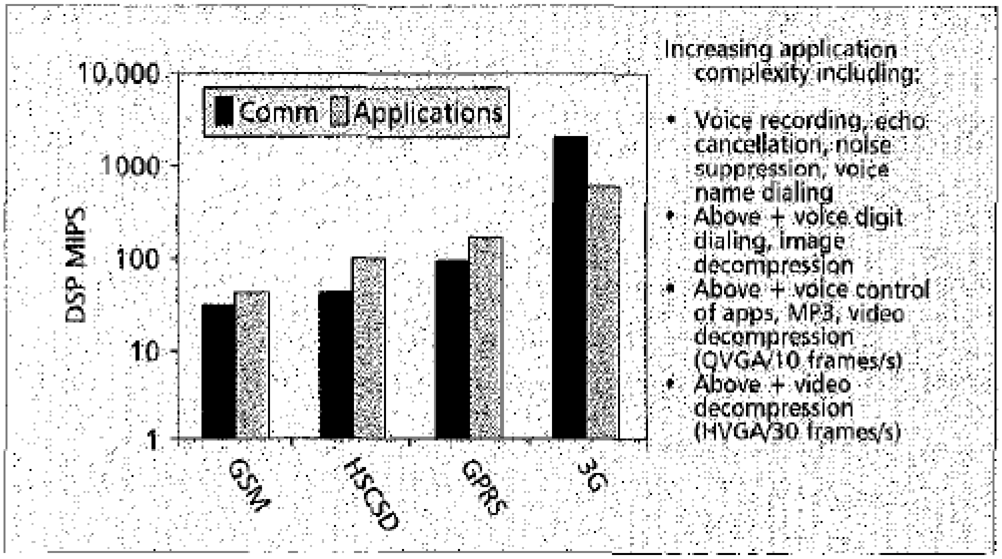


Figure 3. *Layer 1 and application MIPS with time.*



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

115. 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.)

116. 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 receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation"

117. 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 data files 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**.”).)

118. 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 (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.”), 8:2-7 & 8:49-56 (same; video file).) 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 cellular phone is "**configured for receiving and processing data files**" transmitted to the cellular phone, as claimed.

119. 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. <u>Orthogonal frequency division multiplexing (OFDM) is a particular method of FDM that is **particularly suited for cellular systems**</u>. 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"[6] over a cellular

[6] A person of ordinary skill in the art would have understood that the term

network. (*Id.*, 7:51-63; Fig. 2; *see also id.*, 5:29-30, Fig. 1.) 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 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 receiving and processing data transmitted by OFDM.

120. ***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. 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,

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"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.").)

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).) 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.

121. 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.[7]

(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.

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[7] I note that the mitigation of intersymbol interference is a benefit of OFDM that the ’310 patent itself acknowledges. (’310, 16:58-60.)

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

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

124. 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 receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation," this would nevertheless have been obvious, as I explain below.

<u>Receiver</u>

125. Any requirement that the <u>receiver</u> be configured for receiving and processing of data files 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.

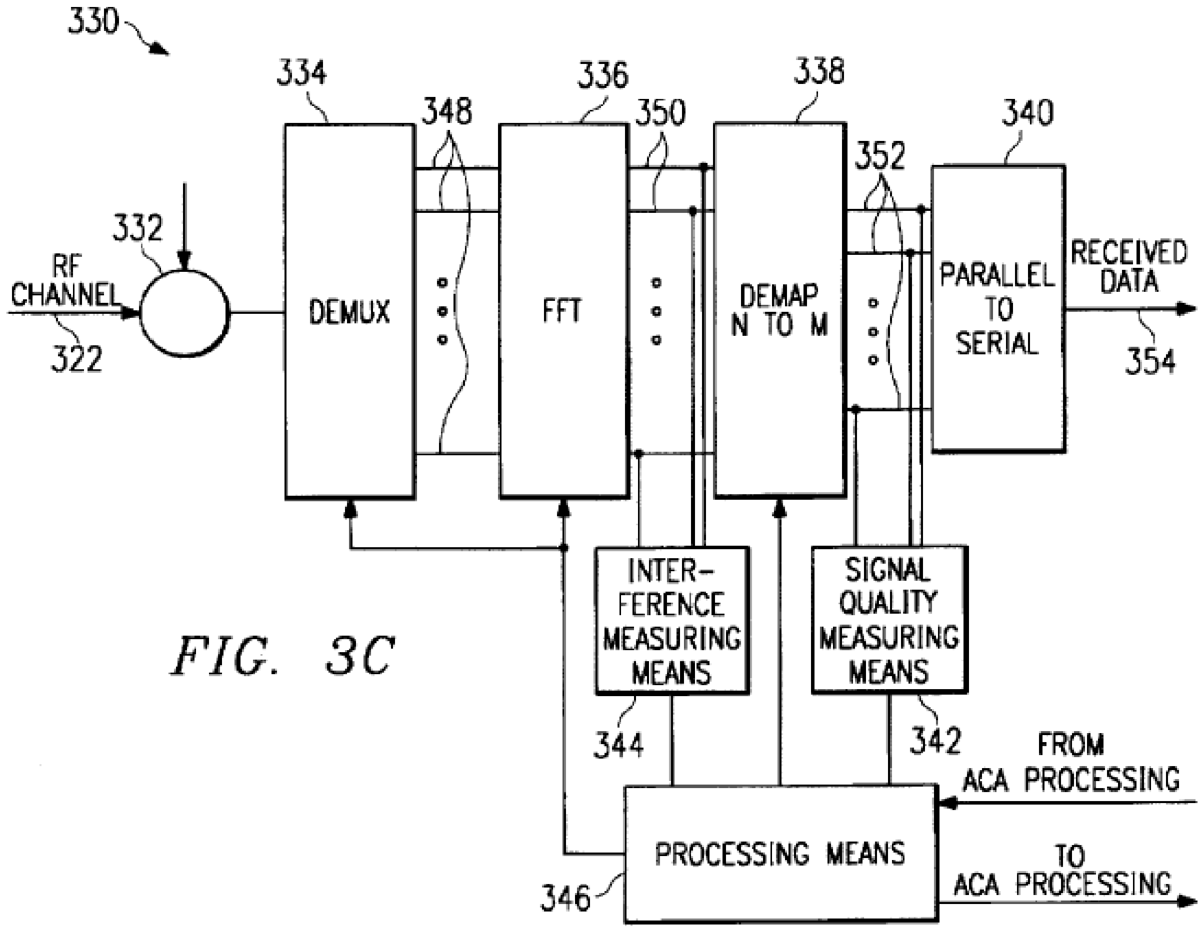


FIG. 3C

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

126. 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.)

127. As noted, Frodigh makes clear that the data received and processed by the receiver **330** can include non-voice data. (*Id.*, 7:58-59 ("<u>Voice</u> <u>and</u> <u>data</u> to be transmitted on each link are modulated onto a number (M) subcarriers.") (underlining added).) Frodigh therefore discloses and renders obvious a <u>receiver</u> "configured for receiving and processing data files 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

128. Any requirement that the digital signal processor be configured for receiving and processing data files 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 "receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation."

129. 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 formatting, 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.

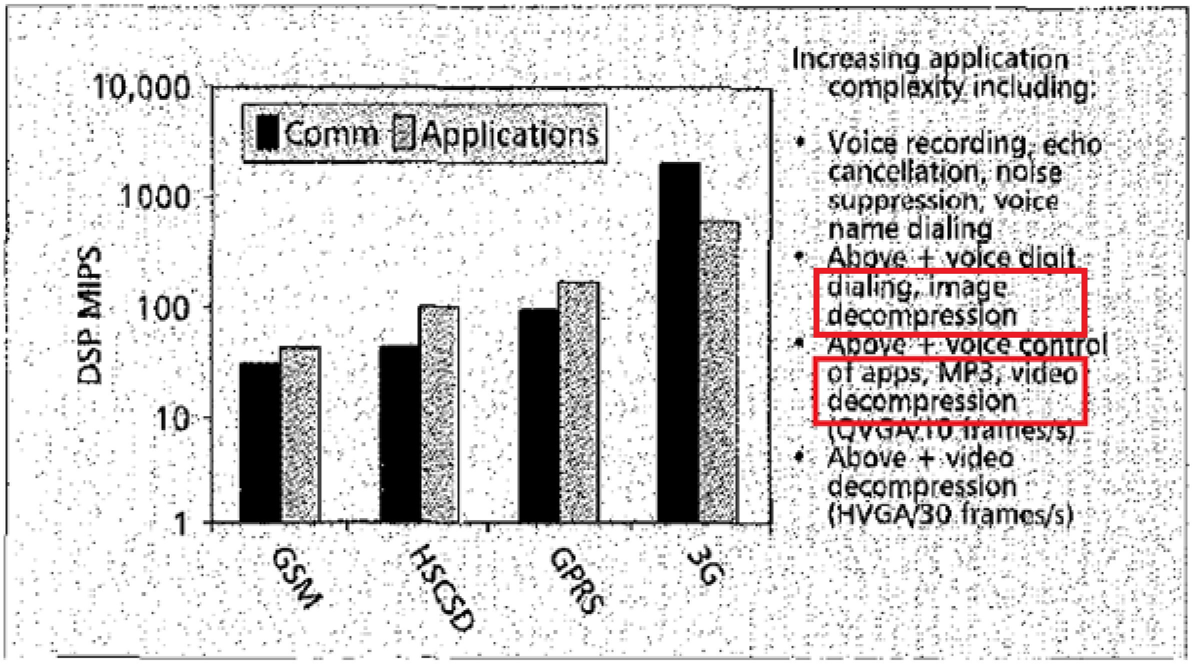
130. One of ordinary skill in the art would have had ample motivations to implement functions of the OFDM receiver using a digital signal processor. To begin with, it was well known that DSPs could be programmed to handle OFDM signals. (E. Lawrey, *Multiuser OFDM*, Fifth International Symposium on Signal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

131. 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.").)

