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. 9,124,718

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. 9,124,718 ("'718" or "'718 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 '718 patent. I have cited to the following documents in my analysis below:

Ex. No.	Description of Document
1001	US Patent No. 9,124,718 to John Mikkelsen
1003	U.S. Patent No. 7,065,342 to Devon A. Rolf, entitled "System and Mobile Cellular Telephone Devices for Playing Recorded Music"
1004	Excerpts from Ben Forta et al., WAP Development with WML and WMLScript, Sams Publishing (September 2000)
1005	Alan Gatherer et al., DSP-Based Architectures for Mobile Communications: Past, Present and Future, IEEE Communications Magazine (January 2000)
1060	U.S. Patent No. 8,996,698 to James P. Tagg, entitled "Cooperative Network for Mobile Internet Access"
1061	Bob O'Hara et al., 802.11 Handbook: A Designer's Companion, IEEE Press (1999)
1069	Excerpts from Scott Hacker, MP3 The Definitive Guide (2000)
1070	U.S. Patent No. 5,815,811 to Patrick Pinard et al., entitled "Preemptive Roaming in a Cellular Local Area Wireless Network"

13. I previously submitted a declaration in support of the Petition for Inter Partes Review of the '718 Patent, dated October 14, 2016. I maintain the opinions set forth in that Declaration, and provide additional opinions in this Declaration. I have also read the "Declaration of William H. Beckmann, Ph.D.," dated June 14, 2016, in support of the Petition for Covered Business Method (CBM) Review of U.S. Patent No. 9,037,502 ("'502 patent") ("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 '502 patent, which I understand shares an identical specification with the '718 patent, as well as the

same earliest claimed priority date. 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 ’718 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 ’718 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 ’502 patent, which I understand shares the same specification with the ’718 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 ’718 patent, entitled “Media Delivery Platform,” purports to disclose and claim a system and method for delivering digital media files to an

electronic device. (’718, Abstract.) In this section, I provide a brief background discussion on technologies pertinent to the ’718 patent prior to June 2001.

A. Cellular Telephones and Networks

20. Cellular phones (also known as “cell phones”) were well known prior to June 2001. The ’718 patent itself recognizes the existence of “commercially available cellular phone[s].” (’718, 14:34-35.) Cell phones included transmitters and receivers for transmitting and receiving over-the-air signals (e.g., radio frequency waves), which allowed cell phones to communicate wirelessly.

21. The first commercial cellular service was launched in 1979 in Japan, over 20 years before the earliest filing date to which the ’718 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” cellular networks known as the Advanced Mobile Phone System (AMPS). Similar cellular phones and networks were also deployed in other countries throughout the 1980s.

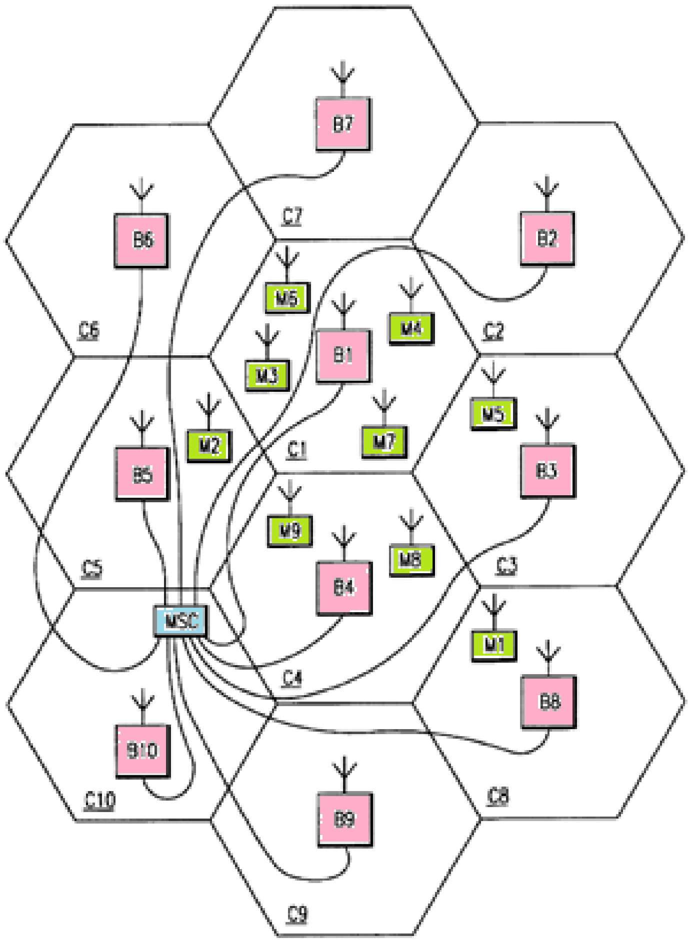


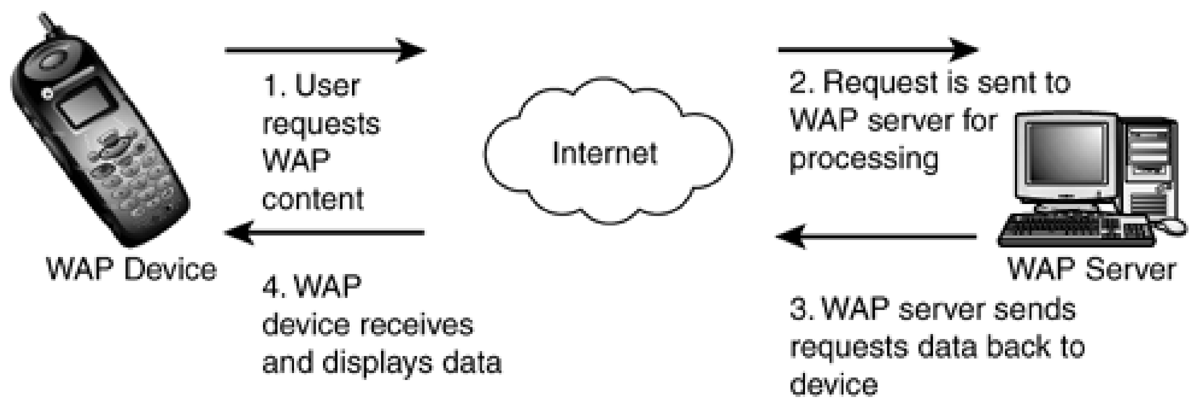
FIG. 1

22. 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.)

23. 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 technique 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 ¶¶ 0002-09; 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]**.)

24. Although cell phones were originally designed for voice communications, techniques were developed to allow them to transmit and receive non-voice data. For example, a technology known as Wireless Application Protocol (WAP), an industry standard for delivery of Web content to cell phones. Cell phones that supported WAP technology typically included a special browser that issued requests for Web content and displayed the received content on the phone's display. These techniques are described in Ben Forta, *WAP Development with WML and WMLScript*, Sam Publishing (Sep. 2000) ("Forta") **[Ex. 1004]**, and is generally shown in Figure 1.1, reproduced below.



(Forta, p. 12, Fig. 1.1.) Indeed, by June 2001 well-known Web companies such as Amazon and Yahoo! were using WAP to make their websites accessible to cell phones. (*Id.*, at p. 316 ("This is the Amazon.com site that is written explicitly for phones with a WAP browser in them."), p. 317 ("Clearly, Yahoo! has done some considerable work here to build a powerful wireless site that works as a companion to its HTML site."); *see also id.* at pp. 316, 317, Figs. 13.3 & 13.5.)

25. It was also well-known that cell phones could be used to download and playback digital media. For example, the Background Art section of the '718 patent acknowledges the existence of cell phones that can play music in a compressed format such as MP3. ('718, 1:36-44.) 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. 7,065,342 to Devon A. Rolf ("Rolf) **[Ex. 1003]**, and Alan Gatherer, *DSP-Based Architectures for Mobile Communications: Past, Present and Future*, IEEE Communications (Jan. 2000) ("Gatherer") **[Ex. 1005]**. I discuss Rolf and Gatherer in detail in **Parts V.A** and **V.B.1** below.

B. Compression of Digital Media

26. It was well known before June 2001 that digital media (e.g., audio and video) could be stored and transmitted in compressed form. Compression techniques enabled media files to be stored at a fraction of their original size, which provided advantages by allowing for more efficient use of storage mediums (e.g., computer hard drives) and network bandwidth.

27. Indeed, the '718 patent acknowledges the existence of "MP3" ('718, 1:38, 24:7-8, 29:67), which is a standardized technique for compressing digital

audio. (John Hedtke, *MP3 and the Digital Music Revolution* (1999) **[Ex. 1013]**, at p. 1.) By 1999, MP3 had already become "enormously popular for distributing and exchanging songs and music." (*Id.*) "The most popular way of finding MP3 files [was] through MP3 web sites. There [were] hundreds of MP3 web sites in existence that distribute MP3 files, software, news bulletins about MP3, and provide a forum for discussions by MP3 users." (*Id.* at p. 37 (under "Getting MP3 Files from Web Sites").)

C. Optimization of Digital Media

28. Optimization is the process of enhancing the perceived quality of digital media content in the face of real-world constraints. For example, an audio file containing a musical song may include defects that hamper the quality of the audio as perceived by the listener. As explained in U.S. Patent No. 6,560,577 to Jay G. Gilbert et al. (filed Mar. 2000) ("Gilbert") **[Ex. 1065]**, "[s]uch defects may arise from the reproduction of the information on the analog medium and may include scratch noises, clicks, pops, hissing, etc." (*Id.*, 4:15-18.) Gilbert explains that "techniques to identify and compensate for certain defects" were "well known in the art" (*id.*, 4:18-20):

> These techniques include searching for certain values of the digital audio information that are beyond a normal range to identify and correct specific audio defects. Other techniques include: applying

> high-pass filters to remove low frequency noise, normalizing extreme or inconsistent volume levels to an average value, adjusting the playback pitch, and comparing adjacent data to adjust inconsistent values (i.e., removing blips by averaging the values of adjacent data in a linear fashion).

(*Id.*, 4:20-29.)

29. As disclosed in the ’718 patent, optimization can also arise in the context of compression. (’718, 23:61-24:9.) Compression can create a tension between reducing the size of the file that stores the audio content, and the quality of the audio content as perceived by the user. Generally speaking, increasing the reduction in file size achieved by compression can reduce the perceived quality of the audio. One of the key considerations in any system that handles digital audio, therefore, is to implement optimization techniques to achieve a desirable balance between performance and audio quality. As explained in Scot Hacker, *MP3: The Definitive Guide* (2000) (“Hacker”) **[Ex. 1069]**, techniques and tools that can be used to “optimize the quality” of compressed MP3 files (*id*. at p. 161), include normalization, sampling, resampling, bitrates, etc. (*Id*. at pp. 163-170.)

D. Digital Signal Processors

30. 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.)

31. 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, at 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, at p. 55, Table 1.)

32. 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.*, at 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.*, at p. 89, left column; *see also id.*, at 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.)

E. Orthogonal Frequency-Division Multiplexing (OFDM)

33. 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.

34. 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.

35. 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"):

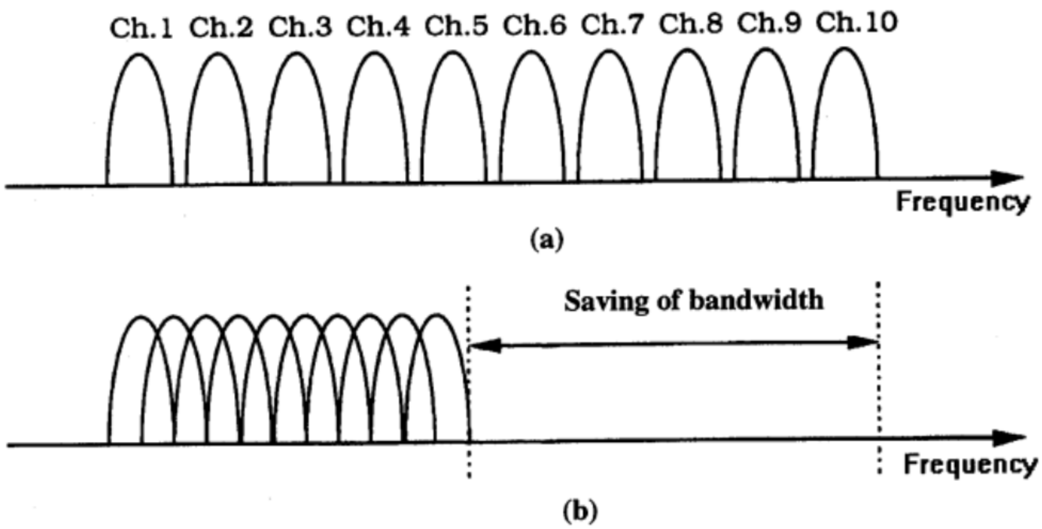


Figure 1.10 Concept of OFDM signal: (a) Conventional multicarrier technique, and (b) orthogonal multicarrier modulation technique.

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

36. The bottom portion (b) of Figure 1.10 shows an OFDM arrangement. As shown, the sub-bands in OFDM overlap, eliminating the need for a guard band and thus resulting 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.

37. 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.

38. 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.)

39. 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 allocated to and used by various cellular networks. 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]**.)

40. 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" 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 p. 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.)

41. 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]**.

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

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

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

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

43. 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 '718 PATENT

A. The Specification

44. Part V of the Beckmann Declaration includes a section containing an overview of the specification of the '502 patent, which I understand shares the same specification with the '718 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.

45. The '718 patent purports to describe a system and method for delivering digital media files to an electronic device. ('718, Abstract.) In one embodiment, the patent describes a server (**206**) for storing digital media files. ('718, 15:13-14; *see also id.* 12:65-66.) The server can store the media files in a database, which may be associated with a website. ('718, 13:56-60.) The website can provide the stored media files for download. ('718, 3:36-38.)

46. 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**. ('718, 14:21-26, 14:43-45.) On the left side is a server **206**, which includes server software **207**. ('718, 14:32-33.) 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**. ('718, 18:33-41.)

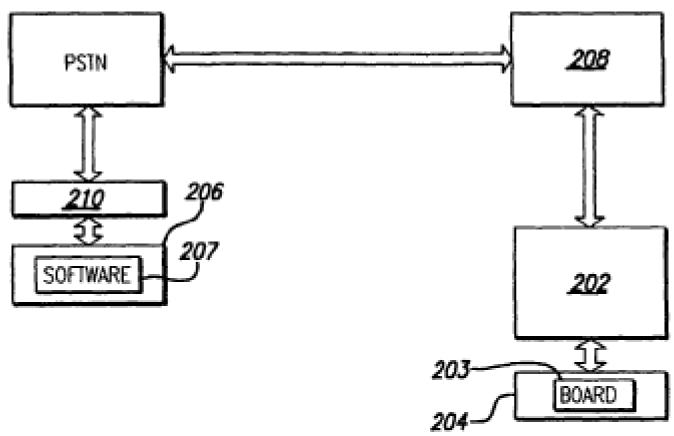

FIG. 2

47. The specification explains that the server can receive requests from the phone ('718, 12:45-67), "which may be given through user voice commands or commands using the phone keys." ('718, 12:67-13:1.) 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. ('718, 12:56-61, 13:7-12, 13:42-43, 14:65-15:1, 15:38-48.) This is shown in Figure 2 above.

48. The '718 patent discloses that "[a]n orthogonal frequency-division multiplex (OFDM) modulation scheme" can be used for data transmission. ('718, 16:63-64.) Further, in one embodiment, the digital media file can be "compressed into an MPEG Layer 3 bit stream." ('718, 25:40-41; *see also id.* 15:6-7, 22:37-50 (discussing "buffers" within the device memory).)

B. The Claims of the '718 Patent

49. This Declaration addresses claims 1-11. Claims 1, 6, and 10 are independent claims that recite substantially similar limitations. Claim 1 reads:

> 1. A method of wirelessly delivering compressed digital audio or audio-visual data file to a cell phone, the method comprising:
>
> providing a compressed digital audio or audio-visual data file for access over the Internet;
>
> receiving a request from the cell phone, said cell phone including a receiver and digital signal processor configured for

> receiving and processing files transmitted by orthogonal frequency-division multiplex modulation (OFDM); and
>
> providing for the transmission of the compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received request, wherein the transmission of the compressed digital audio or audio-visual data file is by a cellular data channel.

('718, 33:2-17 (Claim 1).) I will address the other claims in the '718 patent in my detailed analysis in **Part V** below.

V. APPLICATION OF THE PRIOR ART TO THE CLAIMS

50. I note that claims 1-11 of the '718 patent appear to overlap in both language and subject matter. I have divided the claims into three groups (*i.e.*, 1-5; 6-9; 10-11). For purposes of my analysis below, I have treated claims 1-5 as representative of challenged claims 1-9. In **Part V.B** below, I will explain why the limitations of claims 6-9 are similar to claims 1-5 for purposes of my analysis and for application of the prior art. I separately analyze claims 10-11.

51. I have reviewed and analyzed the prior art references and materials listed in **Part I.B** above. In my opinion, each limitation of claims 1, 3, and 5 is disclosed and rendered obvious by the teachings in Rolf (Ex. 1003), Gatherer (Ex. 1005), O'Hara (Ex. 1061), Tagg (Ex. 1060), and Pinard (Ex. 1070). Each limitation of claim 2 is disclosed and rendered obvious by the teachings in Rolf

(Ex. 1003), Forta (Ex. 1004), Gatherer (Ex. 1005), O'Hara (Ex. 1061), Tagg (Ex. 1060), and Pinard (Ex. 1070). Each limitation of claim 4 is disclosed and rendered obvious by the teachings of Rolf (Ex. 1003), Gatherer (Ex. 1005), O'Hara (Ex. 1061), Tagg (Ex. 1060), Pinard (Ex. 1070), and Hacker (Ex. 1069). Each limitation of claims 6 and 8 is disclosed and rendered obvious by the teachings in Rolf (Ex. 1003), Gatherer, (Ex. 1005), O'Hara (Ex. 1061), and Tagg (Ex. 1060.) Each limitation of claims 7, 10, and 11 is disclosed and rendered obvious by the teachings in Rolf (Ex. 1003), Forta (Ex. 1004), Gatherer (Ex. 1005), O'Hara (Ex. 1061), and Tagg (Ex. 1060). Each limitation of claim 9 is disclosed and rendered obvious by the teachings of Rolf (Ex. 1003), Gatherer (Ex. 1005), O'Hara (Ex. 1061), Tagg (Ex. 1060), and Hacker (Ex. 1069).

52. Counsel has informed me that Rolf, Tagg, and Pinard qualify as prior art to the '718 patent at least because they are U.S. patents issuing from applications filed before June 27, 2001, the filing date of the earliest application to which the '718 patent could claim priority. I am also informed by counsel that O'Hara, Pinard, Forta, Gatherer, and Hacker qualify as prior art to the '718 patent because they were all published before June 27, 2001.

53. 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 Rolf [Ex. 1003]

54. **Rolf**, U.S. Patent No. 7,065,342, entitled "System and Mobile Cellular Telephone Device for Playing Recorded Music," describes a "system and method for wirelessly transmitting encoded music, via a wireless communications link, to a portable or mobile communications device which includes a player for playing the music or audio." (Rolf, Ex. 1003, 1:17-21.) This is generally shown in Figure 1, reproduced below.

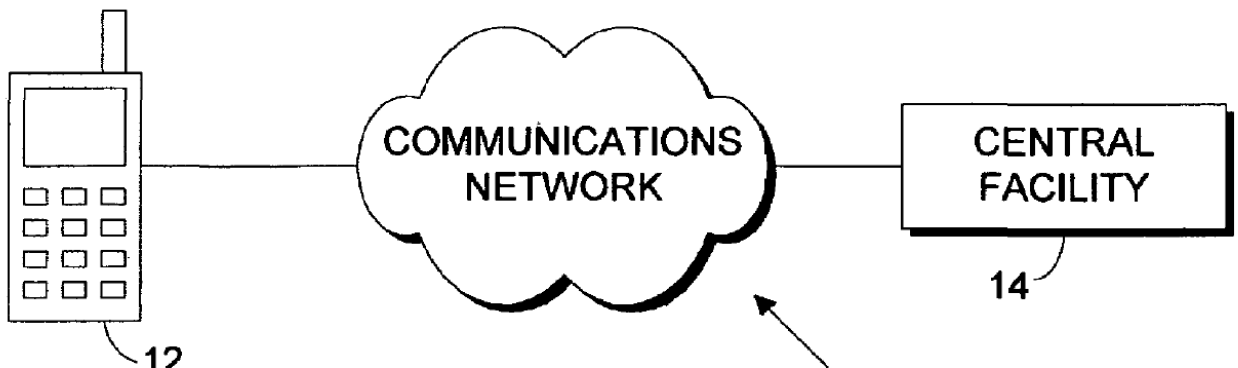

Fig. 1.

(*Id.*, Fig. 1.) As shown, the communications device can be a "cellular telephone." (*Id.*, 1:27-28.) This Declaration relies on Rolf as the primary reference that discloses the majority of the limitations of the claims.

55. Rolf explains that "a user of the cellular telephone (for example) may use the telephone to establish a wireless communications link …, and then wirelessly download one or more selected music recordings for storage in a

memory of the cellular telephone. In particular, the selected music recording(s) is/are transmitted via a wireless data communications link to the cellular telephone." (*Id.*, 1:28-35.) Rolf also explains that the music recording "need not be fully stored" within the cell phone, but rather could be "streamed" to the cell phone via the communications link. (*Id.*, 6:21-26.)

56. Moreover, Rolf teaches that the music can be "encoded by a compression algorithm into an encoded (such as MP3 or other) format." (*Id.*, 1:35-38 (underlining added); *see also id.*, 5:37-39; 8:63-9:6.) Further details about Rolf are provided in my detailed analysis of the claim limitations below.

The Rolf Provisional

57. Even though I understand that Rolf is, on its own, prior art to the '718 patent, I have also been asked to examine U.S. Provisional Patent Application No. 60/167,179 ("Rolf Provisional") **[Ex. 1071]**, in case Patent Owner should attempt to swear behind Rolf in some way. On its face, Rolf claims priority to the Rolf Provisional, which appears to have been filed on November 23, 1999. (Rolf, 1:8-11.) I understand that for Rolf to be considered prior art to the '718 patent as of the earlier filing date of the Rolf Provisional (rather than simply the filing date of the non-provisional application from which Rolf issued), (1) portions of Rolf cited for invalidity must be supported by disclosure in the Rolf Provisional, and (2) at

least one claim issued in Rolf must be supported by disclosure in the Rolf Provisional. It is my opinion that the Rolf Provisional satisfies these requirements.

58. First, I note that the text of the Rolf Provisional and Rolf are substantively identical apart from the title, abstract, the claim language, and four paragraphs where some language was added in the non-provisional application. I have created an exhibit comparing the textual contents of Rolf and the Rolf Provisional. ("Rolf Redline") **[Ex. 1066].** The exhibit shows differences between the two documents with blue indicating the matter added or deleted from the Rolf Provisional. As can be seen from the few differences, much of the added language appears to be non-substantive.

59. Even the figures of Rolf and the Rolf Provisional are the same, despite being hand-drawn in the provisional and formally rendered in the issued patent. (*Compare* Rolf, Figs. 1-10 *with* Rolf Provisional, Figs. 1-10.) In terms of its substantive disclosure, the Rolf Provisional has been entirely carried forward (with the exception of its title and claims) into the later non-provisional application that gave rise to Rolf.

60. In this Declaration, to the extent I cite language from Rolf that is not literally contained verbatim in the Rolf Provisional, I have included cites to substantially similar language that is contained in the Rolf Provisional and

provides adequate support for the same proposition. All citations to Rolf made in this Declaration are supported by disclosures from the Rolf Provisional, as shown in **Exhibit B** to this Declaration.

61. Second, I have determined that there is sufficient description and support within the Rolf Provisional for at least one of the claims that issued in Rolf, such that a person of ordinary skill would have understood and been able to practice that claim. In fact, I performed the analysis for eight exemplary claims for the avoidance of any doubt that the claims of Rolf are adequately supported by the Rolf Provisional. The chart in **Exhibit C** to this Declaration contains a listing of exemplary issued claims of Rolf (claims 1-3) with corresponding support from the Rolf Provisional. I have included exemplary support, but I will provide additional detail should it be required to address any arguments made by Patent Owner in response.

2. Brief Summary of Forta [Ex. 1004]

62. **<u>Forta</u>** is a 2000 book, entitled *WAP Development with WML and WMLScript*, that describes an industry standard known as Wireless Application Protocol (WAP). Independent claim 10 and dependent claims 2 and 7 require a "**website**" that is accessible to a cell phone. This Declaration relies on Forta to disclose well-known technologies for providing websites to cell phones.

63. As Forta explains, "WAP is the Wireless Application Protocol, a communications protocol (based on HTTP) designed specifically for wireless communication and managed by the WAP Forum. WAP is the transport used to communicate between devices (phones initially, but other devices eventually) and servers." (Forta, at p. 1.) Thus, "WAP does for wireless devices what HTTP does for Web browsers—it allows them to become clients in an Internet-based client/server world." (*Id.*, at p. 10.)

64. Forta discloses that by the time of its publication in September 2000, well-known companies such as Amazon and Yahoo! were already using WAP to provide their websites to cell phone users. (*Id.*, pp. 316, 317, Figs. 13.3 & 13.5.) Figure 13.3 (shown at right) shows "the Amazon.com site that is written explicitly for phones with a WAP browser in them." (*Id.*, at p. 316.) Forta also teaches, in detail, how to design and provide a website for mobile e-commerce. (*Id.*, at pp. 429-63 ("Chapter 18. E-Commerce").)

3. Brief Summary of Gatherer [Ex. 1005]

65. **Gatherer**, entitled "DSP-Based Architectures for Mobile Communications: Past, Present and Future," is an article appearing in the January 2000 issue of the IEEE Communications Magazine. The independent claims of the '718 patent recite a cell 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.

66. 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.").

4. Brief Summary of O'Hara [Ex. 1061], Tagg [Ex. 1060], and Pinard [Ex. 1070]

67. I rely on the teachings of O'Hara, Tagg and Pinard to show the transmission of information using OFDM and cellular data channel limitations in the claims.

68. 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.

69. 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 cellular phone **12** of Rolf to receive digital audio and/or visual files wirelessly using IEEE 802.11a, thus disclosing transmission of digital audio and/or visual files using OFDM as recited in the challenged claims.

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

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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).)

Mbps for WLAN networks where transmission of multimedia content is a consideration.”).)

71. **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 cell phone **12** in Rolf, could incorporate IEEE 802.11 wireless networking capability, and use that technology (instead of connections with traditional cell towers) to receive data files. Figure 1 of Tagg provides a basic overview of the system:

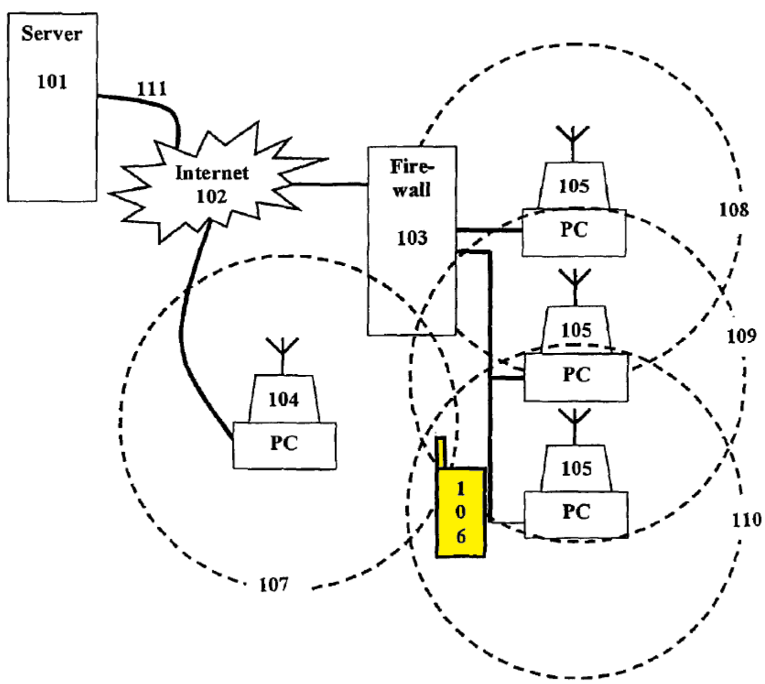

Fig. 1

(Tagg, Fig. 1.) Mobile roaming device **106**, shown highlighted in yellow, may be a "mobile computer, PDA, 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.*)

72. 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 Rolf) 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.)

73. 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.").)

74. I note that claim 1 further recites that files are transmitted "by a **cellular data channel**," for which I have cited the **Pinard** reference. The term "cellular" 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 data channel," in this context, has a more precise and technical definition. A

cellular data channel is a data channel in 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.").

75. The term "cellular data channel" 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.

76. In this regard, I have cited **Pinard** for the simple proposition that a "cellular data channel" can be provided 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.) 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[3]." (*Id.*, 2:50-53.) Pinard further explains that this cellular network

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[3] Pinard refers to the "IEEE 802.11 draft specification" because the standard had not yet been finalized when Pinard was filed in 1995. 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

provides data channels for communication. (*Id.*, 1:39-40 (describing the "data rates" featured in the draft 802.11 specification) (underlining added), 2:31-41, 4:26-35 (explaining that the invention "provide[s] a data communications network").)

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

5. Brief Summary of Hacker [Ex. 1069]

78. **Hacker** is a 2000 book, entitled *MP3 The Definitive Guide*, that describes various techniques for creating, downloading, and building collections of audio files compressed using MP3. (Hacker, at p. vii (Preface).)

79. Dependent claims 4 and 9 recite "optimizing the digital audio or audio-visual data file according to an optimization scheme." This Declaration relies on Hacker to disclose the claimed optimization.

80. Hacker discloses a number of techniques for maximizing sound quality of MP3 files while maintaining acceptable levels of compression. Hacker explains that, generally speaking, the more the audio is compressed, the more degraded the audio quality can be. (*Id.* at p. 161 ("The more you throw away, the

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time the standard was published, including IEEE 802.11a and its higher bit rates.

worse your files will sound and the smaller your MP3 files will be. The more you keep, the better they'll sound and the larger the resulting files will be. Only you can decide where on this spectrum you want to sit.").) In a section entitled, "Pre-encoding optimizations," Hacker asks, "what can you do prior to encoding to <u>optimize the quality of the final results</u>?" (*Id.* (underlining added).) Hacker provides several answers, including "any necessary equalization, de-hissing, de-popping, and de-scratching." (*Id.* at p. 162.) Also, "[y]ou can cut the silent bits off the beginning and end of your files, add effects, alter the levels, and more." (*Id.*)

B. Claims 1-11

1. Independent Claim 1

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

1. A method of wirelessly delivering compressed digital audio or audio-visual data file to a cell phone, the method comprising:

[a] providing a compressed digital audio or audio-visual data file for access over the Internet;

[b] receiving a request from the cell phone, said cell phone including a receiver and digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation (OFDM); and

[c] providing for the transmission of the compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received request, wherein the transmission of the compressed digital audio or audio-visual data file is by a cellular data channel.

('718, 33:2-17 (Claim 1).) Each limitation of claim 1 is disclosed and rendered obvious by Rolf in view of Gatherer, O'Hara, Tagg, and Pinard.

82. The preamble of claim 1 recites, "**[a] method of wirelessly delivering a compressed digital audio or audio-visual data file to a cell phone**." Assuming the preamble of claim 1 provides a claim limitation, it is fully disclosed by Rolf.

83. Rolf describes a "method for wirelessly transmitting encoded music, via a wireless communications link, to a portable or mobile communications device which includes a player for playing the music or audio." (Rolf, Ex. 1003, 1:18-21.) Rolf explains that the communications device can be a "cellular telephone." (*Id.*, 1:27-28.) "[A] user of the cellular telephone (for example) may use the telephone to establish a wireless communications link …, and then wirelessly download one or more selected music recordings for storage in a memory of the cellular telephone. In particular, the selected music recording(s)

is/are transmitted via a wireless data communications link to the cellular telephone." (*Id.*, 1:28-35.)

84. Rolf discloses that the music can be "encoded by a compression algorithm into an encoded (such as MP3 or other) format." (*Id.*, 1:35-38 (underlining added); *see also id.*, 5:37-39, 8:63-9:6.) One of ordinary skill in the art would have understood that "MP3" refers to a compression technique for digital audio files. (Andy Rathbone, *MP3 for Dummies* (1999), Ex. 1062, at p. 1 ("MP3 is simply another boring, compression mechanism – a pair of computerized vice-grips for sound. MP3 squeezes music files down to roughly one-tenth of their size while preserving their near-CD-quality sound.").)[4] Rolf therefore discloses "[a] method of wirelessly delivering compressed digital audio or audio-visual data file to a cell phone," as recited in the preamble.

a. "providing a compressed digital audio or audio-visual data file for access over the Internet "(Claim 1[a])

85. Rolf discloses this limitation. Rolf explains that compressed digital files are provided by a "facility **14**," shown in Figure 1 below.