132. 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.C** 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.

133. 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 media processing." (*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 process for playback the digital media that was transmitted to the cell phone by OFDM modulation.

134. Accordingly, the prior art satisfies the limitation "receiving a data file from the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing data files transmitted by orthogonal frequency-division multiplex modulation."

c. "storing, in the virtual storage locker, the data file received from the cellular phone" (Claim 1[c])

135. As noted previously, Yukie discloses that the data file sent by user device **10**, which may be a cellular phone, 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 sends data to data server **16** for storage 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**, or on data server **16** across the wireless connection, as described above."), 6:60-63 ("When the user desires to store the image (e.g., by pressing a 'shutter' button), the camera would send the image data across the wireless connection to data server **16** for storage as an image file."), 7:41-46 (same, video file) (underlining added to all).) Yukie therefore discloses "**storing . . . the data file received from the cellular phone**."

136. With respect to storing the data file "**in the virtual storage locker**" in particular, I explained above in my analysis of the preamble of claim 1 how Yukie, alone or in combination with Prust, discloses and renders obvious the claimed "virtual storage locker" and the storage of data files received from a device, such as a cellular phone, in the storage area corresponding to the virtual storage locker. (*See*, *e.g.*, Yukie, 4:1-4 (personal server for storing user's personal data files), 20:54-56 (organizing data files by data author or owner); Prust, 1:38-45, 4:52-5:5, 7:3-6, 7:59-8:7.) I also explained that 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 and provided rationale to combine Yukie and Prust, which applies equally to this claim limitation.

d. "receiving a request for the data file" (Claim 1[d])

137. Yukie also discloses that data server **16** receives a request for the data file, such as from user device **10**. 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 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." (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, 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 (same, image file), 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).)

e. "providing for the transmission of the data file to the cellular phone using orthogonal frequency-division multiplex (OFDM) modulation in response to the received request from the cellular phone" (Claim 1[e])

138. 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**, which can be a cellular phone. (*Id.*, 17:48-53 (" . . . user device **10** could send a request to data server **16** for specific data and <u>then receive the data sent from data server **16**</u>"), 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 <u>data server **16** would send the file to the music player across the wireless</u> connection"), 7:14-17, 8:2-4 & 8:49-52.) Yukie therefore discloses the step of "**providing for the transmission of the data file to the cellular phone . . . in response to the received request from the cellular phone**," as claimed.

139. Although Yukie does not disclose that the transmission of the data file to the cellular phone 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 the transmission of the data file to the cellular phone using orthogonal frequency-division multiplex (OFDM) modulation in response to the received request from the cellular phone," as recited in the claim.

140. Accordingly, Yukie in view of Prust, Gatherer and Frodigh disclose and render obvious claim 1.

2. Dependent Claim 2: "The method of claim 1, wherein the data file comprises at least one of a full, partial, or segment of: a song, a musical score, musical composition, other audio recording, a ringtone, a video, other visual recording, a movie, a film, an image clip, a picture, a clip, an image, a photograph, a television show, a human voice recording, a personal recording, a cartoon, an animation, an audio advertisement, a visual advertisement, or combinations thereof."

141. Claim 2 depends from claim 1 and recites:

> The method of claim 1, wherein the data file comprises at least one of a full, partial, or segment of: a song, a musical score, musical composition, other audio recording, a ringtone, a video, other visual recording, a movie, a film, an image clip, a picture, a clip, an image, a photograph, a television show, a human voice recording, a personal recording, a cartoon, an animation, an audio advertisement, a visual advertisement, or combinations thereof.

('310, 33:14-21.) The limitations added by claim 2 are disclosed by Yukie

142. As noted above, Yukie discloses that a cellular phone can be used by the user to make an audio recording file to transmit to the data server **16**. (Yukie, 11:13-19 ("[A]ny of the embodiments of the telephonic device . . . 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 . . . on data server **16** across the wireless connection, as described above.").) Therefore, Yukie discloses and renders obvious at least data files comprising an "audio recording," "a human voice recording" or "a personal recording."

3. Dependent Claim 3: "The method of claim 1, wherein receiving the request for the data file comprises receiving the request from a second cellular phone, and wherein transmitting the data file based on the received request comprises transmitting the data file to the second cellular phone using OFDM modulation."

143. Claim 3 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 second cellular phone, and wherein transmitting the data file based on the received request comprises transmitting the data file to the second cellular phone using OFDM modulation." The limitations added by claim 3 are disclosed by Yukie and Frodigh.

144. As I explained previously, Yukie further discloses that the user device may be a cellular phone, which receives a data file transmitted over a wireless connection from the server in response to a request for that file. (Yukie, *e.g.*, 10:41-43 (cellular phone), 10:52-54 (wireless connection for data transmission), 11:4-6 (request to data server **16** for data).) It would have been obvious to a person of ordinary skill in the art that a user in Yukie could have a second cellular phone and could use that second phone to request download of the data file previously transmitted to data server **16** by the first cellular phone as recited in claim 1. Yukie expressly discloses that a user can be associated with more than one wireless user device, and that data stored on data server **16** by a first device can be accessed by a second device: "Data can also be supplied to data server **16** by a first user device **10** to be accessed by a second user device (not shown) in real time or with a delay." (Yukie, 18:5-7; *see also id.*, 4:14-16 (observing that a particular user may have registered multiple devices with the server), 17:37-41 ("[T]o access data on data server **16** that was stored on data server **16** by user device **10** itself <u>or stored on data server **16** from some other source</u> . . ." (underlining added)).)

145. It would therefore have been obvious that the system of Yukie could be adapted to allow the user to upload a data file to data server **16** using a first cellular phone (per the technique of claim 1), and then later download that file

from data server **16** using a second phone. Yukie therefore discloses and makes obvious the step of "receiving the request [for the data file] from a second cellular phone, and . . . transmitting the data file based on the received request," as claimed.

146. As to transmitting the data file using "OFDM modulation," this would have been obvious in view of Frodigh for the reasons expressed above for claim 1[b] and claim 1[e]. As explained previously, Frodigh describes both the transmission and receipt of data by a wireless device. The disclosures of Frodigh with respect to the OFDM limitation and the rationale for combining are explained at length above, and apply equally here. Claim 3 is therefore obvious.

4. Dependent Claim 5: "The method of claim 1, further comprising providing a representative image of the data files in the virtual storage locker for selection of the data file to be transmitted."

147. Claim 5 depends from claim 1 and recites "[t]he method of claim **1**, further comprising providing a representative image of the data files in the virtual storage locker for selection of the data file to be transmitted." As I explained above, claim 1 is disclosed by and obvious over Yukie, Prust, Gatherer and Frodigh. The additional limitation added by claim 5 is disclosed by Prust.

148. In my opinion, claim 5 does not recite a meaningful distinction over claim 1. As I will explain below, it would have been obvious to a person of ordinary skill in the art to adapt the system of Yukie to allow the cell phone to

provide a representative image of the data files (such as graphical icons) in the storage locker for selection.

149. Indeed, anyone who had used the Microsoft Windows or the Macintosh operating systems would have recognized the ability to associate and display a representative image (such as an image icon) with a data file. Any user of Microsoft's Windows operating systems since at least Windows 95, for example, would have been familiar with this technique as part of their everyday experience navigating the folders and files.