[4] Rolf also expressly notes that its teachings with respect to music files are "applicable to recordings of other types, such as video recordings." (Rolf, 14:57-58 (underlining added).)

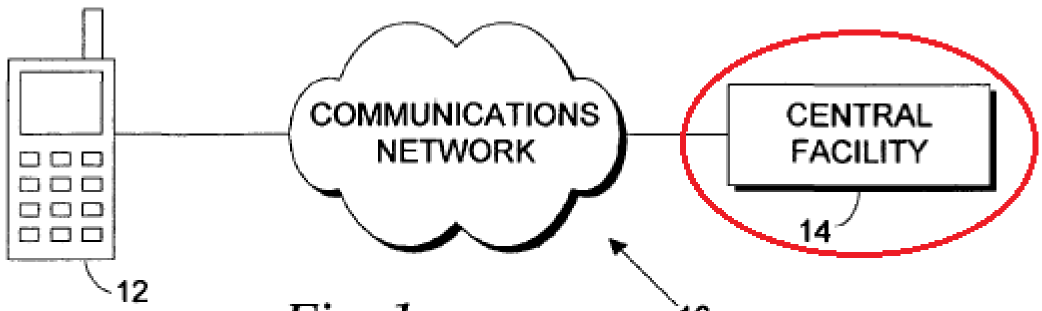


Fig. 1.

(Rolf, Fig. 1 (red circle added).) Figure 5 (below) illustrates the facility **14** in greater detail. (*Id.*, 5:1-2, 8:54-9:18.)

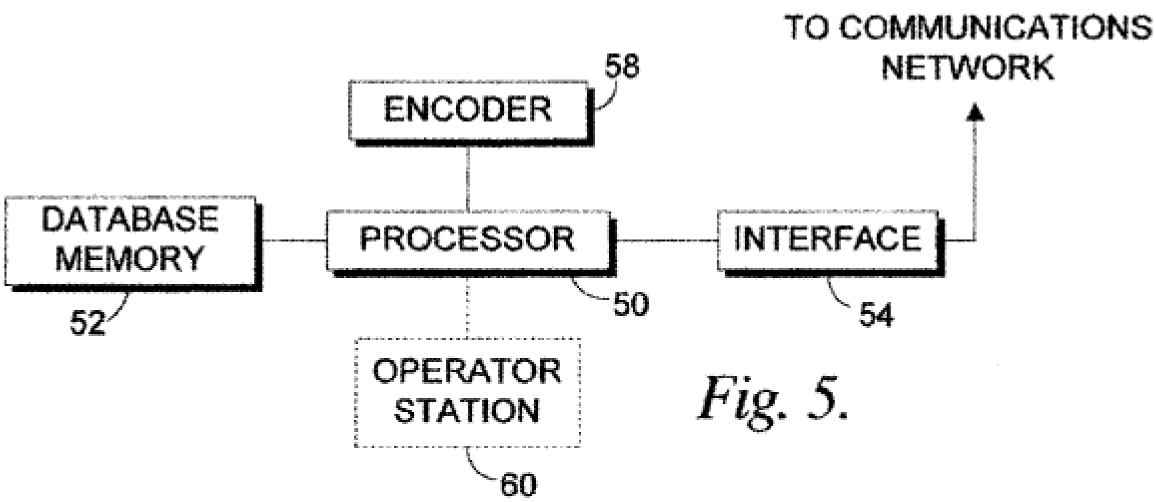


Fig. 5.

(*Id.*, Fig. 5.) As shown in Figure 5 above, the "facility" (**14**) in Rolf is a set of hardware and software components connected to a communications network. (*See also id.*, 8:61-62 ("The encoder **58** is a set of <u>processing instructions stored in a memory</u> …"), 9:11 ("[P]rocessor **50** invokes <u>application software</u> …") (underlining added).) These components include "a processor **50**. Connected to the processor **50** are a data base memory **52** and a [sic] interface **54** (such as a transceiver or modem) for transmitting and receiving communications signals." (*Id.*, 8:56-59.) The data base memory **52** stores music recordings, which as I discussed above, may be stored in compressed form. (*Id.*, 9:4-6.) Although Figure 5 shows the facility **14** as including an encoder **58** and operator station **60**, Rolf makes clear that these components are "not necessary." (*Id.*, 9:6, 9:7.)

86. The hardware and software comprising the facility **14** have an "address on the world wide web." (*Id.*, 5:32-34.) As Rolf explains, "the facility **14** has a <u>uniform resource locator (URL)</u> on a global communications network (such as the <u>world-wide web</u>)," and as such, the cell phone **12** (shown in Figure 1 above) can "access[] the facility **14** via a <u>server in the communications network</u>." (*Id.*, 12:52-55 (underlining added); *see also id.* 3:11-12 ("[A]n identifier, such as a server address, associated with the remote central facility …").) A user can thus use the keypad and input on the cell phone **12** to select music stored in the data base memory **52** (of the facility **12**) for download. (*Id.*, 5:49-53; *see also id.* 1:39-41, 5:63-66, 9:10-15.) Rolf further discloses that the selection can be made via a "menu or listing of recordings." (*Id.*, 9:14-15; *see also id.*, 5:35-37 ("Preferably, the music recordings are categorized by a plurality of selectable fields, such as 'title', 'artist', 'album or CD type', 'recording label', etc.").) One of ordinary skill

in the art would have understood and found it obvious that the Web server in facility **14** (*id.*, 3:11, 12:54) would present this menu or listing of recordings as part of a website where selection is made using the "keypad and input" of the cell phone (*e.g.* as opposed to "voice commands"). (*Id.*, 5:49-50; *see also id.*, 1:39-41.) Thus Rolf discloses "providing a compressed digital audio or audio-visual data file."

87. Rolf further explains:

> A communications link may be established between wireless communications device **12** and a remote storage facility, denoted by reference numeral **14**. The remote storage facility may, for example, be at an address on the world wide web, and <u>includes a data base having a plurality of music recordings therein</u>. Preferably, the music recordings are categorized by a plurality of selectable fields, such as "title", "artist", "album or CD type", "recording label", etc. Additionally, <u>the music recordings are preferably encoded in an encoded format, such as MP3 (Mpeg-1 Audio layer 3)</u>.

(*Id.*, 5:30-39 (underlining added); *see also id.*, 9:4-6 ("[T]he music recording stored within data base memory **52** may be stored in an encoded/compressed manner, …").) According to Rolf, this communications link is an Internet link. (*Id.*, 3:17-21 ("[T]he wireless communications link established between the wireless communication device and the central facility is a cellular communications link and, more particularly, is **an Internet link**.") (emphasis added).)

88. Rolf therefore discloses "providing a compressed digital audio or audio-visual data file for access over the Internet."

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

89. In light of the length of this claim limitation, I will divide it into pieces to ensure that I cover all of its elements.

"receiving a request from the cell phone"

90. As I explained above, the teachings of Rolf disclose providing a compressed digital audio or audio-visual data file for access over the Internet. Rolf discloses "providing a menu driven system to wireless communications device **12**, such that the wireless communications device **12** can be utilized to select [a] recording via a menu or listing of recordings." (*Id.*, 9:12-15 (underlining added).) The selection can be made "using a keypad and input on the wireless communications device," and accordingly, "one or more selected music recordings may be retrieved from the storage facility **14**, for transmission, via wireless communications link, to the device **12**." (*Id.*, 5:49-53 (underlining added); *see also*

id., 1:39-41 ("Using an input of the cellular telephone, a user may select one or more recordings for transmission to the cellular telephone."), 5:64-66 ("[A] wireless communications device **12** communicates with a central facility **14** for retrieval of one or more stored music recordings.").) Because a music recording is retrieved for transmission in response to a selection made from the cell phone, one of ordinary skill in the art would have understood that a request from the cell phone for that music recording was received. Rolf therefore disclose "**receiving a request from the cell phone**," as recited in the claim.

"cell phone including a receiver"

91. As I noted above, Rolf discloses a "wireless communications device **12**, such as a cellular telephone." (Rolf, 5:21-22.) This cell phone is shown in Figure 4, reproduced below. (*Id.*, 4:65-67, 7:49-50.)

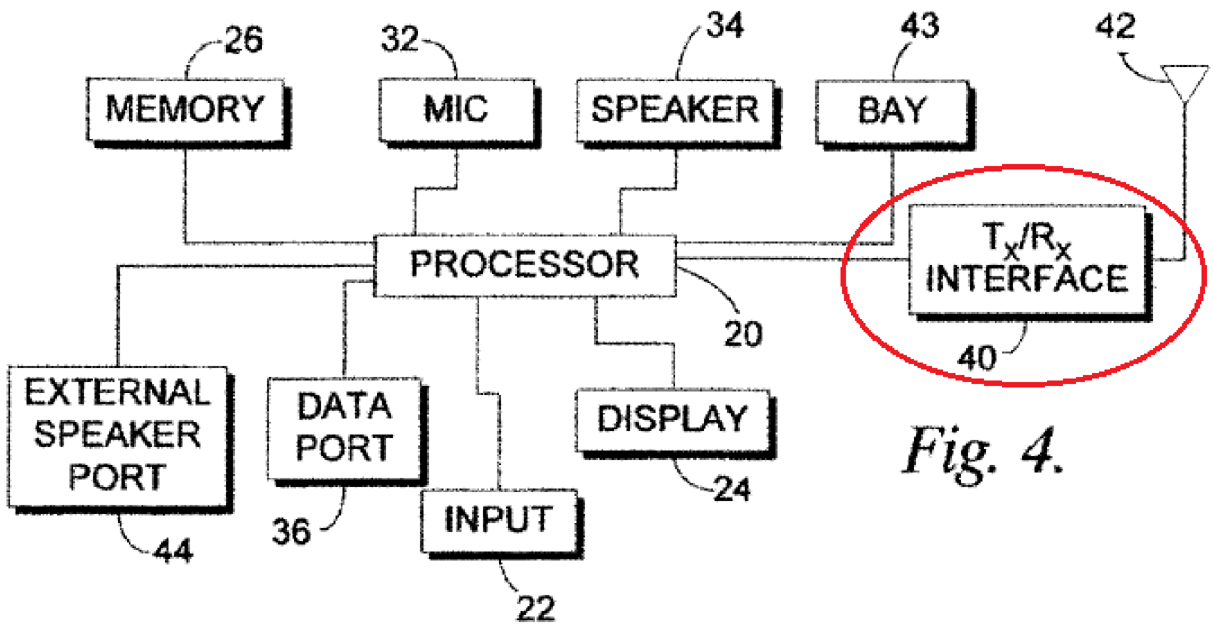


Fig. 4.

(*Id.*, Fig. 4 (red circle added).) As shown, the cell phone includes a "transceiver **40**." (*Id.*, 7:54.) One of ordinary skill in the art would have understood that a "transceiver" serves as a receiver. (*Comprehensive Dictionary of Electrical Engineering*, Ex. 1025, at p. 647 ("transceiver [:] a device that can serve as both a transmitter and receiver.).) Indeed, box **40** (circled in red) in Figure 4 above is labeled as a "Tx/Rx Interface" (Transmitter/Receiver), thus expressly disclosing that the transceiver **40** serves as a receiver. Rolf therefore discloses that the cell phone includes a claimed "**receiver**."

"cell phone including a . . . digital signal processor"

92. As shown in Figure 4 above, the cell phone includes a processor **20**. Rolf explains that the processor **20** performs functions including processing data

packets received by the cell phone and outputting information to be displayed. (Rolf, 10:45-46, 13:39-40.)

93. Rolf does not appear to expressly disclose that the cell phone includes a "**digital signal processor**." However, it was well-known to persons of ordinary skill in the art that cell phones of the sort disclosed in Rolf 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 Rolf could include a digital signal processor. To the extent there is any question, this detail is confirmed and expressly disclosed by Gatherer.

94. As Gatherer explains, "[p]rogrammable digital signal processors (DSPs) are <u>pervasive</u> 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. (*Id.*) For example, as I mentioned above, "[t]he voice coder is the part of the architecture that <u>most engineers agree should be done on a DSP.</u>" (*Id.*, at p. 84, right column (emphasis added).) Gatherer also discloses that digital signal processors <u>were widely used</u> in cell phones for a variety of other functions. (*Id.*, at 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).)

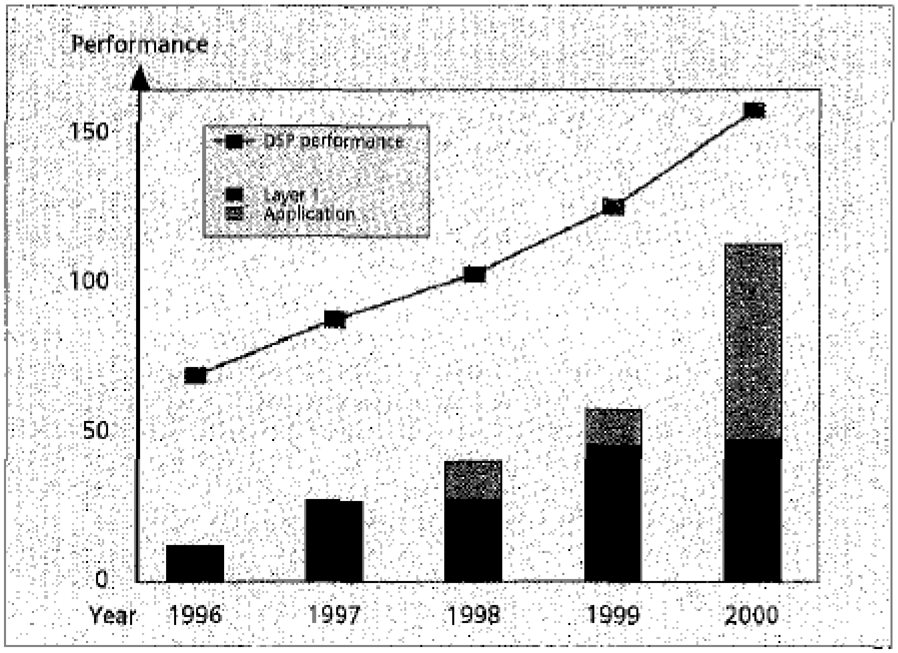
95. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Rolf with Gatherer, predictably resulting in a cell phone that included one or more digital signal processors. Rolf and Gatherer are analogous references in the same field of describing features of cellular phones. In fact, like Rolf, Gatherer recognized that cell phones can be used to provide "[a]udio and visual entertainment . . . delivered wirelessly to mobile subscribers." (Gatherer, at p. 89, left column.) A person of ordinary skill in the art implementing the cell phone of Rolf 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.

96. 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 pp. 84, left column ("We summarize some of the up and coming applications for the new

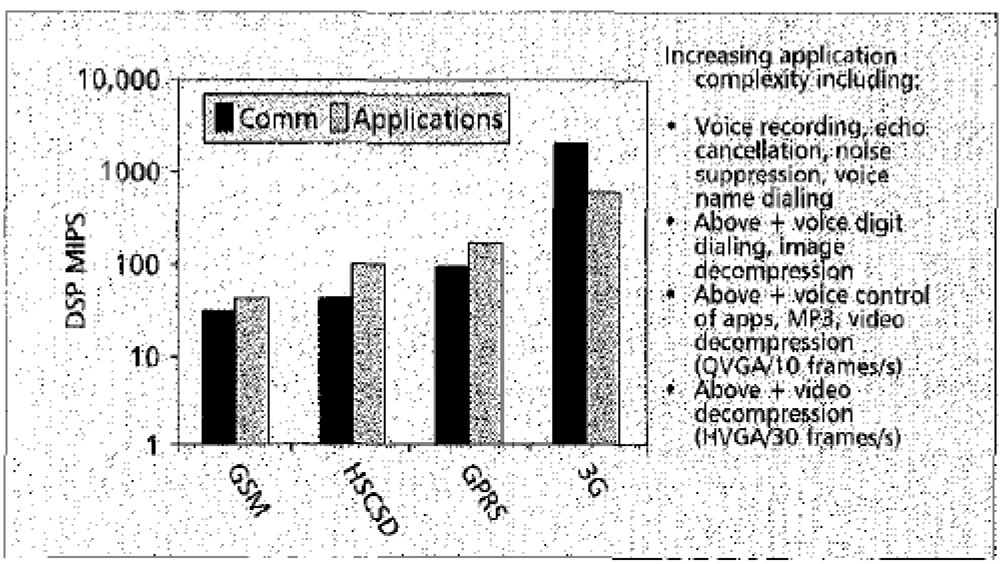
third-generation wireless personal assistants to show that, if anything, flexibility is becoming more of an issue, and therefore the programmability offered by DSPs is even more desirable.”); 85, left column (“[E]ach generation of phone had a slightly different physical layer from the previous one, and 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).)

97. 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.*

98. 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 Rolf 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.)

99. 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 Rolf.

"configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation (OFDM)"

100. As I explained above, Rolf discloses a cell phone that is configured to receive music files transmitted over a wireless communication network. (Rolf, 1:28-35, 5:46-53, 6:23-26, Fig. 1; *see also id.*, 5:64-66.) Rolf further discloses that the cell phone can "play" the music files received. (*Id.*, 1:20, 5:19, 6:21.) Rolf therefore discloses that the cell phone is "**configured for receiving and processing files**."

101. While the music files in Rolf are not disclosed as being "**transmitted by orthogonal frequency-division multiplex modulation**," this would have been obvious in view of O'Hara and Tagg.[5] As I explained in **Part V.A** above, I cite O'Hara and Tagg for two straightforward propositions: that (1) prior art IEEE 802.11a wireless networking transmits digital information to mobile devices using

[5] I note that unlike the recitation of OFDM in claim 1[c], claim 1[b] does not expressly recite transmission by a "cellular data channel." But in the event claim 1[b] were to be interpreted to require that the transmission by OFDM occur over a cellular data channel, this would have been obvious in further view of Pinard, as I explain for claim 1[c] below. (*See* **Part V.B.1.c.**)

OFDM (O'Hara); and (2) IEEE 802.11 wireless networking functionality can be incorporated into a cell phone (Tagg), such as the cell phone **12** of Rolf.

102. 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[6] 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 and process 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

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[6] 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).)

PPDU[7]. An example of an IEEE 802.11a OFDM PMD[8] is illustrated in Figure 7-2."), Fig. 7-2 (showing a block diagram of an 802.11a receiver).)

103. With respect to the second proposition, as I explained in detail in **Part V.A.4**, Tagg discloses a cell phone that can receive data using IEEE 802.11. Figure 1 of Tagg provides a basic overview of the system:

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[7] 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.* at p. 141 (Fig. 7-1, showing OFDM PPDU).)

[8] 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).)

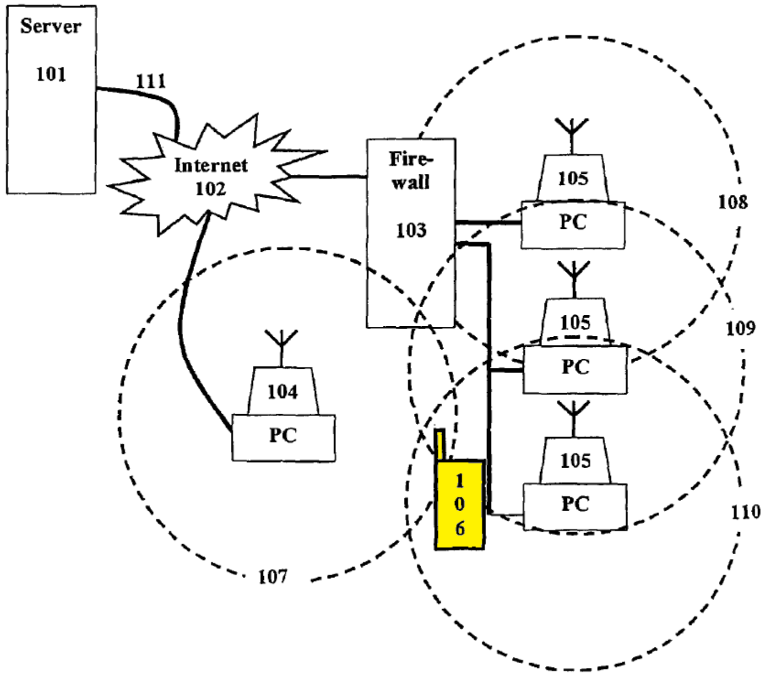

Fig. 1

(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.*)

104. 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:

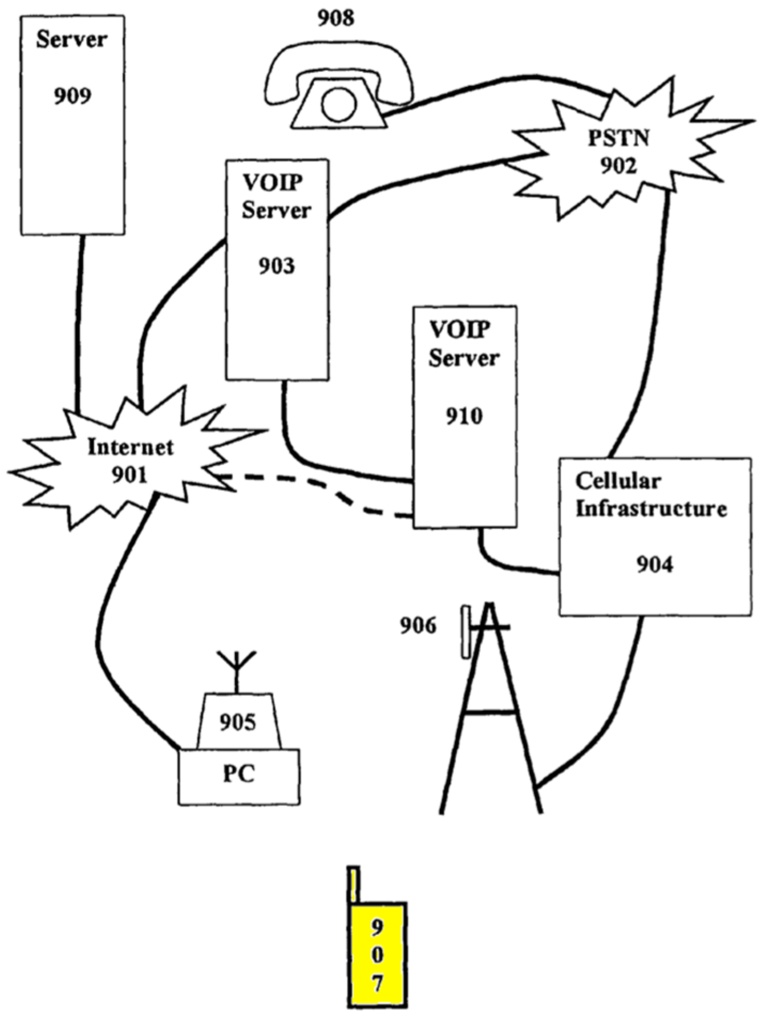

Fig. 9

105. 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.) 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.").)

106. 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.

107. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Rolf with O'Hara and Tagg, predictably resulting in a cell phone **12** of Rolf configured to receive and process

compressed digital audio or visual files in which the files are transmitted to the cell phone by use of IEEE 802.11a networking, thus using OFDM modulation. Tagg, as noted, specifically discloses the ability to incorporate IEEE 802.11 wireless networking technology into a cell phone, and discloses two basic and fundamental reasons why such a combination would be desirable: (a) speed and (b) cost.

108. **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[9]) could transmit digital multimedia content at up to 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, at p. 139 ("The OFDM PHY

[9] One of ordinary skill in the art would have also appreciated that the use of OFDM offers advantages, 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, ...").)

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 “MP3 files” (Tagg, 5:27-29), precisely the use case contemplated in Rolf. 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 MP3 files and significantly improved user experience.

109. **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 MP3 files from a server.

110. 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 MP3 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 **12** of Rolf to obtain these performance and cost benefits.

111. 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. 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 Rolf, predictably resulting in

those devices receiving digital audio and/or visual 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. 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 11 Mbps for IEEE 802.11b), the 802.11a variant would have provided enormous advantages in terms of speed, which I explained at length above. (*See* O'Hara, at p. 139 ("In October 1997 the IEEE 802 Executive Committee approved two projects to for higher rate physical layer (PHY) extensions to IEEE 802.11. The first extension, IEEE 802.11a, defines requirements for a PHY operating in the 5.0 GHz U-NII frequency and data rates ranging from 6 Mbps to 5,4 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.)

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

113. 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 "receiver and digital signal processor" (and not just the cell phone itself) be "configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation," this would nevertheless have been obvious, as I explain below.

<u>Receiver</u>

114. Any requirement that the <u>receiver</u> be configured for receiving and processing files transmitted by OFDM is disclosed and obvious in view of O'Hara.

115. As I mentioned above, O'Hara teaches an 802.11a receiver that can be implemented in mobile devices to receive data transmitted by OFDM modulation. (O'Hara, 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.").) The receiver is shown in Figure 7-2, reproduced in relevant part below.

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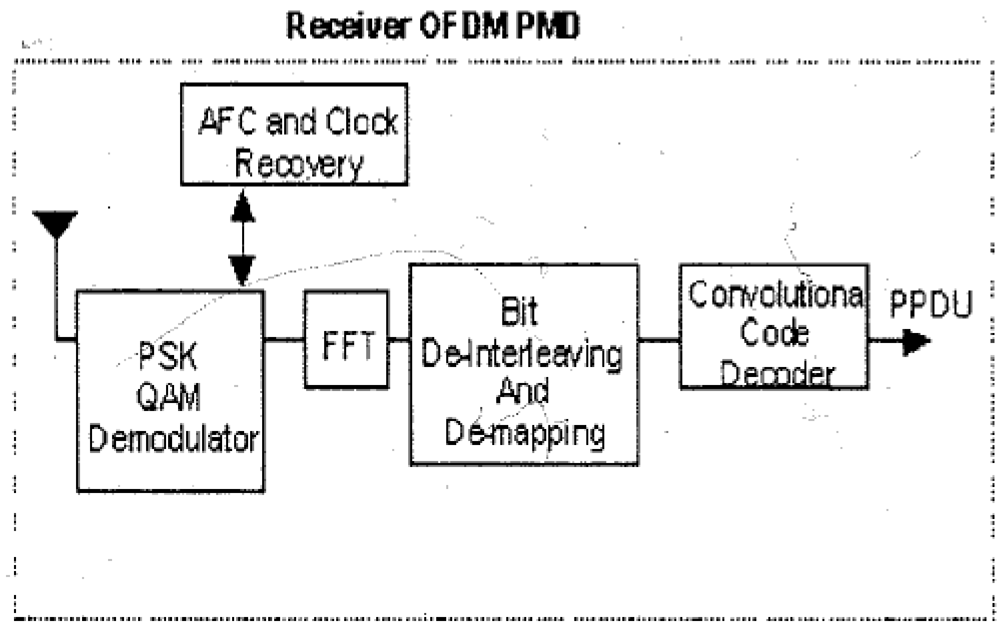
[10] The term "PPDU" refers to a PLCP protocol data unit, a unit of data that includes a preamble and header. (O'Hara, at p. 174 (explaining PPDU acronym); *id.*, at p. 141 (Fig. 7-1, showing OFDM PPDU).)

[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).)



(*Id.*, at p. 145, Fig. 7-2.)

116. As shown, the IEEE 802.11a receiver includes a PSK QAM demodulator, AFC and clock recovery, FFT (fast fourier transform), and bit de-interleaving and de-mapping components, and a convolutional code decoder. O'Hara describes in detail how data is processed for transmission by OFDM modulation:

> The basic principle of operation first divides a high-speed binary signal to be transmitted into a number of lower data rate subcarriers. There are 48 data subcarriers and 4 carrier pilot subcarriers for a total of 52 nonzero subcarriers defined in IEEE 802,11a. Each lower data rate bit stream is used to modulate a separate subcarrier from one of the channels in the 5 GHz band. . . . [B]it interleaving and convolutional encoding is used to improve the bit error rate

> performance. The scheme uses integer multiples of the first subcarrier, which are orthogonal to each other. This technique is known as orthogonal frequency division multiplexing (OFDM). Prior to transmission the PPPU is encoded using a convolutional coded rate R = 1/2, and the bits are reordered and bit interleaved for the desired data rate. Each bit is then mapped into a complex number according the modulation type and subdivided in 48 data subcarriers and 4 pilot subcarriers. The subcarriers are combined using an inverse fast fourier transform and transmitted.

(*Id.*, at pp. 143-44.)

117. O'Hara further explains that "[a]t 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." (*Id.*, at p. 144.) One of ordinary skill in the art would have understood that the receiver, upon receiving data transmitted by OFDM, would perform the reverse of the process described for the transmitter.

118. O'Hara therefore discloses a receiver "configured for receiving and processing 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 O'Hara to the cell phone in Rolf is provided above.

Digital Signal Processor

119. Any requirement that the digital signal processor be configured for receiving and processing 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 process data transmitted by OFDM modulation, thus satisfying any requirement imposed by the claim that the digital signal processor be configured for "processing files transmitted by orthogonal frequency-division multiplex modulation." Unlike a traditional CPU, the digital signal processor is optimized to process digital signals such as physical layer processing, voice processing, and other numeric processing.

120. 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 pp. 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.”), 85, Fig. 1 (showing that DSP functions include GSM vocoder, channel codec, interleaving/deinterleaving, ciphering/deciphering, burst formating, demodulator, and equalizer); *see also id.*, at p. 85, left column (“After 1994, a single DSP was powerful enough to do all the DSP functions, making the argument for a DSP-only solution for the baseband even more compelling.”).) As such, one of ordinary skill in the art would have understood and found it obvious that, when included in a cell phone that receives files transmitted by OFDM modulation, the digital signal processor could process the OFDM signals.

121. One of ordinary skill in the art would have had ample motivations to implement functions of the OFDM receiver, as described in O’Hara, using a digital signal processor. To begin with, it was well known that DSPs could be programmed to receive and process 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.”); U.S. Patent No. 6,711,221 (filed Feb. 2000), Ex. 1017, 3:33-48.)

122. 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 described in O'Hara 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). (O'Hara, at p. 144 ("At the receiver, the carrier is converted back to a multicarrier lower data rate form using an FFT.""), Fig. 7-2.) 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.").)

123. 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.*, at p. 85, Fig. 1.) Because the receipt and processing of OFDM signals would be a physical layer task in an IEEE 802.11a-compliant cell phone, one of ordinary skill in the art would have found DSPs to be a natural candidate for performing functions of the OFDM receiver.

(O'Hara, at p. 139 ("IEEE 802.11a PHY is one of the physical layer (PHY) extensions of IEEE 802.11 and is referred to as the orthogonal frequency division multiplexing (OFDM) PHY.") (underlining added); *see also id.*, at p. 143-144.) In fact, OFDM was one of a finite number of known techniques for implementing wireless physical layer, and in many cases DSPs were optimized specifically to perform physical layer signal processing. 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." (Gatherer, 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.E** above. Accordingly, it would have been obvious to configure a digital signal processor included in a cell phone to receive and process files transmitted by OFDM modulation.

124. A person of ordinary skill in the art would also have been motivated to implement functions of the music player using a digital signal processor. As Gatherer explains, digital signal processors "can provide power-efficient media processing." (Gatherer, 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 MP3 decompression.