150. Prust confirms that these techniques were not only known, but could have been readily adapted to Yukie. The excerpt of Figure 6 from Prust below depicts an embodiment in which a listing of data files is provided through a web-based display, each file shown with a representative image:

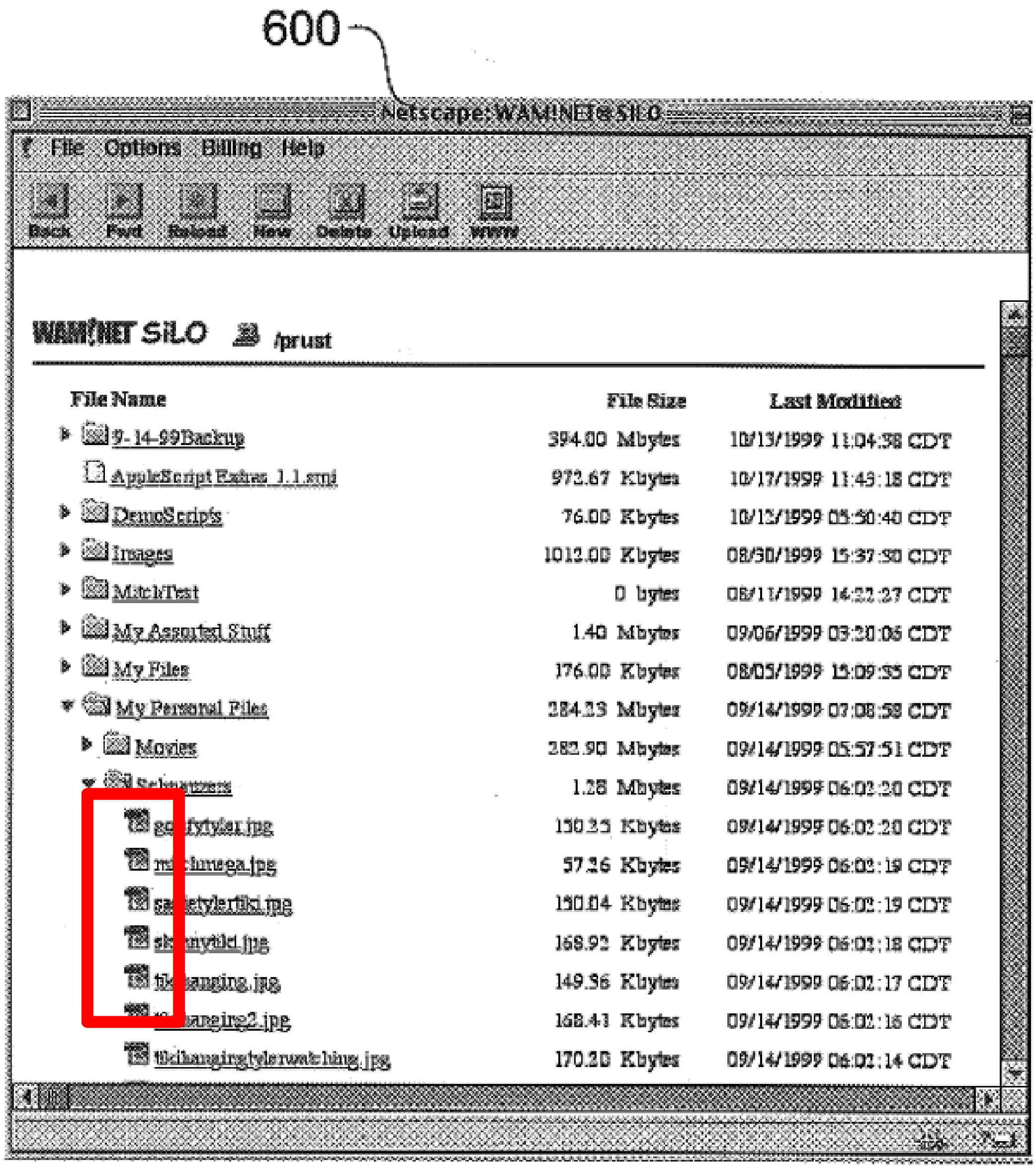


FIG. 6

(Prust, Fig. 6 (excerpt; red box added to highlight image icons).) Prust explains that the web-based display in Figure 6 was designed to "closely resemble" the well-known Windows and Macintosh operating systems discussed above. (Prust, 7:1-2 ("Window **600**, therefore, closely resembles windows **300** and **400** as displayed by operating system **135**.”), 5:60-63 (“FIG. 3 illustrates window **300** as displayed by operating system **135** for accessing a virtual storage area **225**. In the illustrated embodiment, operating system **135** is the Macintosh® operating system from Apple Computer, Inc.”), 6:13-15 (“FIG. 4 illustrates another embodiment in which operating system **135** is the Windows® operating system from Microsoft.”) (underlining added to all).) As further explained in Prust:

> FIG. 6 illustrates the user accessing one of the virtual storage areas **225** via a conventional web browser executing on client computer **205**. The web browser displays window **600** that lists each directory within virtual storage area **225**. Storage servers **210** maintain a set of image icons for representing the stored data file according to file and creator type information or file extension. Storage servers **210** select and display an appropriate icon as a function of the file and creator information stored within virtual storage area **225**.

(Prust, 6:59-67 (underlining added).) Prust therefore discloses providing an image icon representative of an associated file from the virtual storage area (“virtual storage locker”) for selection of the associated file.

151. It would have been obvious to apply the image icon technique described by Prust to the system of Yukie, predictably resulting in a system in which the cellular phone of Yukie is provided with a representative image of the data files in the virtual storage locker (in the form of icons) for the selection of the

data file to be transmitted. The rationale and motivations to combine Yukie and Prust that I described above apply equally here. Additionally, as noted previously, Prust discloses that its techniques can be used with mobile wireless devices closely analogous to cellular phones, such as hand-held PCs and personal digital assistants (PDAs). (Prust, 3:38-41, 4:12-15.) And Yukie, for its part, confirms that "[t]he telephonic device can include software for accessing content on the Internet, such as web-browsing software." (Yukie, 10:50-51). A person of ordinary skill in the art would therefore have regarded the user interface techniques in Prust as being adaptable to the cellular phone of Yukie.

152. A person of ordinary skill in the art would have been motivated to combine Yukie and Prust in this manner for another reason. Yukie discloses that different types of filed may be stored on data server 16 for selection by the user, such as video, still images and audio. (Yukie, 20:52-21:23.) Prust discloses the ability to provide a representative image (e.g. a graphical icon) based on, for example, the filename extension or the creator type of information. (Prust, 6:59-67.) Adding Prust's representative image to the system of Yukie would have improved the system of Yukie by providing a visual indicator to aid the user in identifying and distinguishing different data files from other files listed on the

display, thus improving user experience. Accordingly, claim 5 would have been obvious.

5. Dependent Claim 6: "The method of claim 5, wherein providing for selection of the data file to be transmitted comprises listing the data file in alphabetical order among a plurality of data files."

153. Claim 6 depends from claim 5 and recites "[t]he method of claim **5**, wherein providing for selection of the data file to be transmitted comprises listing the data file in alphabetical order among a plurality of data files." As I explained above, claim 5 is disclosed by and obvious over Yukie, Prust, Gatherer and Frodigh. The additional limitation added by claim 6 is disclosed by Prust.

154. As with claim 5, claim 6 adds nothing more than the unremarkable technique of listing items in alphabetical order, which, again, would have been familiar to any user of the Macintosh and Microsoft Windows operating systems, and more fundamentally, is a basic and age-old method of organizing information in numerous contexts, such as telephone books.

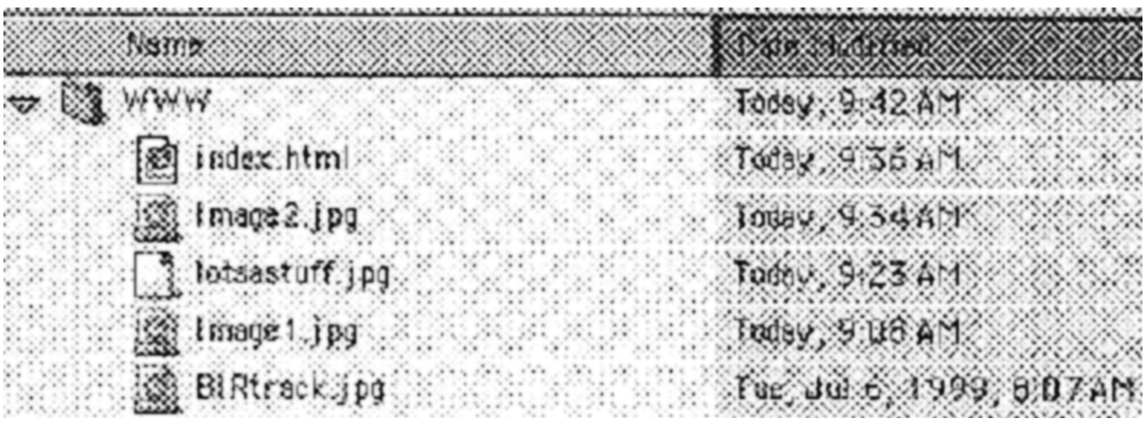
155. Figure 6 of Prust, shown in connection with claim 5 above, expressly shows a grouping of data files listed in alphabetical order. A similar alphabetical listing is provided in Figure 4. Prust therefore discloses listing a data file "**in alphabetical order among a plurality of data files**," as claimed.

156. For the same reasons as claim 5, it would have been obvious to a person of ordinary skill in the art to combine Yukie with Prust, in this case, to provide an alphabetical listing of data files that include "the data file" recited in claim 1. The example from Figure 6 above, moreover, shows a representative image accompanying each of the alphabetically-ordered files, so it would have been obvious to provide the system of Yukie that contains both the representative image of claim 5, and the alphabetical listing shown in claim 6. The rationale and motivations to combine Yukie and Prust that I described above apply equally here. Moreover, listing files in alphabetical order is one of a finite number of ways to arrange them so as to assist a user in locating a desired file. Accordingly, claim 6 would have been obvious.