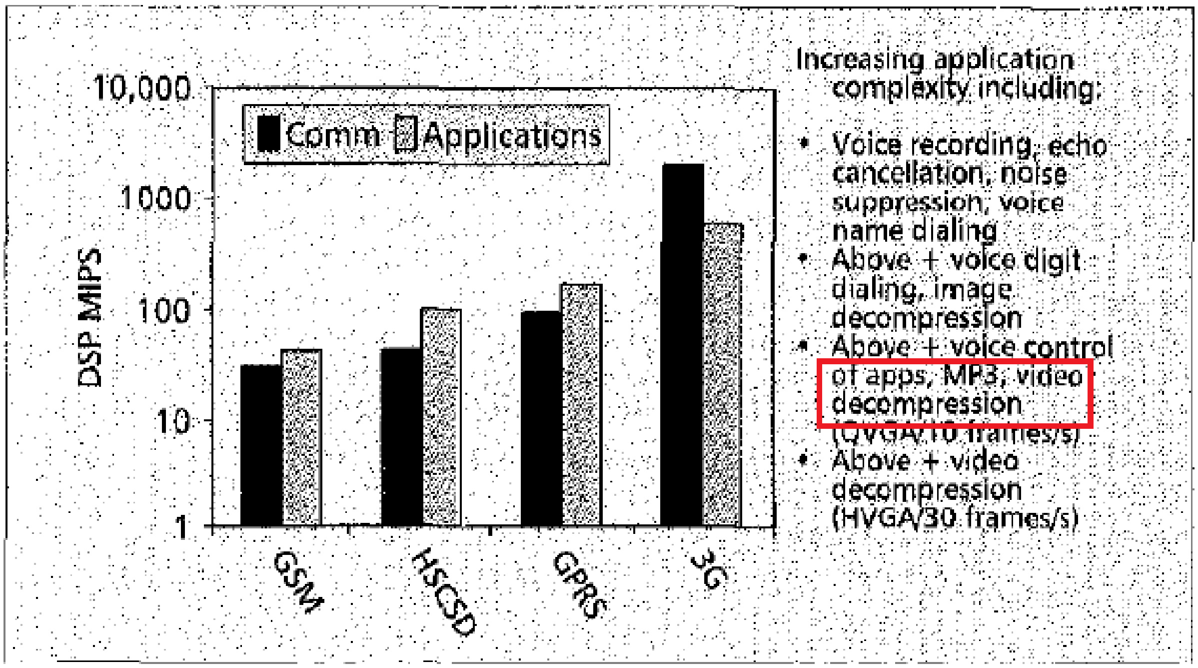


Figure 7. *Applications drive DSP MIPS.*

125. (Gatherer, 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 music files that were transmitted to the cell phone by OFDM modulation.

126. Accordingly, the prior art satisfies the limitation "said cell phone including a receiver and digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation," as recited in the claim.

c. "providing for the transmission of the compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received request, wherein the transmission of the compressed digital audio or audio-visual data file is by a cellular data channel." (Claim 1[c])

127. As I explained above, Rolf discloses providing for the wireless transmission of requested music files from the facility **14** to the cell phone based on the received request. (Rolf, 1:18-21, 1:25-28, 5:46-53 ("… [U]sing a keypad and input on the wireless communications device, or by voice commands, one or more selected music recordings may be retrieved from the storage facility **14**, for transmission, via wireless communications link, to the device **12**.").) As noted, Rolf makes clear that these music files can be compressed. (*Id.*, 1:35-38, 5:37-39, 8:63-9:3.) Rolf therefore discloses "**providing for the transmission of the compressed digital audio or audio-visual data file to the cell phone . . . based on the received request**."

128. While Rolf does not disclose that the transmission occurs "**by orthogonal frequency-division multiplex modulation**" and "**by a cellular data channel**," this would have been obvious in view of O'Hara, Tagg, and Pinard. As I explained for claim 1[b] above, it would have been obvious, in view of O'Hara and Tagg, to transmit data to a cell phone by OFDM modulation. Moreover, it

would have been obvious, in further view of **Pinard**, that the transmission could occur "**by a cellular data channel**."

129. As I explained above in **Part V.A.4** and **V.B.1.b**, I have cited O'Hara and Tagg for the propositions that (1) prior art IEEE 802.11a wireless networking transmits digital information to mobile devices using OFDM (O'Hara) and (2) IEEE 802.11 wireless networking functionality can be incorporated into a cell phone, such as the cell phone **12** of Rolf (Tagg). I now cite Pinard for the proposition that (3) a "cellular data channel," as recited in claim 1, can be provided based on IEEE 802.11 wireless networking technology.

130. As I discussed above in **Part V.A.4**, Pinard teaches that an IEEE 802.11 wireless network is a cellular network, and can provide data channels for communication. I explained previously that the term "cellular data channel" simply refers to a data channel in a network in which wireless communications are provided through a series of "cells," each cell providing network access for a particular geographic area. Thus, a "cellular data channel" 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.

131. In this regard, I have cited **Pinard** for the simple proposition that a "cellular data channel" can be provided 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.) 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 further explains that this cellular network provides data channels for communication. (*Id.*, 1:39-40 (describing the "data rates" featured in the draft 802.11 specification) (underlining added), 2:31-41, 4:26-35 (explaining that the invention "provide[s] a data communications network") (underlining added).)[12]

[12] To the extent there is any question as to whether an IEEE 802.11**a** cellular

Pinard therefore confirms that a "cellular data channel" as recited in claim 1 can be built using IEEE 802.11 access points.

132. 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.

133. ***Rationale and Motivation to Combine:*** It would have been obvious to a person of ordinary skill in the art to combine Rolf with O'Hara, Tagg, and Pinard, predictably resulting in the transmission of an MP3 file to the cell phone

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network provides "data channels" for communication, this is expressly disclosed in O'Hara. (O'Hara, at pp. 143 ("Each lower data rate bit stream is used to modulate a separate subcarrier from one of the channels in the 5 GHz band.") (underlining added), 144-146 (section entitled "OFDM Operating Channels and Transmit Power Requirements") (underlining added).)

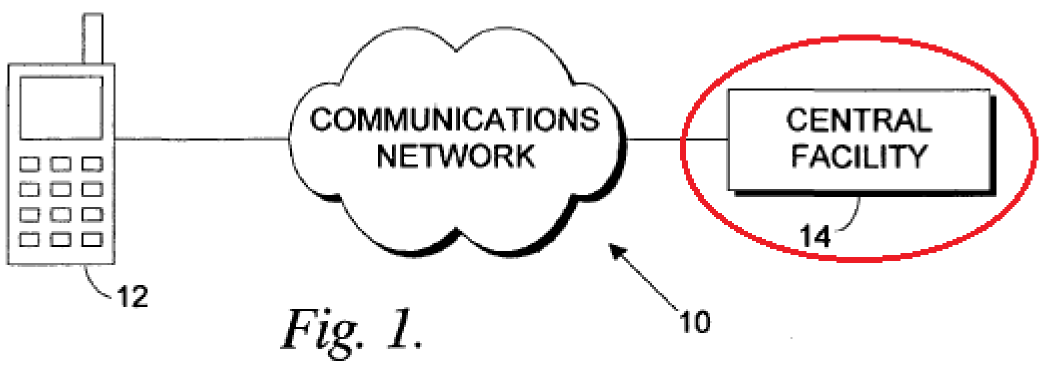
12, as described in Rolf, in which the MP3 file is transmitted by an IEEE 802.11a cellular data channel by OFDM modulation. As noted previously, Pinard expressly confirms that a "cellular data channel" can be provided using IEEE 802.11 access points. (*See also* O'Hara, at pp. 166-67 (discussing "WLAN cells" implemented using IEEE 802.11 access points).) And Tagg, as I explained for claim 1[b] above, specifically discloses the ability to incorporate IEEE 802.11 wireless networking technology into a cell phone.

134. **Part V.B.1.b** above sets forth the motivations for transmitting data to a cell phone by use of IEEE 802.11a networking, thus using OFDM modulation. Those motivations, including the benefits of speed and cost, apply with full force here. Moreover, a person of ordinary skill in the art would have appreciated that using multiple of 802.11a-compliant access points to provide wireless communication for a series of cells (as opposed to a single access point) would be beneficial because it would enable network access over a larger geographical area. A person of ordinary skill in the art would be motivated to build a Pinard-style 802.11 network to achieve the dual and interrelated benefits of increased speed and decreased cost, and by using 802.11-based cells that provide a wider geographical range, to exploit these speed and cost benefits even further and avoid the disadvantages of more traditional cellular networks. (*See* O'Hara, at p. 3 ("In a

laptop equipped with an IEEE 802.11 WLAN connection, the connection to the network is available in a coworker's office, down the hall in the conference room, downstairs in the lobby, across the parking lot in another building, even across the country on another campus.").)

2. Dependent Claim 2: "The method of claim 1, wherein the compressed digital audio or audio-visual data file is provided by a website."

135. Rolf discloses this limitation. The "website" in Rolf is provided by a "facility **14**," shown in Figure 1 below.



(Rolf, Fig. 1 (red circle added).) Figure 5 (below) illustrates the facility **14** in greater detail. (*Id.*, 5:1-2; 8:54-9:18.)

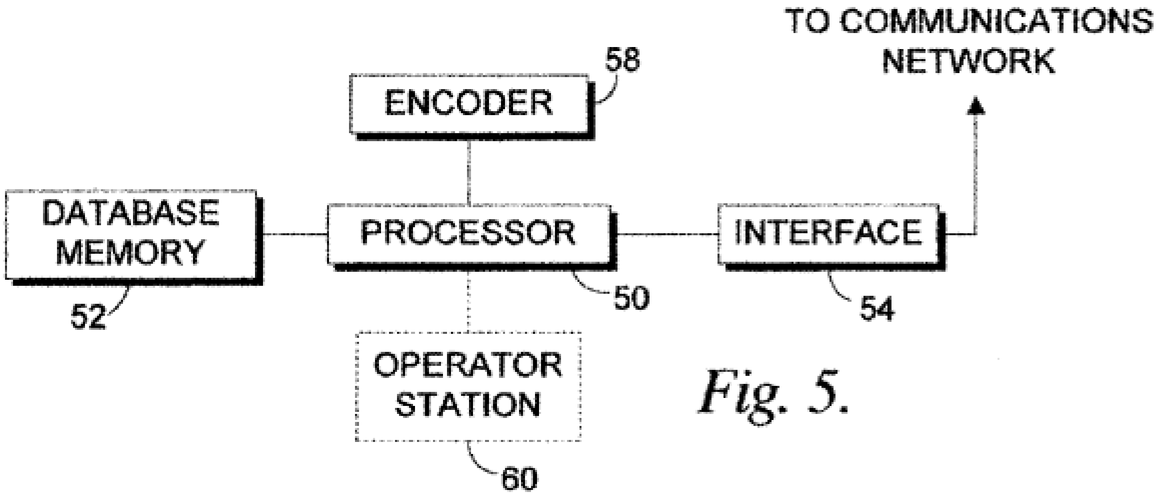


Fig. 5.

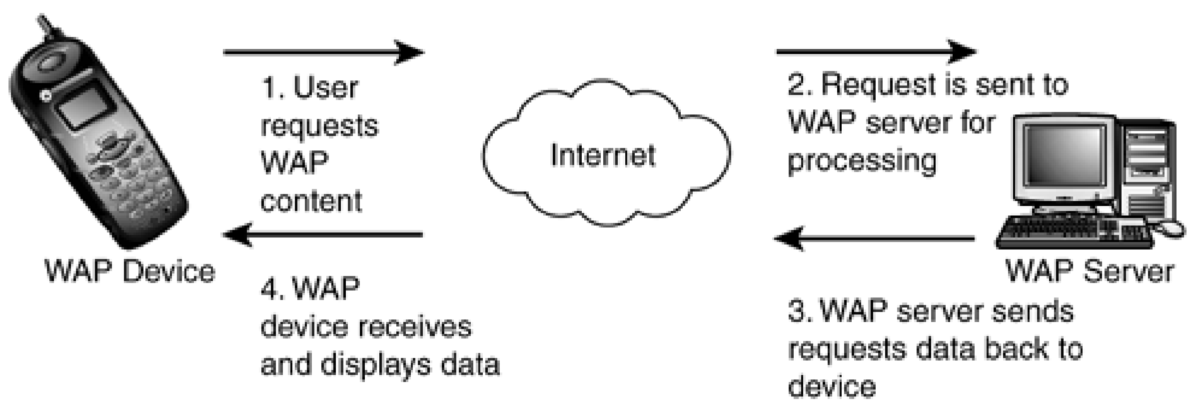
(*Id.*, Fig. 5.) As shown in Figure 5 above, the "facility" (**14**) in Rolf is a set of hardware and software components connected to a communications network. (*See also id.*, 8:61-62 ("The encoder **58** is a set of <u>processing instructions stored in a memory</u> …"), 9:11 ("[P]rocessor **50** invokes <u>application software</u> …") (underlining added).) These components include "a processor **50**. Connected to the processor **50** are a data base memory **52** and a [sic] interface **54** (such as a transceiver or modem) for transmitting and receiving communications signals." (*Id.*, 8:56-59.) The data base memory **52** stores music recordings, which as I discussed above, may be stored in compressed form. (*Id.*, 9:4-6; *see also id.*, 5:32-39.) Although Figure 5 shows the facility **14** as including an encoder **58** and operator station **60**, Rolf makes clear that these components are "not necessary." (*Id.*, 9:6, 9:7.)

136. The hardware and software comprising the facility **14** have an "address on the world wide web." (*Id.*, 5:32-34.) As Rolf explains, "the facility **14** has a uniform resource locator (URL) on a global communications network (such as the **world-wide web**)," and as such, the cell phone **12** (shown in Figure 1 above) can "access[] the facility **14** via a server in the communications network." (*Id.*, 12:52-55 (underlining added); *see also id.*, 3:11-12 ("[A]n identifier, such as a server address, associated with the remote central facility …").) A user can thus use the keypad and input on the cell phone **12** to select music stored in the data base memory **52** (of the facility **12**) for download. (*Id.*, 5:49-53; *see also id.*, 1:39-41, 5:63-66, 9:10-15.) Accordingly, one of ordinary skill in the art would have understood that the facility **14** includes a server (on the World Wide Web) from which files are "**provided by a website**," as recited in claim 2.

137. But Rolf does not disclose specific details about the website provided by facility **14**. In the event it is argued that Rolf does not disclose the facility **14** providing a website, such a step would have been obvious over the teachings of **Forta**. As I discussed above in **Part V.A.2**, Forta describes a technique for providing websites to cell phones called "Wireless Application Protocol," or "WAP" for short. (Forta, Ex. 1004, at p. 1.) As Forta explains, "WAP is the Wireless Application Protocol, a communications protocol (based on HTTP)

designed specifically for wireless communication and managed by the WAP Forum. WAP is the transport used to communicate between devices (phones initially, but other devices eventually) and servers." (*Id.*) Thus, "WAP does for wireless devices what HTTP does for Web browsers—it allows them to become clients in an Internet-based client/server world." (*Id.*, at p. 10.)

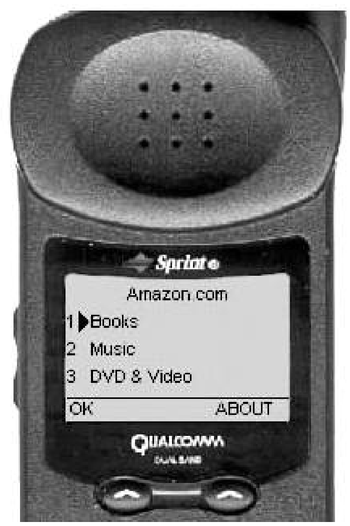
138. Forta explains that "WAP devices connect to servers to retrieve and send information in much the same way as Web browsers connect to HTTP servers." (*Id.*, at p. 11.) "If you want to serve WAP content you can install a WAP server. This is a piece of software, much like an HTTP server (and indeed, the two can usually run on the same machine)." (*Id.*) The WAP technique is generally illustrated in Figure 1.1, shown below.



(*Id.*, at p. 12 (Fig. 1.1).)[13]

[13] Forta also explains that "WAP devices can request and receive data from HTTP

139. Forta discloses that using WAP, a visual interface for display can be received from a server as a WML document. (*Id.*, at pp. 40 ("WML pages—content viewed on separate screens—are called *cards* and those cards are all placed within a *deck* of related pages which constitute one single file."), 20 ("[H]ow to configure your Web server to serve WML content and how to view that content with several common devices …"); *see also id.* at p. 21 (section on "WML's Functionality").) As Forta explains, "Wireless Markup Language (WML) is a markup language used for describing the structure of documents to be delivered to wireless devices. WML is to wireless browsers as HTML is to a browser on a desktop computer. WML was created to address the display, bandwidth, and memory limitations of mobile and wireless devices, such as cellular phones . . . ." (*Id.*, at p. 20.)



140. Forta discloses that by the time of its publication in September 2000, well-known companies such as Amazon and Yahoo! were already using WAP to provide their websites to cell phone users. Figure 13.3 (shown at right) shows "the Amazon.com site that is

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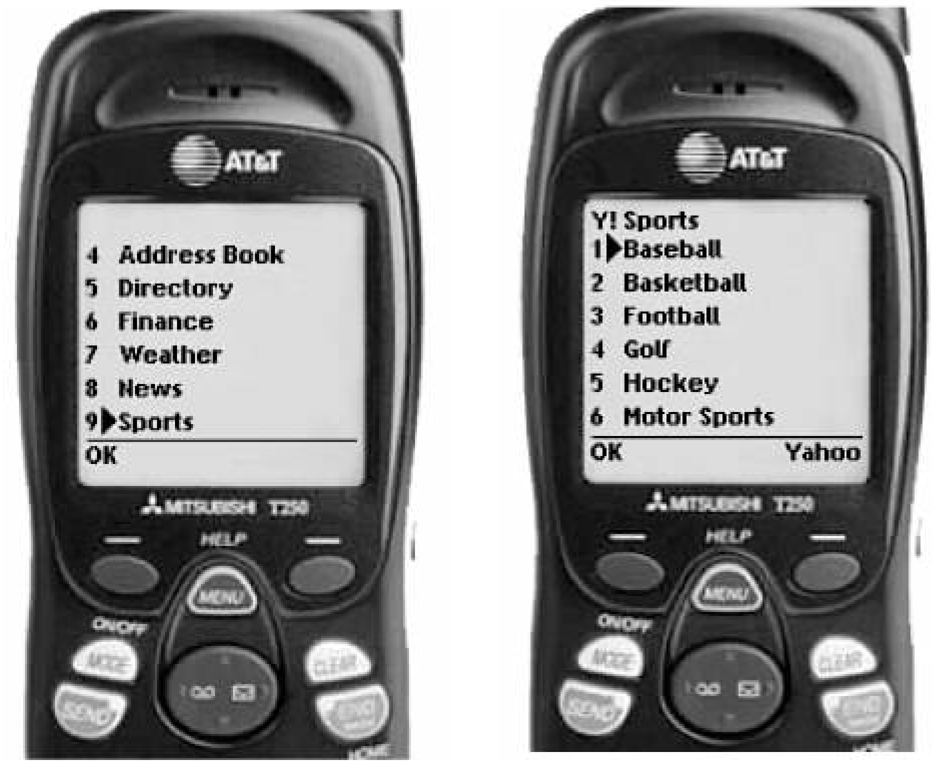
servers via WAP gateways." (*Id.*, at p. 12; *see also id.*, at Fig. 1.2.)

written explicitly for phones with a WAP browser in them." (*Id.*, at p. 316.) Similarly, Figure 13.5 (below) shows the Yahoo! website provided to cell phones.



(*Id.*, Fig. 13.5; *see also id.*, at p. 317 ("Clearly, Yahoo! has done some considerable work here to build a powerful wireless site that works as a companion to its HTML site.").) Forta goes on to teach, in detail, the use of WAP to provide a website for mobile e-commerce. (*Id.*, at pp. 429-63 ("Chapter 18. E-Commerce").)

141. ***Rationale and Motivation to Combine***: It would have been obvious to a person of ordinary skill in the art to combine Forta with Rolf, with no change in their respective functions. The combination would have predictably resulted in

a server on the World Wide Web, as disclosed in Rolf, that provides a website according to the WAP techniques of Forta.

142. One of ordinary skill in the art would have found this to be a largely trivial combination. As noted above, Rolf discloses a server on the World Wide Web accessible to cell phones, but does not appear to provide a detailed discussion of the technologies that can be used to implement that Web server. (Rolf, 5:30-35, 5:46-53, 12:49-55; *see also id.*, 5:64-66, 9:10-15.) A person of ordinary skill in the art would have found this omission insignificant in light of already known and industry standard techniques for providing websites to cell phones, such as those described in Forta. Forta provides an express motivation to combine by explaining that WAP "promises to be one of the most important protocols and standards ever developed," and stating that the Forta book is intended for any developer who "want[s] to learn how to generate content for wireless devices…." (Forta, at p. 1.) As such, one of ordinary skill in the art would have naturally consulted Forta to ascertain the details involved in providing a website to a cell phone.

143. Forta provides several other express motivations to combine. It states that WAP and its associated technologies were "created to address the display, bandwidth, and memory limitations of mobile and wireless devices, such as cellular phones." (Forta, at p. 20.) Forta further explains that "WAP will succeed

because it is being supported by almost every major hardware, software, device, data carrier, and telecom vendor. And with that kind of muscle behind a common goal, anything is possible." (*Id.*, at p. 1.) Thus, one of ordinary skill in the art would have appreciated that the WAP techniques described in Forta are particularly suitable for the cell phone in Rolf, and would have appreciated the advantages of using such a widely adopted technology, including the advantages of interoperability with other existing systems and technologies.

144. Moreover, Rolf and Forta are analogous references in the same field of wireless communication and computing. Forta's "Introduction" section explains that while "[w]ireless data communication is not a new idea, … wireless computing is becoming a reality and in ways no one could have imagined." (Forta, at p. 1.) Consistent with Forta's description, Rolf teaches a cell phone that can not only be used to communicate wirelessly, but also play music. (Rolf, 1:17-21.) The analogous nature of these references is further confirmed by the fact that both recognized that cell phones can be used as instruments of e-commerce. Forta specifically notes that "[e]-commerce is a highly practical and exciting application for mobile users" (Forta, at p. 462), and devotes an entire chapter to this topic. (*Id.*, at pp. 429-63 ("Chapter 18. E-Commerce").) Rolf, for its part, teaches that cell phones can be used to electronically purchase products such as music and

concert tickets. (Rolf, 6:53-7:23, 14:35-53.) Thus, a person of ordinary skill in the art would have understood that the two references pertain to the same technology area and are readily combinable.

3. Dependent Claim 3: "The method of claim 1, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone."

145. Rolf provides two independent ways for satisfying the limitation of claim 2. As discussed, Rolf discloses that a music file can be streamed to the cell phone. (Rolf, 6:20-30.) And as noted, Rolf makes clear that these music files can be compressed. (*Id.*, 1:35-38, 5:37-39, 8:63-9:3.) Rolf discloses that during streaming, the music file is transmitted to the cell phone as a series of "data packets." (*Id.*, 6:26.) This is shown in Figure 7a, reproduced below.

Fig. 7a.

(*Id.*, Fig. 7a (green highlighting added); *see also id.*, 10:7-20 (explaining that the packets labeled "A" and "I" "serve as a header" for the streaming transmission, and "[t]he remainder of the packets include data indicative of the music recording being transmitted, and are labeled 'M'").) The data packets of the music file being transmitted (labeled "M") are highlighted in green above. (*Id.*, 10:16-20.) Each

"M" data packet corresponds to a "**portion**" of the music file being transmitted.

146. Rolf further explains that these data packets are "streamed through a buffer for play by a player <u>each of which are in a memory **26**</u> (see FIG. 4), such that, as one data packet is played within the buffer, and then exits the buffer, an additional data packet is streamed into the buffer." (*Id.*, 6:26-30 (underlining added).) Because each data packet corresponding to a portion of the music file to be played is "in a memory **26**" of the cell phone (*id.*, 6:28, Fig. 4), one of ordinary skill in the art would have understood that individual data packets are "**stored**," as recited in the claim, notwithstanding the fact that the music file as a whole may not be "fully stored" within the cell phone. (*Id.*, 6:22.) Rolf therefore provides one way of satisfying the step of "**storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone**."

147. Rolf also discloses that during streaming, "data indicative of a site at which the particular music recording is being [sic] played … can be ordered is transmitted and associated with a particular input" (*e.g.* keypad input) on the cell phone. (*Id.*, 11:48-51; *see also id.*, 10:8-11 ("[T]he first set of data packets, including one or more packets **100**, may include information pertaining to an identifier or address associated with a source of the streamed data."), 10:57-59.) "Accordingly, while listening to the music recording, an individual may activate

the order key and be connected with a source for ordering that particular music recording." (*Id.*, 11:54-57.) "[U]pon activation of the order key," a data link may be "established with the source at which the music recording is to be purchased, and the purchase may be conducted in a purely electronic fashion." (*Id.*, 11:61-65.) "For example, purchase may be made such that <u>a complete copy of the sound recording</u> (or its associated album) <u>is downloaded to the memory **26** within wireless communications device **12**</u>." (*Id.*, 12:4-7 (underlining added).) Rolf thus provides a second way of satisfying the "storing" step. Accordingly, claim 3 would have been obvious in view of the prior art.

4. Dependent Claim 4: "The method of claim 1, further comprising optimizing the digital audio or audio-visual data file according to an optimization scheme."

148. As explained above for claim 1, Rolf discloses that compressed audio or audio-visual data files, such as MP3 files, are stored on and can be downloaded from, central facility **14**. (Rolf, *e.g.*, 1:18-21, 1:25-28, 1:35-38, 5:32-39, 5:46-53, 8:63-9:6.) But Rolf does not appear to disclose the additional step of optimizing the MP3 files "according to an optimization scheme."

149. In my opinion, this step provides no meaningful distinction over the prior art and is disclosed by **<u>Hacker</u> [Ex. 1069]**. Hacker, entitled "MP3: The Definitive Guide," is a textbook that discloses a number of techniques for

maximizing the sound quality of MP3 files while maintaining acceptable levels of compression. Hacker discloses optimizing the digital audio MP3 file according to an optimization scheme, as recited in the claim, in several different ways.

150. First, Hacker confirms that the process of converting audio data into a compressed MP3 file includes optimization of the digital audio according to an optimization scheme. When creating an MP3 audio file, MP3 "provides a means of analyzing patterns in an audio stream and comparing them to models of human hearing and perception," which "preserve[s] only the data absolutely necessary to reproduce an intelligible signal." (*Id.* at p. 2.) This model is referred to as a "psychoacoustic" model, which guides the compression based on the idiosyncrasies of how human beings hear and perceive sounds. As explained in Hacker, during the MP3 encoding process:

> The frequency spread for each frame is compared to mathematical models of human psychoacoustics, which are stored in the codec as a reference table. From this model, it can be determined which frequencies need to be rendered accurately, since they'll be perceptible to humans, and which ones can be dropped or allocated fewer bits, since we wouldn't be able to hear them anyway. Why store data that can't be heard?

(*Id.* at p. 26.)

151. This process discloses the step of "optimizing the [MP3] data file according to an optimization scheme," as recited in the claim. The process described above optimizes the audio signal based on the frequencies that are most perceptible to humans. The "optimization scheme" includes the psychoacoustic models, "which are stored in the codec as a reference table." (*Id.*)

152. As a second and separate basis for disclosing the claimed optimization, Hacker explains that creating an MP3 compressed audio file requires that the user consider the trade-off between compression performance and audio quality. (Hacker, at p. 161 ("The more you throw away, the worse your files will sound and the smaller your MP3 files will be. The more you keep, the better they'll sound and the larger the resulting files will be.").) Hacker explains that "[o]nly you can decide where on this spectrum you want to sit." (*Id.* at p. 161.)

153. For example, the user can specify a "samplerate" that measures how many times per second the audio signal is digitally represented by the final stream. (*Id.* at p. 163.) A lower sample rate, therefore, generally means a smaller file size but poorer audio quality. (*Id.*) For example, "[y]ou might want much smaller file sizes at the expense of fidelity when working with the spoken word—for encoding class lectures." (*Id.*) Hacker therefore discloses optimization according to an optimization scheme because, in compressing audio data into MP3 files, the user

can decide how to balance audio quality and file size to achieve the optimum balance ("optimization scheme"). (*Id.* at p. 2 ("The amount of data preserved is configurable by the person doing the compressing, so an optimal balance between file size and quality can be achieved.").)

154. This is consistent with the written description of the '718 patent, which explains that "[t]he server audio data optimization and compression element **1205**, utilizes a music compression algorithm outlined in FIG. 15, <u>which converts common music files into compressed files in order to reduce the audio clip size for minimizing its download time, while maintaining predetermined audio quality</u>." ('718, 23:61-66 (underlining added).) The step of compressing the audio file based on a user-selected balance between file size and audio quality entails optimization "according to an optimization scheme," as recited in the claim.

155. Third, a section entitled, "***Pre-encoding optimizations***," Hacker asks, "what can you do prior to encoding to <u>optimize the quality of the final results</u>?" (Hacker, at p. 161 (bold italics in original; underlining added).) Hacker provides several answers, including "any necessary equalization, de-hissing, de-popping, and de-scratching." (*Id.* at p. 162.) Also, "[y]ou can cut the silent bits off the beginning and end of your files, add effects, alter the levels, and more." (*Id.*) Any one of these processes would disclose the claimed optimization. In specifying

what optimizations to perform on the audio data, *e.g.* equalization, de-hissing, altering levels, etc., optimization is performed according to an optimization scheme.

156. ***Rationale and Motivation to Combine***: It would have been obvious to a person of ordinary skill in the art to combine Rolf with Hacker, with no change in their respective functions. This would have predictably resulted in the system of Rolf in which MP3 files are created for storage on the central facility **14**, with an optimization being performed as part of the process of creating the MP3 file.

157. A person of ordinary skill in the art would have found the combination of these references straightforward for a simple reason – Rolf specifically discloses that audio files can be stored in MP3 compressed format. (Rolf, 5:35-39.) A person of ordinary skill in the art would have naturally consulted Hacker to provide further details into the very MP3 compression technique that Rolf uses for storage of compressed audio files.

158. Hacker provides several express motivations to combine by explaining that the optimizations discussed above are specifically designed to achieve an optimal balance between storage efficiency and audio quality. With respect to the psychoacoustic models, for example, Hacker explains that it can achieve more effective compression by eliminating audio frequencies that are not

human perceptible. (Hacker, at p. 26 ("Why store data that can't be heard?").) Similarly, Hacker explains that a user can achieve smaller file size by reducing the MP3 encoding samplerate. (*Id.* at p. 163.) A person of ordinary skill in the art implementing the system of Rolf would have appreciated that storage space and network bandwidth are finite resources, and thus, would have been motivated to optimize the digital files according to the optimization schemes discussed above to increase storage efficiency while maintaining good audio quality.

5. Dependent Claim 5: "The method of claim 1, wherein the compressed digital audio or audio-visual data file is attached to a library."

159. As explained above for claim 1, Rolf discloses that compressed audio or audio-visual data files, such as MP3 files, are stored on and can be downloaded from, central facility **14**. (Rolf, *e.g.*, 1:18-21, 1:25-28, 1:35-38, 5:32-39, 5:46-53, 8:63-9:6.)

160. Rolf further discloses that these data files are "attached to a library." In particular, Rolf explains that the data files are cataloged and stored in a database at the central facility **14**. (Rolf, 5:32-37 ("The remote storage facility . . . includes a data base having a plurality of music recordings therein. Preferably, the music recordings are categorized by a plurality of selectable fields, such as 'title', 'artist', 'album or CD type', 'recording label', etc.").) Because the data files are stored and

cataloged in the database, they are "attached" to it. Rolf further discloses that the transmission of data files can include information identifying the source of the data file, thereby disclosing a second way in which the data files are "attached to a library." (Rolf, 6:23-26 ("[A] music recording stored in central facility **14** or personal storage unit 16 may be streamed to the wireless device **12** via an established communications link" (underlining added)), 10:8-11 ("[F]or example, the first set of data packets, including one or more packets **100**, may include information pertaining to an identifier or address associated with a source of the streamed data." (underlining added)).) Rolf therefore fully discloses the limitations of claim 5.

6. Independent Claim 6

161. Independent claim 6 is substantially similar, for purposes of my Declaration, to claim 1. A side-by-side listing of claims 1 and 6 is shown in the table below (with common or overlapping language shown in underlining):

Independent Claim 6	**Independent Claim 1**
6[pre]. A method of wirelessly delivering compressed digital audio or audio-visual data file to a cell phone, the method comprising:	1[pre]. A method of wirelessly delivering compressed digital audio or audio-visual data file to a cell phone, the method comprising:
[a] providing a compressed digital audio or audio-visual data file for access over the Internet;	[a] providing a compressed digital audio or audio-visual data file for access over the Internet;

Independent Claim 6	Independent Claim 1
[b] receiving a request from the cell phone for the digital audio or audio-visual data file said cell phone including a receiver and digital signal processor configured for receiving and processing digital audio or audio-visual data files transmitted by orthogonal frequency-division multiplex modulation (OFDM);	[b] receiving a request from the cell phone, said cell phone including a receiver and digital signal processor configured for receiving and processing files transmitted by orthogonal frequency-division multiplex modulation (OFDM); and
[c] providing for the streaming transmission of the compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received request.	[c] providing for the transmission of the compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received request, wherein the transmission of the compressed digital audio or audio-visual data file is by a cellular data channel.

162. As shown, the preamble and limitations [a]-[b] of claims 1 and 6 are not materially different for purposes of my analysis. The fact that claim 6 recites that the request from the cell phone is "for the digital audio or audio visual data file" presents no differences in claim scope that could be used to distinguish the prior art from the claim.