6. Dependent Claim 7: "The method of claim 5, wherein providing for selection of the data file to be transmitted comprises listing the data file in chronological order among a plurality of data files."

157. Claim 7 depends from claim 5 and recites "[t]he method of claim **5**, wherein providing for selection of the data file to be transmitted comprises listing the data file in chronological order among a plurality of data files." As I explained above, claim 5 is disclosed by and obvious over Yukie, Prust, Gatherer and Frodigh. This additional limitation is also disclosed by Prust.

158. Like claim 6, claim 7 adds nothing more than the unremarkable technique of listing items in chronological order, which, again, has been a familiar feature of the Microsoft Windows operating system for decades to any user. Listing items in chronological order is also a basic and age-old method of organizing information for activity logs, employment records, and many other contexts. Figure 3 of Prust expressly discloses listing files in chronological order:



(Prust, Fig. 3 (excerpt); *see also id.*, 5:60-61 ("FIG. 3 illustrates window **300** as displayed by operating system **135** for accessing a virtual storage area **225**.").)

159. As shown in the excerpt above, the files within the folder "WWW" are listed in chronological order based on the date of modification – in this case, the files are ordered from most-to-least recent chronological order. The listing starts with "Today, 9:42 AM" for the file "index.html," then "Today, 9:36 AM" for

the file "Image2.jpg," and so on. Prust therefore discloses listing a data file "**in chronological order among a plurality of data files**," as recited.[8]

160. It would have been obvious to list data files in chronological order in Yukie. To begin with, all of the rationale and motivations to combine Yukie and Prust that I described above apply equally here. The example from Figure 3 above, moreover, shows a representative image accompanying each of the chronologically-ordered files, so it would have been obvious to adapt the system of Yukie to provide the representative image of claim 5, and the chronological listing shown above for claim 7. Moreover, listing files in chronological order is one of a finite number of ways to arrange them so as to assist a user in locating a desired file. Furthermore, Yukie expressly discloses that "storage date" information for

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[8] The '310 patent is not clear whether "**chronological order**" requires listing the files in ascending order (from the earliest to the most recent), or in descending order (from the most recent to the earliest). In my opinion, this distinction would make no difference because both provide a chronological order. And to the extent the claim were construed to require either ascending and not descending order, it was known that chronological listings of data files, such as those described in Prust, could be easily arranged in ascending or descending order.

data files is provided from the data server **16** to the user device **10** (Yukie, 17:50-53), confirming the applicability of a chronological ordering of files to Yukie.

161. Accordingly, claim 7 would have been obvious.

7. Dependent Claim 8: "The method of claim 1, further comprising storing at least a portion of the data file on the cellular phone."

162. Claim 8 depends from claim 1 and recites "[t]he method of claim 1, further comprising storing at least a portion of the data file on the cellular phone." As I explained above, claim 1 is disclosed by and obvious over Yukie, Prust, Gatherer and Frodigh. The additional limitation added by claim 8 is disclosed and rendered obvious by Yukie.

163. Yukie discloses multiple embodiments in which the data file, or a portion of it, is stored on the user device **10**. For example, with respect to an audio file transmitted from data server **16** to the 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. <u>Alternatively, or in addition, the music player can store the entire audio file, or a portion</u>, 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.

164. 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. 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). Based on this express disclosure, it would have been obvious to a person of ordinary skill in the art that the wireless user device **10** in Yukie could fall into both the cellular phone and music player categories, and thus, incorporate the functionalities of both types of devices.

165. Such a combination is even more obvious in light of the fact that the cellular phone embodiment in Yukie shares a key feature with the music player – like 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.) 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. Storing the data file locally also allows faster access to the data file because it need not be downloaded for subsequent access. This may be particularly advantageous where the data file is expected to be accessed often, or large in size. Accordingly, one of ordinary skill in the art would have appreciated that the ability to store data files locally (in addition to retrieval on demand from the server) would provide the user with flexibility to choose the appropriate method of storage based on different circumstances. Claim 8 would therefore have been obvious.

8. Independent Claim 10

166. As with claim 1, I have reproduced independent claim 10 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:

10. A system for wirelessly transmitting a digital data file to a cellular phone, the system comprising:

[a] a server including a non-transitory virtual storage locker configured to store a plurality of data files; and

[b] a cellular communication network operably coupling the server and the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation;

[c] wherein the server is configured to:

[c][1] create the virtual storage locker associated with the cellular phone;

[c][2] receive a data file from the cellular phone over the communication network,

[c][3] store, in the virtual storage locker, the data file received from the cellular phone,

[c][4] receive a request for the data file over the cellular communication network, and

[d] providing for the transmission of the data file over the cellular communication network using orthogonal frequency-division multiplex modulation in response to the received request.

(’310, 34:3-23.)

167. Each limitation of claim 10 is disclosed and rendered obvious by Yukie in view of Prust, Gatherer and Frodigh.

168. The preamble of claim 10 recites "**[a] system for wirelessly transmitting a digital data file to a cellular phone**." Assuming the preamble of claim 10 provides a claim limitation, it is fully disclosed by Yukie. As I explained for claim 1 above, Yukie discloses a system in which a data file stored on a data server **16** can be requested and downloaded to a user device **10**, which can be a cellular phone. (Yukie, 10:41-43, 11:13-22 (downloading data file using wireless connection from data server **16** to telephonic device).)

169. I note that claim 10 recites a "*digital* data file" while claim 1 recites a "data file." This is not a meaningful distinction. A person of ordinary skill in the art would understand that the data files disclosed in Yukie are *digital* data files. Yukie discloses a digital, computer-based system for storing data files on a data server.

a. "a server including a non-transitory virtual storage locker configured to store a plurality of data files" (Claim 10[a])

170. I already largely addressed claim 10[a] in my analysis of the preamble of claim 1 and claim 1[c] above. As noted above, the preamble of claim 1 recites "the server comprising a non-transitory virtual storage locker" and claim 1[c] further recites "storing, in the virtual storage locker, the data file." I explained above that these claim limitations are met by Yukie, alone or in combination with

Prust. Therefore for all of the reasons discussed above for the preamble of limitation 1[c] of claim 1, claim 10[a] is also disclosed by Yukie, alone or in combination with Prust.

171. I note that claim 10[a] recites storing a "plurality" of data files, while claim 1 recites only a "data file." Both Yukie and Prust confirm that a storage area associated with a user can store a plurality of data files. (Yukie, 20:54-56 ("Data can be stored on the server in numerous ways, such as encoded electronic files organized by data author or owner."), 21:4-8 ("Storage, such as data supplied by the user (e.g., images, audio, or other data stored in files)"); Prust, 7:2-6 ("Using the browser, 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.").)

b. "a cellular communication network operably coupling the server and the cellular phone, said cellular phone including a receiver and a digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation" (Claim 10[b])

172. I already addressed the limitations of claim 10[b] in my analysis for the preamble of claim 1 and claim 1[b]. As to the first portion of claim 10[b], "a cellular communication network operably coupling the server and the cellular phone," I explained for the preamble of claim 1 above that Yukie discloses a user

device **10**, in the form of a cellular phone, that can connect wirelessly (using, e.g., a cellular network) to data server **16**. (Yukie, *e.g.*, 5:14-29, 10:40-49, 11:13-22.) I also explained that Frodigh similarly discloses a cellular network and identified the rationale to combine Yukie and Frodigh. While claim 10[b] recites a "cellular communication network" instead of a "cellular network," a person of ordinary skill in the art would not regard the two phrases as having any meaningful differences for purposes of my analysis in this Declaration.

173. Regarding the second portion of the claim 10[b], "said cellular phone including a receiver and a digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation," this portion was addressed in my analysis of claim 1[b]. I explained that Yukie discloses a receiver (Yukie, 3:55-67), but does not disclose a DSP. I explained that Gatherer discloses a DSP and identified the rationale for combining Yukie and Gatherer in my claim 1[b] analysis. I explained that further combination of Frodigh discloses and renders obvious that the receiver and DSP are "configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation." I identified the rationale for combining Yukie and Frodigh in my analysis of claim 1[b], which applies equally here.

c. "wherein the server is configured to: create the virtual storage locker associated with the cellular phone" (Claim 10[c][1])

174. I addressed claim 10[c][1] in my analysis of claim 1[a], which similarly recites "creating the virtual storage locker associated with the cellular phone." For the reasons explained above for claim 1[a], claim 10[c][1] is disclosed by Yukie in view of Prust. (Yukie, 4:14-16, 11:13-22, 17:37-41, 19:41-46; Prust, 3:37-40, 7:59-8:7, Fig. 8.) I identified the rationale to combine Yukie and Prust in my claim 1[a] analysis, which applies here as well.

d. "wherein the server is configured to: . . . receive a data file from the cellular phone over the communication network" (Claim 10[c][2])

175. I largely addressed claim 10[c][2] in my analysis for claim 1[b], which similarly recites in part, "receiving a data file from the cellular phone." As I explained above, Yukie discloses a data server **16** that can receive a data file from a user device **10**, such as a cellular phone. (Yukie, *e.g.*, 10:40-49, 11:13-22.) As I noted above for the preamble of claim 10, Yukie further discloses that wireless transmission from the user device **10** to the data server **16** may be by a cellular connection. (Yukie, 5:23-29.) I also explained in my analysis of the preamble of claim 1 that Frodigh also discloses a cellular network and renders obvious transmission of a data file over a cellular network. I explained the rationale for

combining Yukie and Frodigh in my analysis of claim 1[b], which applies equally here.

e. "wherein the server is configured to: . . . store, in the virtual storage locker, the data file received from the cellular phone," (Claim 10[c][3])

176. Claim 10[c][3] is substantially the same as claim 1[c], which similarly recites "storing, in the virtual storage locker, the data file received from the cellular phone." Therefore, my analysis for claim 1[c] applies equally to claim 10[c][3].

f. "wherein the server is configured to: . . . receive a request for the data file over the cellular communication network" (Claim 10[c][4])

177. I largely addressed claim 10[c][4] in my analysis for claim 1[d], which similarly recites, "receiving a request for the data file." As I explained above, Yukie discloses a data server **16** that can receive a request for a data file from a user device **10**, such as a cellular phone. (Yukie, *e.g.*, 10:40-49, 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**."), 11:13-22.) As I noted above for the preamble of claim 10, Yukie further discloses that wireless transmission between the user device **10** to the data server **16** may be by a cellular connection. (Yukie, 5:23-29.) I also explained in my analysis of the preamble of claim 1 that Frodigh also discloses a cellular network and renders obvious transmission of a data file

over a cellular network. I explained the rationale for combining Yukie and Frodigh in my analysis of claim 1[b], which applies equally here.

g. "providing for the transmission of the data file over the cellular communication network using orthogonal frequency-division multiplex modulation in response to the received request." (Claim 10[d])

178. I largely addressed claim 10[d] in my analysis for claim 1[e], which similarly recites, "providing for the transmission of the data file to the cellular phone using orthogonal frequency-division multiplex (OFDM) modulation in response to the received request from the cellular phone." My analysis for claim 1[e] applies equally to claim 10[d].

179. I note that claim 10[d] recites that the transmission occurs "over the cellular communications network," while claim 1[e] does not. However, as I explained for other limitations of claim 10, both Yukie and Frodigh disclose transmission over a cellular network (or cellular communication network). I explained the rationale for combining Yukie and Frodigh in my analysis of claim 1[b], which applies equally here.

180. Therefore, claim 10 is obvious.

9. Dependent Claim 11

181. As shown in the table below, claims 2 and 11 add nearly identical limitations to the claims from which they depend. As shown with underlined text,

the limitations only differ by claim 11 reciting a "digital data file," while claim 2 recites a "data file."

Claim 2	Claim 11
2. The method of claim 1, wherein the data file comprises at least one of a full, partial, or segment of: a song, a musical score, musical composition, other audio recording, a ringtone, a video, other visual recording, a movie, a film, an image clip, a picture, a clip, an image, a photograph, a television show, a human voice recording, a personal recording, a cartoon, an animation, an audio advertisement, a visual advertisement, or combinations thereof.	10. The system of claim 10, wherein the digital data file comprises at least one of a full, partial, or segment of: a song, a musical score, musical composition, other audio recording, a ringtone, a video, other visual recording, a movie, a film, an image clip, a picture, a clip, an image, a photograph, a television show, a human voice recording, a personal recording, a cartoon, an animation, an audio advertisement, a visual advertisement, or combinations thereof.

182. As I explained above for claim 10, the recitation of a "digital" data file is not a patentable distinction. The prior art therefore discloses claim 11.

10. Dependent Claim 12: "The system of claim 10, wherein the request for the data file is received from the cellular phone, and wherein the data file is transmitted to the cellular phone in response to the received request."

183. Unlike claim 1, independent claim 10 from which claim 12 depends does not recite that the request for the data file and the transmission of the file is from and to the cellular phone. The limitations of claim 12 therefore were already addressed above in my analysis of claim 1[d] and claim 1[e]. As I explained above, Yukie clearly teaches that the cellular phone from which a data file was

transmitted to data server **16** can later request and receive the data file back from the server:

> [A]ny of the embodiments of the telephonic device . . . 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. For playback, the device would download audio data in an audio stream from data server **16** and outputs the audio in real-time.

(Yukie, 11:13-22 (underlining added); *see also id.* 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**.").)

184. Therefore, claim 12 is obvious.

11. Dependent Claim 13: "The system of claim 10, wherein the request for the data file is received from a second cellular phone, and wherein the data file is transmitted to the second cellular phone in response to the received request."

185. Dependent claim 13 adds substantially the same limitations to claim 10 that claim 3 adds to claim 1. As I explained above for claim 3, Yukie expressly discloses that a data file stored on data server **16** by a first user device can be requested by and transmitted to a second user device. (Yukie, 18:5-7.) As I have

noted multiple times, Yukie also explains that the user devices may be cellular phones. Therefore, this claim is obvious.

C. Ground 2: Claim 9 Based on Yukie, Prust, Gatherer, Frodigh and Chan

186. I have reproduced independent claim 9 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:

> 9. The method of claim 1, further comprising:
>
> [a] associating, in response to receiving the data file from the cellular phone, a unique identifier with the data file and a user of the cellular phone;
>
> [b] evaluating the unique identifier; and
>
> [c] identifying the data file based on the unique identifier in response to receiving the request for the data file.

('310, 33:40-34:2.)

187. As I explained in the preceding **Part V.B** above, claim 1 is disclosed and rendered obvious by Yukie, Prust, Gatherer and Frodigh. But those references do not appear to expressly disclose the additional requirements added by dependent claim 9. Those limitations, and claim 9 as a whole, are nevertheless disclosed and obvious over the prior art that I applied to claim 1, in further view of <u>**Chan**</u>.

188. As I briefly explained in my overview in **Part V.A**, Chan describes various features of the popular UNIX operating system. Chan devotes an entire

chapter, entitled "UNIX Files," to a description of the operating system's file storage techniques. (Chan, at pp. 129-46.) Chan explains that "[f]iles are the building blocks of any operating system, as most operations in a system invariably deal with files." (*Id.*, at p. 129.) My analysis below focuses on portions of Chan that describe how UNIX assigns a unique identifier to a data file, and then uses that identifier to locate the file for subsequent retrieval and access.

1. "associating, in response to receiving the data file from the cellular phone, a unique identifier with the data file and a user of the cellular phone" (Claim 9[a])

189. As established in my analysis of claim 1[b] above, data server **16** in Yukie receives a data file from user device **10** (the "**cell phone**") for storage. (Yukie, *e.g.*, 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 later access by user **10**.").) Yukie therefore discloses "**receiving the data file from the cellular phone**," but Yukie does not disclose the mechanics of how that file is stored and, therefore, does not disclose associating the data file with a unique identifier as claimed. But **Chan** discloses this detail.

190. Chan explains that UNIX maintains an "**inode table**" that contains a separate "**inode**" record for each file or directory. (Chan, pp. 136-137, § 6.4.) The purpose of an inode record is to keep track of critical information about a file or

directory. For example, an inode record stores critical attributes about a file, such as where the data of the file is physically stored on disk. (*Id*. at p. 136.) Another key attribute of an inode record is its unique "**inode number**," which is a unique identifier associated with the file. (*Id.*)

191. Chan explains that UNIX associates an "inode number" with a file when a new file is created. The process is straightforward. "Whenever a new file is created in a directory, the UNIX kernel allocates a new entry in the inode table to store the information of the new file. Moreover, **it will assign a unique inode number to the file** and add the new file name and inode number to the directory file that contains it." (*Id.* at p. 137 (underlining added); *see also id.* p. 135 ("All the above attributes [including file inode number] are assigned by the kernel to a file when it is created. Some of these attributes will stay unchanged for the entire life of the file . . . The attributes that are constant for any file are . . . • File inode number").) Chan therefore discloses "**associating**" a "**unique identifier**" with a data file, as recited in claim 9[a].

192. Chan also discloses that the inode number ("unique identifier") may also be associated with a user. In addition to an inode number, UNIX maintains an "access permission" and "file owner user ID" (UID) for each file. (*Id.* at p. 134-35, § 6.3.) The "access permission" attribute specifies, among other things, the

permission afforded to the owner of the file. (*Id.* at p. 135.) Thus, if a particular user attempts to access the file, UNIX checks to see if the user's ID against matches UID for the file; if they do, the "access permission" will provide the access privileges for the requesting user. (*Id.*) The file owner user ID is assigned to a file upon creation, although UNIX also provides a standard system call or command ("chown") that allows the owner user ID to be changed. (*Id.* at p. 135-136.) Because both user ID (UID) and the unique inode number for a particular file are stored in the inode for the file, the two are clearly "associated" with one another, and in the inode number is associated with the user by virtue of its associate with the UID. Chan thus discloses "**associating . . . a unique identifier with the data file and a user**," as claimed.