163. Limitation [c] of claim 6 also shares the same core concepts as limitation [c] of claim 1, but adds that the transmission method must be "streaming." As I explained in **Part V.B.1.c** with respect to claim 1 above, Rolf

discloses that selected recordings can be streamed to the cell phone. (*Id.*, 6:20-30; *see also id.*, 1:39-41.)

164. As noted, Rolf further explains:

> [A] music recording desired to be played on wireless communications device **12** need not be fully stored within the device **12**. In this regard, for example, a music recording stored in central facility **14** or personal storage unit **16** may be **streamed to the wireless device 12** via an established communications link. In such an instance, data packets are streamed through a buffer for play by a player each of which are in a memory **26** (see FIG. 4), such that, as one data packet is played within the buffer, and then exits the buffer, an additional data packet is streamed into the buffer.

(*Id.*, 6:20-30 (emphasis added).) Rolf therefore satisfies "providing for the streaming transmission of the compressed digital audio or audio-visual data file to the cell phone," and as such, claim 6 would have been obvious in view of the prior art.

165. Accordingly, each limitation of claim 6 is disclosed and rendered obvious by Rolf in view of Gatherer, O'Hara, and Tagg for the same reasons I discussed previously with respect to claim 1. I noted that although my analysis for claim 1 additionally relied on the **Pinard** reference, claim 6 does not recite the

limitation for which I have cited Pinard: "wherein the transmission of the compressed digital audio or audio-visual data file is by a **cellular data channel**."

7. Dependent Claim 7: "The method of claim 6, wherein the compressed digital audio or audio-visual data file is provided by a website."

166. Dependent claim 7 is substantially similar, for purposes of my Declaration, to claim 2. A side-by-side listing of claims 2 and 7 is shown in the table below (with common or overlapping language shown in underlining):

Dependent Claim 7	Dependent Claim 2
7. <u>The method of claim</u> 6<u>, wherein the compressed digital audio or audio-visual data file is provided by a website.</u>	2. <u>The method of claim</u> 1<u>, wherein the compressed digital audio or audio-visual data file is provided by a website.</u>

167. As shown, there is no material difference between claims 2 and 7 (other than claim dependency) that could be used to distinguish claim 7 from the prior art. For the same reasons as for claim 2, therefore, claim 7 would have been obvious in view of the prior art.

8. Dependent Claim 8: "The method of claim 6, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone."

168. Independent claim 8 is substantially similar, for purposes of my Declaration, to claim 3. A side-by-side listing of claims 3 and 8 is shown in the table below (with common or overlapping language shown in underlining):

Dependent Claim 8	Dependent Claim 3
8. The method of claim 6, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone.	3. The method of claim 1, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone.

169. As shown, there is no material difference between claims 3 and 8 (other than claim dependency) that could be used to distinguish claim 8 from the prior art. For the same reasons as for claim 3, therefore, claim 8 would have been obvious in view of the prior art.

9. Dependent Claim 9: "The method of claim 6, further comprising optimizing the digital audio or audio-visual data file according to an optimization scheme."

170. Dependent claim 9 is substantially similar, for purposes of my Declaration, to claim 4. A side-by-side listing of claims 4 and 9 is shown in the table below (with common or overlapping language shown in underlining):

Dependent Claim 9	Dependent Claim 4
9. The method of claim 6, further comprising optimizing the digital audio or audio-visual data file according to an optimization scheme.	4. The method of claim 1, further comprising optimizing the digital audio or audio-visual data file according to an optimization scheme.

171. As shown, there is no material difference between claims 4 and 9 (other than claim dependency) that could be used to distinguish claim 9 from the

prior art. For the same reasons as for claim 4, therefore, claim 9 would have been obvious in view of the prior art.

10. Independent Claim 10

172. Claim 10 is similar to independent claim 1, but includes additional limitations regarding a library and a website. As a result of these differences, I analyze claim 10 independently. Claim 10 reads:

> 10. A method of wirelessly delivering compressed digital audio or audio-visual data files to a cell phone, the method comprising:
>
> [a] providing a representation of a library of compressed digital audio or audio-visual data files accessible via a website or a cell phone;
>
> [b] receiving a first request from a cell phone associated with a user for the representation of a library, said cell phone including a receiver and digital signal processor configured for receiving and processing digital audio or audio-visual data files transmitted by orthogonal frequency-division multiplex modulation (OFDM);
>
> [c] associating the user of the cell phone with the representation of the library of compressed digital audio or audio-visual data files; and
>
> [d] providing for the transmission of the representation of the library of the compressed digital audio or audio-visual data files to the cell

phone by orthogonal frequency-division multiplex modulation based on the received first request;

[e] receiving a second request from the cell phone selecting at least one compressed digital audio or audio-visual data file associated with the library;

[f] providing for the transmission of the selected at least one compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received second request;

[g] receiving a request via a website to modify a portion of the representation associated with the user of the cell phone; and

[h] providing for the transmission of the modified portion of the representation of the library by orthogonal frequency-division multiplex modulation to the cell phone.

('718, 34:7-40.) Each limitation of claim 10 is disclosed and rendered obvious by Rolf in view of Forta, Gatherer, O'Hara, and Tagg.

173. As with claim 1, the preamble of claim 10 recites, "**[a] method of wirelessly delivering compressed digital audio or audio-visual data files to a**

cell phone." Assuming the preamble of claim 10 provides a claim limitation, it is fully disclosed by Rolf for the same reasons that I discussed above for claim 1.

a. "providing a representation of a library of compressed digital audio or audio-visual data files accessible via a website or a cell phone" (Claim 10[a])

174. This limitation is disclosed by and obvious over Rolf, alone or with Forta.

175. Rolf discloses "**providing a representation of a library**." As I explain below, the library in Rolf takes the form of a collection of songs associated with a particular user at central facility **14**. The central facility **14** provides a representation of that library by generating menus and song listings for transmission to the user's communication device.

176. In particular, as I discussed for claim 1 above, Rolf discloses a central facility **14** that includes a database that catalogs and stores a collection of audio or audio-visual data files, such as MP3 files. (Rolf, 5:32-39 ("The remote storage facility . . . includes a data base having a plurality of music recordings therein. Preferably, the music recordings are categorized by a plurality of selectable fields, such as 'title', 'artist', 'album or CD type', 'recording label', etc. Additionally, the music recordings are preferably encoded in an encoded format, such as MP3

(Mpeg-1 Audio layer 3).”); *see also e.g., id.*, 1:18-21, 1:25-28, 1:35-38, 5:46-53, 8:63-9:6.)

177. Rolf further discloses that the central facility **14** can include personal storage unit **16** associated with a particular user. (Rolf, 13:5-13, 2:62-67.) Rolf explains that the personal storage unit **16** “serves as a directory or index for retrieval of acquired or accumulated recordings,” such as recordings that the user has purchased. (Rolf, 2:52-57, 13:5-13 (“[T]he user can . . . enter his or her personal storage unit account for retrieval of recordings that have already been purchased.”).) The collection of recordings in a particular user’s personal storage unit **16** corresponds to the “**library**” in the claim.

178. Rolf further explains that the central facility **14** provides a representation of that library. In particular, Rolf explains that the central facility **14** includes software to “provid[e] a menu driven system” to allow a user to select a recording “via a menu or listing of recordings.” (Rolf, 9:10-15.) Rolf further makes clear that this menu-driven system is used to access a personal storage unit. (Rolf, 13:5-13 (“[T]he personal storage unit **16** . . . may be located at the remote storage facility **14**. In such an instance, when a communications link with a remote storage facility **14** is established with wireless communications device **12**, the user can select whether he or she wishes to select new recordings, or enter his or her

personal storage unit account for retrieval of recordings that have already been purchased.").) Rolf therefore discloses the step of "**providing a representation of a library**."

179. The library in Rolf is of "**compressed digital audio or audio-visual data files**." Rolf explains that the central facility **14** and personal storage unit **16** store recordings in a compressed format, such as MP3. (Rolf, 5:30-39 ("[T]he music recordings are preferably encoded in an encoded format, such as MP3 (Mpeg-1 Audio layer 3)"); *see also id.*, 9:4-6 ("[T]he music recording stored within data base memory **52** may be stored in an encoded/compressed manner, . . ."), 1:35-38 ("[T]he music recordings . . . may particularly be encoded by a compression algorithm into an encoded (such as MP3 or other) format."), 9:39-42 ("[I]t should be understood and appreciated that the encoded music received by the personal storage unit **16** may be stored in an encoded fashion . . . .").)[14] One of ordinary skill in the art would have understood that "MP3" refers to a compression technique for digital audio files. (Andy Rathbone, *MP3 for Dummies* (1999), Ex. 1062, at p. 1 ("MP3 is simply another boring, compression mechanism – a pair of

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[14] Rolf also expressly notes that its teachings with respect to music files are "applicable to recordings of other types, such as <u>video recordings</u>." (Rolf, 14:57-58 (underlining added).)

computerized vice-grips for sound. MP3 squeezes music files down to roughly one-tenth of their size while preserving their near-CD-quality sound.”).)

180. Turning to the last portion of this limitation, I note an ambiguity in the language. It is not clear whether the limitation requires that the “representation of the library,” or that the “data files,” be “**accessible via a website or a cell phone**.” As I explain below, however, Rolf in view of Forta discloses both interpretations.

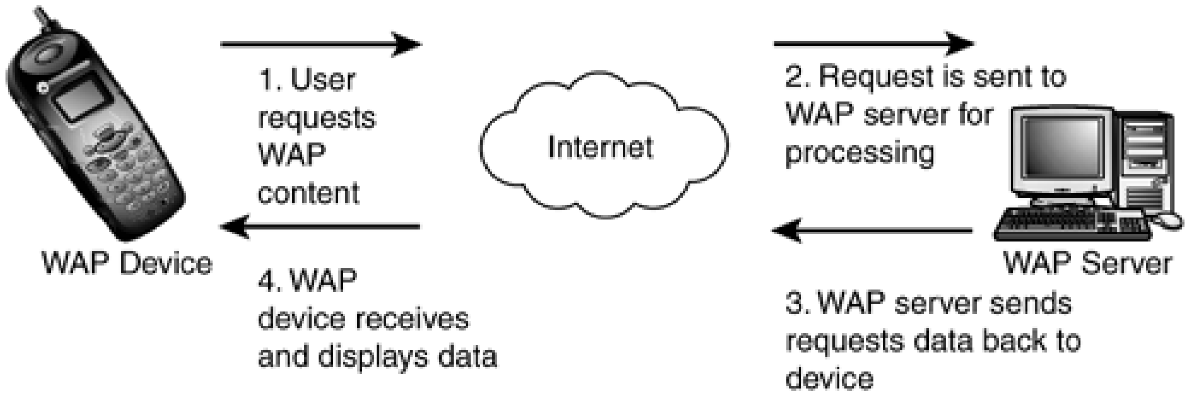
181. Rolf discloses that the “representation of the library” is “accessible via a website or a cell phone.” As I explained above, the “representation of the library” corresponds to the menu or song listing that is provided by the central facility **14**. As I explain below, Rolf (alone or with Forta) discloses that this representation is accessible via a website <u>and</u> accessible via a cell phone.

182. Rolf makes clear that this representation is accessible via a web site. As noted above for claims 1 and 2, Rolf discloses that the central facility is accessible at an address on the World Wide Web—i.e., a web site. (Rolf, 12:51-55 (“In a preferred embodiment, the facility **14** has a uniform resource locator (URL) on a global communications network (such as the <u>world-wide web</u>), and device **12** accesses the facility **14** via a server in the communications network.” (underlining added); *see also id.*, 5:32-35 (“The remote storage facility may, for example, be at an address on the <u>world wide web</u>.” (underlining added)).)

183. To the extent there is any question that Rolf alone discloses that the representation is accessible via a web site, it would have been obvious over the teachings of **Forta** for the reasons explained above for claim 2 and which I recap here.

184. As I discussed above in **Part V.A.2**, Forta describes a technique for providing websites to cell phones called "Wireless Application Protocol," or "WAP" for short. (Forta, Ex. 1004, at p. 1.) As Forta explains, "WAP is the Wireless Application Protocol, a communications protocol (based on HTTP) designed specifically for wireless communication and managed by the WAP Forum. WAP is the transport used to communicate between devices (phones initially, but other devices eventually) and servers." (*Id.*) Thus, "WAP does for wireless devices what HTTP does for Web browsers—it allows them to become clients in an Internet-based client/server world." (*Id.*, at p. 10.)

185. Forta explains that "WAP devices connect to servers to retrieve and send information in much the same way as Web browsers connect to HTTP servers." (*Id.*, at p. 11.) "If you want to serve WAP content you can install a WAP server. This is a piece of software, much like an HTTP server (and indeed, the two can usually run on the same machine)." (*Id.*) The WAP technique is generally illustrated in Figure 1.1, shown below.



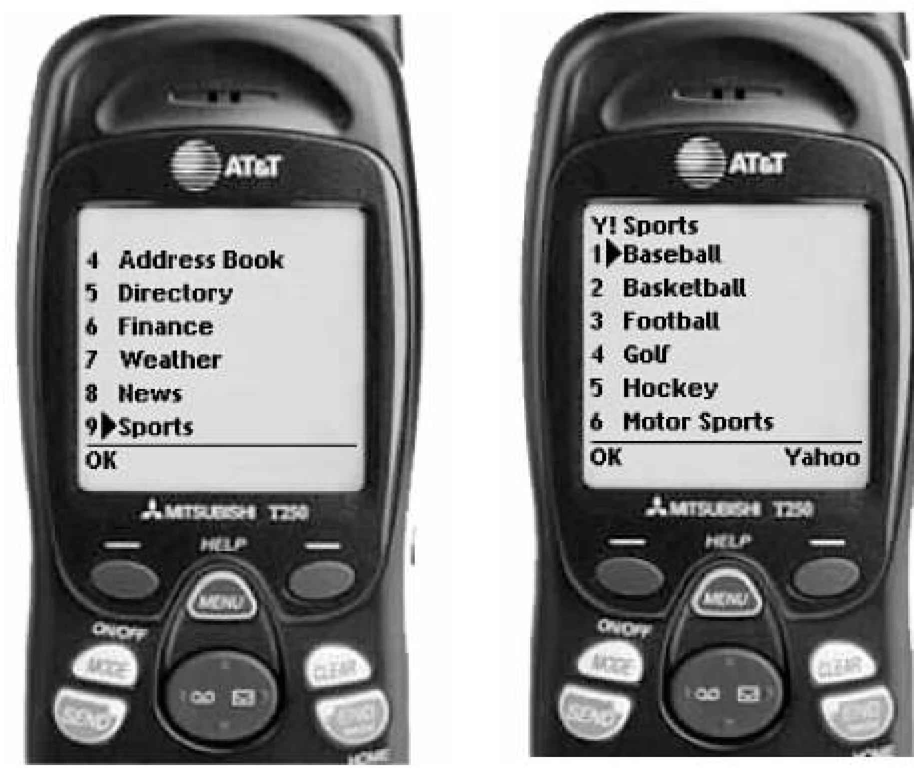
(*Id.*, Fig. 1.1.)[i15]

186. Forta discloses that using WAP, a visual interface for display can be received from a server as a WML document. (*Id.*, at pp. 40 ("WML pages—content viewed on separate screens—are called *cards* and those cards are all placed within a *deck* of related pages which constitute one single file."), 41 ("[H]ow to configure your Web server to serve WML content and how to view that content with several common devices …"); *see also id.*, at p. 21 (section on "WML's Functionality").) As Forta explains, "Wireless Markup Language (WML) is a markup language used for describing the structure of documents to be delivered to wireless devices. WML is to wireless browsers as HTML is to a browser on a desktop computer. WML was created to address the display, bandwidth, and

[15] Forta also explains that "WAP devices can request and receive data from HTTP servers via WAP gateways." (*Id.*, at p. 12; *see also id.*, Fig. 1.2.)

memory limitations of mobile and wireless devices, such as cellular phones . . . ." (*Id.*, at p. 20.)

187. Forta discloses that by the time of its publication in September 2000, well-known companies such as Amazon and Yahoo! were already using WAP to provide their websites to cell phone users. Figure 13.3 (shown at right) shows "the Amazon.com site that is written explicitly for phones with a WAP browser in them." (*Id.*, at p. 316.) Similarly, Figure 13.5 (below) shows the Yahoo! website provided to cell phones.



(*Id.*, Fig. 13.5; *see also id.*, at p. 317 ("Clearly, Yahoo! has done some considerable work here to build a powerful wireless site that works as a companion to its HTML site.").) Forta goes on to teach, in detail, the use of WAP to provide a website for mobile e-commerce. (*Id.*, at pp. 429-63 ("Chapter 18. E-Commerce").)