193. ***Rationale and Motivation to Combine***: As I explained in my discussion of claim 1[c] above, the combination of Yukie and Prust would have resulted in a system in which data server **16** of Yukie, in response to receiving a data file from a cellular phone, stores the data file in the "virtual storage area" associated with the user, as disclosed in Prust. A person of ordinary skill in the art would have found it obvious to add **Chan** to this combination, predictably resulting in the system of Yukie and Prust in which the data file is stored in the

user's virtual storage area in association with a unique identifier (inode number) and the user who transmitted the file to the server (UID).

194. A person of ordinary skill in the art would have regarded this combination as exceedingly straightforward. A person of ordinary skill in the art would have understood that claim 9[a] does not recite a novel feature of the alleged invention – it simply recites concepts of file storage that were well-known and already "built in" to the known UNIX operating system. Chan confirms that UNIX was a well-known operating system, dating back to the late 1960s, that could run on a large number of computing platforms. (Chan, p. 1.) UNIX became very popular in part because it could be readily adapted to run on multiple computing platforms (a characteristic known as "portability"). Because of its portability and other benefits, UNIX had become the "de facto server operating system" for major corporations by the mid-1990s. (Mike Azzara, *UNIX Unleashed* (1994) (Ex. 1071), at p. xvi (Foreword).) Yukie itself does not specify or otherwise limit the operating system for data server **16**. (Yukie, 21:34-62.) It would have been obvious to a person of ordinary skill in the art that data server **16** of Yukie could run the UNIX operating system, predictably resulting in data server **16** associating a unique "inode number" with the data file and the user, as disclosed in Chan. A person of ordinary skill in the art would have been motivated to make this

combination to obtain the many benefits of UNIX, including its portability, which allows easier migration of the operating system and application software to other computing platforms.

2. "evaluating the unique identifier" and "identifying the data file based on the unique identifier in response to receiving the request for the data file" (Claim 9[b] & 9[c])

195. Because these two claim limitations are closely-related, I will discuss them together. As explained for claim 1, when data server **16** in Yukie receives a request for a data file from user device **10**, the server identifies the file and wirelessly transmits it to user device **10**. (Yukie, *e.g.*, 6:28-31 ("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."), 7:14-20, 8:2-7, 8:49-56, 11:16-22.) Because Yukie does not expressly disclose the "unique identifier" of claim 9[a], it likewise does not fully disclose the "**evaluating**" and "**identifying**" steps of claims 9[b] and 9[c].

196. As explained for claim 9[a] above, Chan discloses a technique for associating a unique identifier ("inode number") with a data file being stored. Chan further explains that, when the data file is to be later requested, the unique identifier is evaluated and used to identify and then access the file.

> Each entry of the inode table is an inode record which contains all the attributes of a file, including an unique inode number and the physical

> disk address where the data of the file is stored. Thus <u>if a kernel needs to access information of a file with an inode number of, say 15, it will scan the inode table to find an entry which contains an inode number of 15</u>, in order to access the necessary data.

(Chan, p. 136, § 6.4 (underlining added).)

197. The above-quoted passage discloses the "**evaluating**" and "**identifying**" steps of claims 9[b] and 9[c], respectively. This is because when access to the data file is requested, the operating system kernel <u>evaluates</u> the file's inode number (the "unique identifier," such as "15") by comparing that number with the inode number in each inode table entry. (*Id.*) Once a match is located and the correct inode has been identified, the operating system can then "access the necessary data." (*Id.*) Chan therefore discloses evaluating the unique identifier, and then identifying the data file based on the unique identifier.

198. ***Rationale and Motivation to Combine***. As explained previously for claim 9[a], it would have been obvious to combine the prior art applied against claim 1 with Chan. As applied to claims 9[b] and 9[c], this would have resulted in the system of Yukie in which, in response to a request for the data file from user device **10**, data server **16** evaluates and identifies the data file based on the unique inode number, as described in Chan. Chan therefore discloses and renders obvious

claims 9[b] and 9[c]. The rationale and motivation for combining Chan with the prior art applied against claim 1 was provided in the discussion of claim 9**[a]**.

D. Alternative Grounds Based on O'Hara, Tagg, and Pinard

199. In Part **V.B** above, I explained why the claims of the '310 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 '310 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.

200. 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" (or "cellular communication network") as recited in claims 1 and 10, can be built based on IEEE 802.11 wireless networking technology (Pinard).

201. 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[9] 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[10]. An example of an IEEE 802.11a OFDM PMD[11] is illustrated in Figure 7-2.").) This is shown in Figure 7-2, reproduced in relevant part below.

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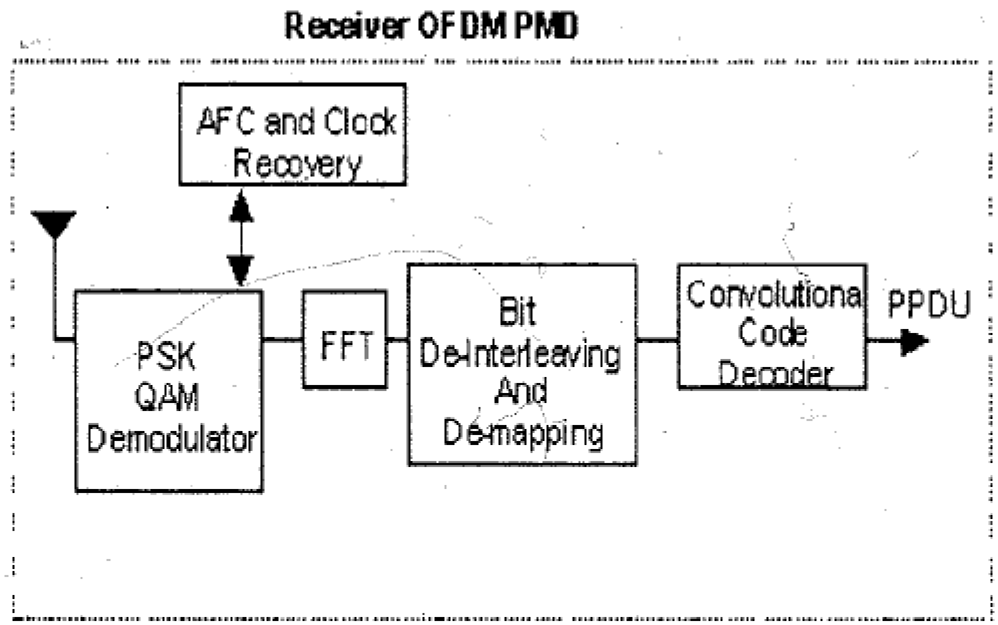
9 The term "PSDU" refers to a PLCP service data unit, a basic unit of data for transmission over an IEEE network. (O'Hara, at p. 174 (explaining PSDU acronym), *id.* at p. 141 (Fig. 7-1, showing OFDM header and PSDU).)

10 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. 145, Fig. 7-2.)[12]

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

[11] 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).)

[12] O'Hara thus satisfies any requirement that the receiver be configured for receiving and processing digital media transmitted by OFDM. Any requirement that the digital signal processor be configured for receiving and processing digital media transmitted by OFDM would also have been obvious over the prior art, as explained in **Part V.B.1.b** above.

202. 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:

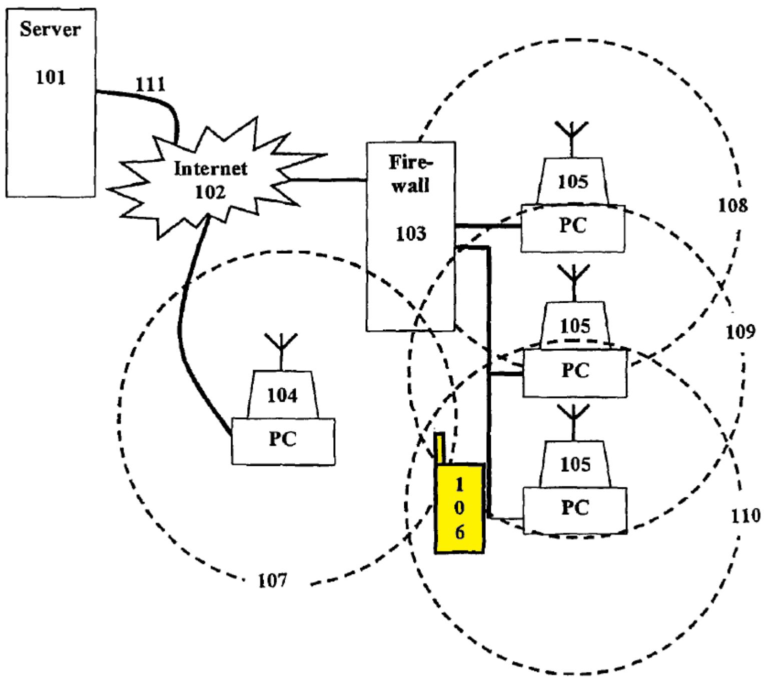

Fig. 1

(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.)

203. 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:

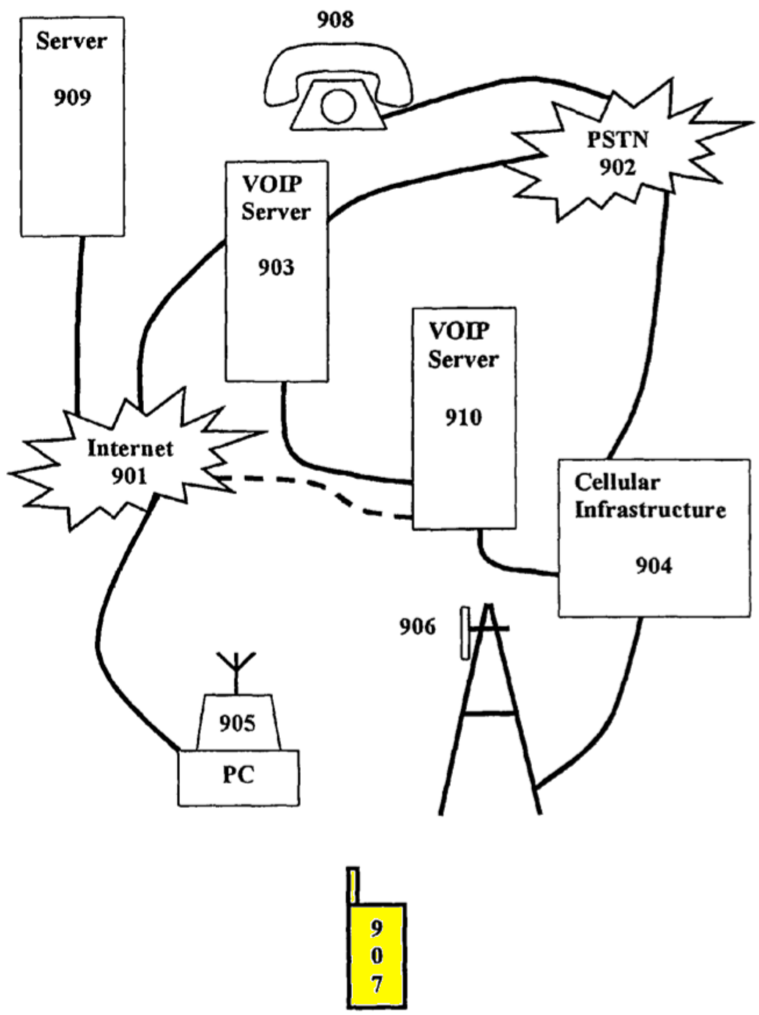

Fig. 9

204. 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.)

205. 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.").)

206. 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.

207. 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 providing 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.

208. 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.)

209. 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.

210. 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.

211. ***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.

212. 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**:

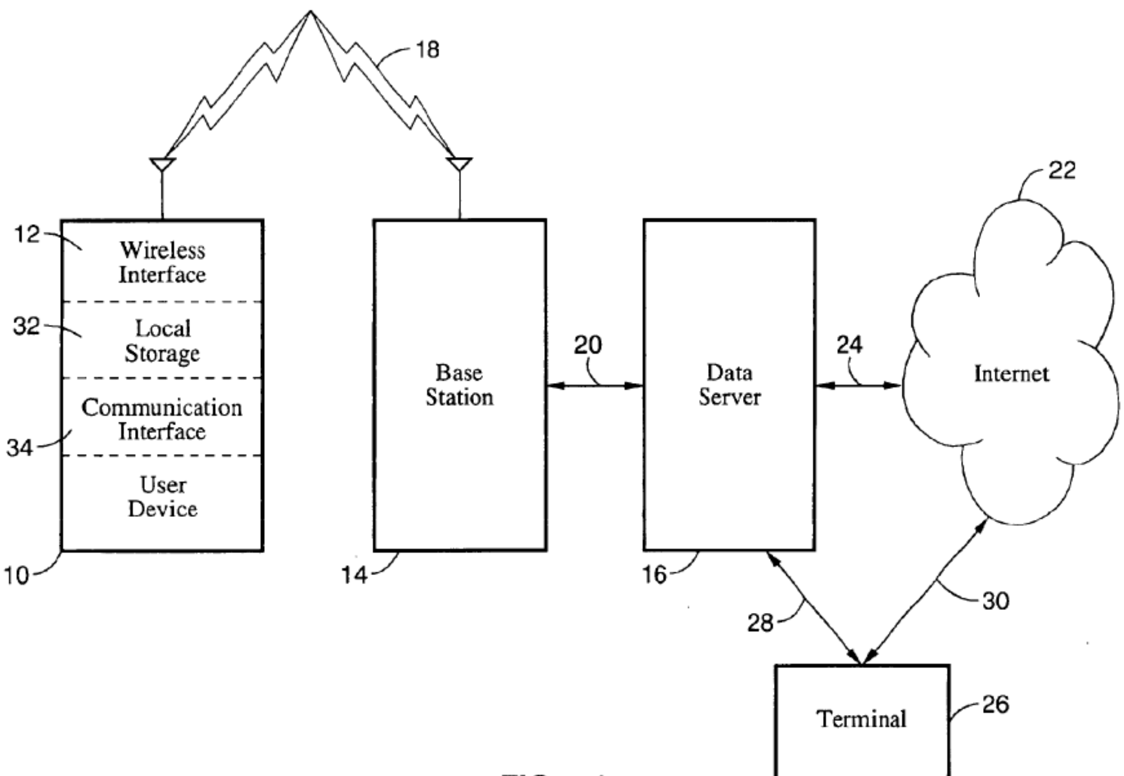

FIG. 1

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**." (Yukie, 3:32-35.)

213. 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.

214. **Speed**: 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[13]) could transmit digital multimedia content at up to

[13] 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.

215. **Cost**: 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.

216. 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. Moreover, a person of ordinary skill in the art would have appreciated that providing a series of "cells" using multiple of 802.11a-compliant access points (a "**cellular network**" or "**cellular communication network**") would have extended wireless network

coverage to a larger geographical area, thus allowing these speed and cost benefits to be even further exploited.

217. 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.

218. 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.

219. 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,[14] or 11 Mbps for IEEE

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[14] 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

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 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

220. 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.

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having a data rate of 2 Mbps.

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.

221. 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 ’310 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 ’310 patent itself acknowledges that “[t]he cellular telephone **202** may be any commercially available cellular phone” (’310, 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.)

222. 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.

223. Frodigh, Gatherer, Yukie, Prust, O'Hara, and Pinard all pre-date the '310 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.) The Chan reference applied to claim 9, as noted above, describes basic and known file storage functionality of UNIX, an operating system that dates back to the late 1960s. (Chan, p. 1)

224. 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.)

225. In short, by June 2001, each aspect of the disclosures that I have cited from Frodigh, Gatherer, Yukie, Prust, Chan, 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

226. 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 '310 patent claims at issue and/or offer testimony in support of this Declaration.

227. 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 14, 2017

Respectfully submitted,

Tal Lavian
Jan, 14, 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

University of California, Berkeley, 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

TelecommNet Consulting, Inc.(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

VisuMenu, Inc., 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

Ixia, 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
US 20140105025	Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device	Link
US 20140105012	Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device	Link
US 20140012991	Grid Proxy Architecture for Network Resources	Link
US 20130080898	Systems and Methods for Electronic Communications	Link
US 20130022191	Systems and Methods for Visual Presentation and Selection of IVR Menu	Link
US 20130022183	Systems and Methods for Visual Presentation and Selection of IVR Menu	Link
US 20130022181	Systems and Methods for Visual Presentation and Selection of IVR Menu	Link
US 20120180059	Time-Value Curves to Provide Dynamic QOS for Time Sensitive File Transfers	Link
US 20120063574	Systems and Methods for Visual Presentation and Selection of IVR Menu	Link
US 20110225330	Portable Universal Communication Device	Link
US 20100220616	Optimizing Network Connections	Link
US 20100217854	Method and Apparatus for Intelligent Management of a Network Element	Link
US 20100146492	Translation of Programming Code	Link
US 20100146112	Efficient Communication Techniques	Link
US 20100146111	Efficient Communication in a Network	Link
US 20090313613	Methods and Apparatus for Automatic Translation of a Computer Program Language Code	Link
US 20090313004	Platform-Independent Application Development Framework	Link
US 20090279562	Content-aware dynamic network resource allocation	Link
US 20080040630	Time-Value Curves to Provide Dynamic QoS for Time Sensitive File	Link

	Transfers	
US 20070169171	Technique for authenticating network users	Link
US 20060123481	Method and apparatus for network immunization	Link
US 20060075042	Extensible Resource Messaging Between User Applications and Network Elements in a Communication Network	Link
US 20050083960	Method and Apparatus for Transporting Parcels of Data Using Network Elements with Network Element Storage	Link
US 20050076339	Method and Apparatus for Automated Negotiation for Resources on a Switched Underlay Network	Link
US 20050076336	Method and Apparatus for Scheduling Resources on a Switched Underlay Network	Link
US 20050076173	Method And Apparatus for Preconditioning Data to Be Transferred on a Switched Underlay Network	Link
US 20050076099	Method and Apparatus for Live Streaming Media Replication in a Communication Network	Link
US 20050074529	Method and apparatus for transporting visualization information on a switched underlay network	Link
US 20040076161	Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device	Link
US 20020021701	Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device	Link
WO 2006/063052	Method and apparatus for network immunization	Link
WO 2007/008976	Technique for authenticating network users	Link
WO2000/0054460	Method and apparatus for accessing network information on a network device	Link
US 20140156556	Time-variant rating system and method thereof	Link
US 20140156758	Reliable rating system and method thereof	Link

Publications
(Not an exhaustive list)

- "R&D Models for Advanced Development & Corporate Research" Understanding Six Models of Advanced R&D - Ikhlaq Sidhu, Tal Lavian, Victoria Howell - University of California, Berkeley. Accepted paper for 2015 ASEE Annual Conference and Exposition- June 2015
- "Communications Architecture in Support of Grid Computing",Tal Lavian,Scholar's Press 2013ISBN 978-3-639-51098-0.
- "Applications Drive Secure Lightpath Creation across Heterogeneous Domains, Feature Topic Optical Control Planes for Grid Networks: Opportunities, Challenges and the Vision." Gommans L.; Van Oudenaarde B.; Dijkstra F.; De Laat C.; Lavian T.; Monga I.; Taal A.; Travostino F.; Wan A.; IEEE Communications Magazine, vol. 44, no. 3, March 2006, pp. 100-106.
- *Lambda Data Grid: Communications Architecture in Support of Grid Computing*. Tal I. Lavian, Randy H. Katz; Doctoral Thesis, University of California at Berkeley. January 2006.
- "Information Switching Networks." Hoang D.B.; T. Lavian;The 4th Workshop on the Internet, *Telecommunications and Signal Processing, WITSP2005*, December 19-21, 2005, Sunshine Coast, Australia.
- "Impact of Grid Computing on Network Operators and HW Vendors." Allcock B.; Arnaud B.; Lavian T.; Papadopoulos P.B.; Hasan M.Z.; Kaplow W.; *IEEE Hot Interconnects at Stanford University 2005*, pp.89-90.
- *DWDM-RAM: A Data Intensive Grid Service Architecture Enabled by Dynamic Optical Networks*. Lavian T.; Mambretti J.; Cutrell D.; Cohen H.J; Merrill S.; Durairaj R.; Daspit P.; Monga I.; Naiksatam S.; Figueira S.; Gutierrez D.; Hoang D.B., Travostino F.; *CCGRID 2004*, pp. 762-764.
- *DWDM-RAM: An Architecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Hoang D.B.; Cohen H.; Cutrell D.; Figueira S.; Lavian T.; Mambretti J.; Monga I.; Naiksatam S.; Travostino F.; Proceedings IEEE Globecom 2004, Workshop on High-Performance Global Grid Networks, Houston, 29 Nov. to 3 Dec. 2004, pp.400-409.
- *Implementation of a Quality of Service Feedback Control Loop on Programmable Routers*. Nguyen C.; Hoang D.B.; Zhao, I.L.; Lavian, T.; Proceedings, 12th IEEE International Conference on Networks 2004. (ICON 2004) Singapore, Volume 2, 16-19 Nov. 2004, pp.578-582.
- *A Platform for Large-Scale Grid Data Service on Dynamic High-Performance Networks*. Lavian T.; Hoang D.B.; Mambretti J.; Figueira S.; Naiksatam S.; Kaushil N.; Monga I.; Durairaj R.; Cutrell D.; Merrill S.; Cohen H.; Daspit P.; Travostino F; GridNets 2004, San Jose, CA., October 2004.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Daspit, P.; Gutierrez D.; Hoang D. B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F; Proceedings, 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004, pp. 707-714.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Gutierrez D.; Hoang D.B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F.; 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004.
- *An Extensible, Programmable, Commercial-Grade Platform for Internet Service Architecture*. Lavian T.; Hoang D.B.; Travostino F.; Wang P.Y.; Subramanian S.; Monga I.; IEEE Transactions on Systems, Man, and Cybernetics on Technologies Promoting Computational

Intelligence, Openness and Programmability in Networks and Internet Services Volume 34, Issue 1, Feb. 2004, pp.58-68.

- *DWDM-RAM: An Architecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Lavian T.; Cutrell D.; Mambretti J.; Weinberger J.; Gutierrez D.; Naiksatam S.; Figueira S.; Hoang D. B.; Supercomputing Conference, SC2003 Igniting Innovation, Phoenix, November 2003.
- *Edge Device Multi-Unicasting for Video Streaming*. Lavian T.; Wang P.; Durairaj R.; Hoang D.; Travostino F.; Telecommunications, 2003. ICT 2003. 10th International Conference on Telecommunications, Tahiti, Volume 2, 23 Feb.-1 March, 2003 pp. 1441-1447.
- The SAHARA Model for Service Composition Across Multiple Providers. Raman B.; Agarwal S.; Chen Y.; Caesar M.; Cui W.; Lai K.; Lavian T.; Machiraju S.; Mao Z. M.; Porter G.; Roscoe T.; Subramanian L.; Suzuki T.; Zhuang S.; Joseph A. D.; Katz Y.H.; Stoica I.; Proceedings of the First International Conference on Pervasive Computing. ACM Pervasive 2002, pp. 1-14.
- *Enabling Active Flow Manipulation in Silicon-Based Network Forwarding Engines*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Duraraj R.; Hoang D.B.; Sethaput V.; Culler D.; Proceeding of the Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 65-76.
- *Practical Active Network Services within Content-Aware Gateways*. Subramanian S.; Wang P.; Durairaj R.; Rasimas J.; Travostino F.; Lavian T.; Hoang D.B.; Proceeding of the DARPA Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 344-354.
- *Active Networking on a Programmable Network Platform*. Wang P.Y.; Lavian T.; Duncan R.; Jaeger R.; Fourth IEEE Conference on Open Architectures and Network Programming (OPENARCH), Anchorage, April 2002.
- *Intelligent Network Services through Active Flow Manipulation*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; IEEE Intelligent Networks 2001 Workshop (IN2001), Boston, May 2001.
- *Intelligent Network Services through Active Flow Manipulation*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; Intelligent Network Workshop, 2001 IEEE 6-9 May 2001, pp.73 -82.
- *Enabling Active Flow Manipulation in Silicon-based Network Forwarding Engine*. Lavian, T.; Wang, P.; Travostino, F.; Subramanian S.; Hoang D.B.; Sethaput V.; Culler D.; Journal of Communications and Networks, March 2001, pp.78-87.
- *Active Networking on a Programmable Networking Platform*. Lavian T.; Wang P.Y.; IEEE Open Architectures and Network Programming, 2001, pp. 95-103.
- *Enabling Active Networks Services on a Gigabit Routing Switch*. Wang P.; Jaeger R.; Duncan R.; Lavian T.; Travostino F.; 2nd Workshop on Active Middleware Services, 2000.
- *Dynamic Classification in Silicon-Based Forwarding Engine Environments*. Jaeger R.; Duncan R.; Travostino F.; Lavian T.; Hollingsworth J.; Selected Papers. 10th IEEE Workshop on Metropolitan Area and Local Networks, 1999. 21-24 Nov. 1999, pp.103-109.
- *Open Programmable Architecture for Java-Enabled Network Devices*. Lavian, T.; Jaeger, R. F.; Hollingsworth, J. K.; IEEE Hot Interconnects Stanford University, August 1999, pp. 265-277.
- *Open Java SNMP MIB API*. Rob Duncan, Tal Lavian, Roy Lee, Jason Zhou, Bay Architecture Lab Technical Report TR98-038, December 1998.
- *Java-Based Open Service Interface Architecture*. Lavian T.; Lau S.; BAL TR98-010 Bay Architecture Lab Technical Report, March 1998.

- *Parallel SIMD Architecture for Color Image Processing*. Lavian T. Tel – Aviv University, Tel – Aviv, Israel, November 1995.
- *Grid Network Services, Draft-ggf-ghpn-netservices-1.0*. George Clapp, Tiziana Ferrari, Doan B. Hoang, Gigi Karmous-Edwards, Tal Lavian, Mark J. Leese, Paul Mealor, Inder Monga, Volker Sander, Franco Travostino, Global Grid Forum(GGF).
- *Project DRAC: Creating an applications-aware network*.Travostino F.; Keates R.; Lavian T.; Monga I.; Schofield B.; Nortel Technical Journal, February 2005, pp. 23-26.
- *Optical Network Infrastructure for Grid, Draft-ggf-ghpn-opticalnets-1*. Dimitra Simeonidou, Reza Nejabati, Bill St. Arnaud, Micah Beck, Peter Clarke, Doan B. Hoang, David Hutchison, Gigi Karmous-Edwards, Tal Lavian, Jason Leigh, Joe Mambretti, Volker Sander, John Strand, Franco Travostino, Global Grid Forum(GGF) GHPN Standard GFD-I.036 August 2004.
- *Popeye - Using Fine-grained Network Access Control to Support Mobile Users and Protect Intranet Hosts*. Mike Chen, Barbara Hohlt, Tal Lavian, December 2000.

Presentations and Talks

(Not an exhaustive list)

- Lambda Data Grid: An Agile Optical Platform for Grid Computing and Data-intensive Applications.
- 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?