188. ***Rationale and Motivation to Combine***: It would have been obvious to a person of ordinary skill in the art to combine Forta with Rolf, with no change in their respective functions. The combination would have predictably resulted in a server on the World Wide Web, as disclosed in Rolf, that provides a website according to the WAP techniques of Forta.

189. One of ordinary skill in the art would have found this to be a largely trivial combination. As noted above, Rolf discloses a server on the World Wide Web accessible to cell phones, but does not appear to provide a detailed discussion of the technologies that can be used to implement that Web server. (Rolf, 5:30-35, 5:46-53, 12:49-55; *see also id.*, 5:64-66, 9:10-15.) A person of ordinary skill in the art would have found this omission insignificant in light of already known and industry standard techniques for providing websites to cell phones, such as those described in Forta. Forta provides an express motivation to combine by explaining that WAP "promises to be one of the most important protocols and standards ever developed," and stating that the Forta book is intended for any developer who "want[s] to learn how to generate content for wireless devices…." (Forta, at p. 1.)

As such, one of ordinary skill in the art would have naturally consulted Forta to ascertain the details involved in providing a website to a cell phone.

190. Forta provides several other express motivations to combine. It states that WAP and its associated technologies were "created to address the display, bandwidth, and memory limitations of mobile and wireless devices, such as cellular phones." (Forta, at p. 20.) Forta further explains that "WAP will succeed because it is being supported by almost every major hardware, software, device, data carrier, and telecom vendor. And with that kind of muscle behind a common goal, anything is possible." (*Id.*, at p. 1.) Thus, one of ordinary skill in the art would have appreciated that the WAP techniques described in Forta are particularly suitable for the cell phone in Rolf, and would have appreciated the advantages of using such a widely adopted technology, including the advantages of interoperability with other existing systems and technologies.

191. Moreover, Rolf and Forta are analogous references in the same field of wireless communication and computing. Forta's "Introduction" section explains that while "[w]ireless data communication is not a new idea, … wireless computing is becoming a reality and in ways no one could have imagined." (Forta, at p. 1.) Consistent with Forta's description, Rolf teaches a cell phone that can not only be used to communicate wirelessly, but also play music. (Rolf, 1:17-21.) The

analogous nature of these references is further confirmed by the fact that both recognized that cell phones can be used as instruments of e-commerce. Forta specifically notes that "[e]-commerce is a highly practical and exciting application for mobile users" (Forta, at p. 462), and devotes an entire chapter to this topic. (*Id.*, at pp. 429-63 ("Chapter 18. E-Commerce").) Rolf, for its part, teaches that cell phones can be used to electronically purchase products such as music and concert tickets. (Rolf, 6:53-7:23, 14:35-53.) Thus, a person of ordinary skill in the art would have understood that the two references pertain to the same technology area and are readily combinable.

192. Therefore, Rolf, alone or with Forta, discloses that the menu or listing of recordings—the "representation of the library"—is accessible via a web site.

193. Rolf also explains that the menu or listing of recordings is accessible "**via . . . a cell phone**." Rolf states that a "menu driven system" is provided "to wireless communications device **12**, such that the wireless communications device **12** can be utilized to select recording via a menu or listing of recordings." (Rolf, 9:10-15.) Rolf further makes clear that "wireless communications device **12**" may be a cell phone. (Rolf, 1:64-67 ([T]he wireless communications device is preferably a cellular communications device and, in particular, is a cellular voice communications device, such as a <u>cellular telephone</u>." (underlining added)).)

194. Therefore, Rolf, alone or with Forta, discloses and renders obvious the claim requirement that the "**representation of a library**" be "**accessible via a website or a cell phone**."

195. For many of the same reasons discussed above, Rolf also discloses that the "**data files**" are "**accessible via a website or a cell phone**."

196. Rolf, alone or with Forta, discloses that the data files are "**accessible via a website**." As explained above, Rolf teaches that the central facility is accessible at an address on the World Wide Web. (Rolf, 5:32-35, 12:51-55.) And to the extent that there is any question that Rolf alone discloses that the data files are accessible via a web site, it would have been obvious over the teachings of **Forta** for the reasons explained above.

197. Rolf also discloses that the data files are "**accessible via . . . a cell phone**." Rolf explains that a user can stream or download recordings associated with user's personal storage unit using a communications device. (Rolf, 2:62-67 ("Upon access to the personal storage account by the account holder (via a communications device), and after entry of any required passwords, the user may select one or more recordings for streaming or download, whereupon the recording(s) will be retrieved."); *see also id.*, 2:1-5 ("[T]he wireless communications device of the present invention (whether it be handheld or

installed within a vehicle) retrieves recorded music from a personal storage unit of the user.”).) Further, as explained above, Rolf makes clear that the communications device may be a cell phone. (Rolf, 1:64-67 ([T]he wireless communications device is preferably a cellular communications device and, in particular, is a cellular voice communications device, such as a <u>cellular telephone</u>.” (underlining added)).)

198. Therefore, claim 10[a] is disclosed by Rolf, alone or in view of Forta.

b. “receiving a first request from a cell phone associated with a user for the representation of a library, said cell phone including a receiver and digital signal processor configured for receiving and processing digital audio or audio-visual data files transmitted by orthogonal frequency-division multiplex modulation (OFDM)” (Claim 10[b])

199. This limitation is disclosed by and obvious over Rolf, O’Hara, Tagg, and Gatherer.

200. Rolf discloses “**receiving a first request from a cell phone associated with a user for the representation of a library**.**”** As explained above, Rolf teaches that a user can send a request to his or her personal storage unit using a cell phone in order to be provided with a menu or listing of songs that the user can download. For example, Rolf explains:

> As described, the personal storage unit **16** . . . may be located at the remote storage facility **14**. In such an instance, <u>when a</u>

> communications link with a remote storage facility **14** is established with wireless communications device **12**, the user can select whether he or she wishes to select new recordings, or enter his or her personal storage unit account for retrieval of recordings that have already been purchased.

(Rolf, 13:5-13 (underlining added); *see also id.*, 9:10-15 ("[P]rocessor **50** invokes application software for providing a menu driven system to wireless communications device **12**, such that the wireless communications device **12** can be utilized to select recording via a menu or listing of recordings."), 1:64-67 (cellular phone).) Rolf further makes clear that the cell phone is associated with a user, explaining that access to a personal storage account is associated with an account holder and may require a password. (Rolf, 2:62-67 ("Upon access to the personal storage account by the account holder (via a communications device), and after entry of any required passwords, the user may select one or more recordings for streaming or download, whereupon the recording(s) will be retrieved." (underlining added)).)

201. Claim 10[b] further recites "said cell phone including a receiver and digital signal processor configured for receiving and processing digital audio or audio-visual data files transmitted by orthogonal frequency-division multiplex modulation (OFDM)." This limitation is identical to claim 1[b]. Therefore, for the

reasons discussed above for claim 1[b], it is disclosed by and obvious over Rolf in view of **Gatherer** (digital signal processor) and **O'Hara and Tagg** (OFDM).

c. "associating the user of the cell phone with the representation of the library of compressed digital audio or audio-visual data files" (Claim 10[c])

202. Rolf discloses this limitation. As noted above, Rolf explains that a personal storage unit is associated with an account holder and a password may be required in order to access it. (Rolf, 2:62-67 ("Upon access to the personal storage account by the account holder (via a communications device), and after entry of any required passwords, the user may select one or more recordings for streaming or download, whereupon the recording(s) will be retrieved." (underlining added).)

d. "providing for the transmission of the representation of the library of the compressed digital audio or audio-visual data files to the cell phone by orthogonal frequency-division multiplex modulation based on the received first request" (Claim 10[d])

203. This limitation is disclosed by Rolf, O'Hara, and Tagg.

204. Rolf discloses "**providing for the transmission of the representation of the library of the compressed digital audio or audio-visual data files to the cell phone**." As explained above for claim 10[a], the representation of the library corresponds in Rolf to the menu or listing of recordings associated with a user's personal storage unit. (Rolf, *e.g.*, 9:10-15, 13:5-13.) Rolf explains that the central facility **14**, of which the personal storage

unit may be a part (*e.g.*, Rolf, 13:5-13), includes components to provide for the transmission of that representation. Rolf explains, for example that, "[i]n particular, a central facility **14** has a processor **50**. Connected to the processor **50** are a data base memory **52** and <u>a interface **54** (such as a transceiver or modem) for transmitting and receiving communications signals</u>." (Rolf, 8:56-59 (underlining added).)

205. Rolf does not disclose transmission "**by orthogonal frequency-division multiplex modulation**," but as explained above for claim 1[b] and 1[c], this would have been obvious in view of <u>**O'Hara**</u> and <u>**Tagg**</u>. The disclosures of O'Hara and Tagg with respect to the "orthogonal frequency-division multiplex modulation" limitation and the rationale for combining are explained at length above, and apply equally here.

206. Lastly, Rolf makes clear that the system provides for transmission of the menu or listing of recordings—the "representation of the library"—"**based on the received first request**." As explained above, Rolf explains that the user of communications device establishes the connection with the central facility. (Rolf, 12:49-51 ("In use, a user of communications device **12** may establish a communications link via the communications network with the remote storage facility **14**.").) Rolf further explains that the system presents the user with the

option to request entry into his or her personal storage unit account. (Rolf, 13:5-13 ("[T]he user can select whether he or she wishes to select new recordings, or enter his or her personal storage unit account for retrieval of recordings that have already been purchased." (underlining added)).)

e. "receiving a second request from the cell phone selecting at least one compressed digital audio or audio-visual data file associated with the library" (Claim 10[e])

207. This limitation is disclosed by Rolf. As I have already amply discussed, Rolf explains that a user may use a cell phone to select—i.e., **request**—a recording to download or stream from his or her personal storage unit. (Rolf, 1:64-67 (cellular telephone), 2:62-67 (select one or more recordings associated with personal storage account for streaming or download), 9:10-15 (select recording via menu or listing of recordings), 13:5-13 (retrieve purchased recordings from personal storage unit account).)

f. "providing for the transmission of the selected at least one compressed digital audio or audio-visual data file to the cell phone by orthogonal frequency-division multiplex modulation based on the received second request;" (Claim 10[f])

208. This limitation is disclosed by and obvious over Rolf, O'Hara and Tagg.

209. Rolf discloses "**providing for the transmission of the selected at least one compressed digital audio or audio-visual data file to the cell phone**." As I explained above for claim 10[d], Rolf explains that the central facility **14**, of which the personal storage unit may be a part (*e.g.*, Rolf, 13:5-13), includes components to provide for the transmission of data files, such as recordings encoded in MP3 format. Rolf explains, for example that, "[i]n particular, a central facility **14** has a processor **50**. Connected to the processor **50** are a data base memory **52** and a interface **54** (such as a transceiver or modem) for transmitting and receiving communications signals." (Rolf, 8:56-59 (underlining added).)

210. Rolf does not disclose transmission "**by orthogonal frequency-division multiplex modulation**," but as explained above for claim 1[b] and 1[c], this would have been obvious in view of **O'Hara** and **Tagg**. The disclosures of O'Hara and Tagg with respect to the "orthogonal frequency-division multiplex modulation" limitation and the rationale for combining are explained at length above, and apply equally here.

211. Lastly, Rolf makes clear that the system provides for transmission of a data file "**based on the received second request**." As I explained for the previous limitation, Rolf discloses that the system transmits a recording in response to a selection from a user for that recording. (Rolf, 2:62-67 (select one or more

recordings associated with personal storage account for streaming or download), 9:10-15 (select recording via menu or listing of recordings), 13:5-13 (retrieve purchased recordings from personal storage unit account).)

g. "receiving a request via a website to modify a portion of the representation associated with the user of the cell phone" (Claim 10[g])

212. This limitation is disclosed by Rolf, alone or with Forta.

213. As I explain below, Rolf and Forta teach that a user can purchase a recording through the central facility web site and add that recording to the user's personal storage unit. Rolf further teaches that doing so will accordingly modify the menu or listing of recordings associated with that user's personal storage unit, thereby disclosing this claim limitation.

214. As I discussed previously, Rolf makes clear that the system provides a menu or listing of recordings of a user's personal storage unit, which, as I explained above, corresponds to the "representation of a library" of the claim. Rolf further explains that the songs associated with the personal storage unit include purchased recordings. (Rolf, 13:5-13 ("[T]he user can . . . enter his or her personal storage unit account for retrieval of recordings that have already been purchased.").)

215. Rolf teaches that a user can request to purchase, through central facility **14**, a recording during playback. In particular, Rolf states that "a music recording stored in central facility **14** . . . may be streamed to the wireless device **12** via an established communications link." (Rolf, 6:23-26.) The recording may be associated with information that allows the user to connect to the source of the recording, such as central facility **14**, and purchase the recording. (Rolf, 11:61-12:2 ("[A] combined voice/data link may be established with the source at which the music recording is to be purchased, and the purchase may be conducted in a purely electronic fashion . . . . Preferably, such a link terminates the link with the streaming source . . . ." (underlining added)); *see also id.*, 3:64-4:3 ("[W]hen a music recording is being played at the wireless communications device, data indicative of that recording may be displayed on the display, and, additionally, a selected key on the wireless communications device may be pressed to transmit a signal to the source of the stream that the user of wireless communications device wishes to purchase the music recording.").)

216. As I explained previously for claim 10[a], Rolf, alone or with Forta, discloses that the central facility **14** may be a web site. (*E.g.*, Rolf, 12:51-55, 5:32-35.) To the extent that Rolf does not fully disclose a web site, it would have been obvious to combine Rolf and Forta, as I explained above for claim 10[a], which

would have predictably resulted in the central facility **14** of Rolf having the ability to provide for the purchase of a recording via a web site.

217. Rolf further teaches that, once purchased, the recording may be downloaded to the user's personal storage unit and later transmission to the user's communication device. (Rolf, 12:7-12 ("[T]he user can specify, either by input, or through a previously established account with the source at which the recording is being purchased, to have the music recording downloaded to a remote, personal storage unit . . . ." (underlining added)), 13:5-13 ("[T]he user can select whether he or she wishes to select new recordings, or enter his or her personal storage unit account for retrieval of recordings that have already been purchased." (underlining added)).)

218. Because, as explained above, Rolf teaches that the user accessing his or her personal storage unit is provided with a menu or listing of associated recordings, Rolf makes clear that that menu or listing—i.e., the "representation"—will be modified as a result of the addition of a new recording to the personal storage unit. Therefore, Rolf and Forta disclose and render obvious this limitation.

h. "providing for the transmission of the modified portion of the representation of the library by orthogonal frequency-division multiplex modulation to the cell phone" (Claim 10[h])

219. This limitation is disclosed by and obvious over Rolf, O'Hara, and Tagg.

220. As explained for the previous limitation, Rolf teaches that the addition of a new purchased recording to a user's personal storage unit will modify the menu or listing of recordings associated with the personal storage unit. (Rolf, 9:10-15, 12:7-12, 13:5-13.) Therefore, Rolf makes clear that when the user subsequently requests access to the personal storage unit, using, e.g., a cell phone, the modified menu or listing of recordings will be transmitted. Rolf therefore discloses "**providing for the transmission of the modified portion of the representation of the library** . . . **to the cell phone**."

221. Rolf does not disclose transmission "**by orthogonal frequency-division multiplex modulation**," but as explained above for claim 1[b] and 1[c], this would have been obvious in view of **<u>O'Hara</u>** and **<u>Tagg</u>**. The disclosures of O'Hara and Tagg with respect to the "orthogonal frequency-division multiplex modulation" limitation and the rationale for combining are explained at length above, and apply equally here.

222. Therefore, claim 10 is disclosed by and obvious over Rolf, Forta, O'Hara, Tagg, and Gatherer.

11. Dependent Claim 11: "The method of claim 10, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone."

223. Independent claim 11 is substantially similar, for purposes of my Declaration, to claim 3. A side-by-side listing of claims 3 and 11 is shown in the table below (with common or overlapping language shown in underlining):

Dependent Claim 11	Dependent Claim 3
11. The method of claim 10, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone.	3. The method of claim 1, further comprising storing at least a portion of the compressed digital audio or audio-visual data file on the cell phone.

224. As shown, there is no material difference between claims 3 and 11 (other than claim dependency) that could be used to distinguish claim 11 from the prior art. For the same reasons as for claim 3, therefore, claim 11 would have been obvious in view of the prior art.

VI. ENABLEMENT OF THE PRIOR ART

225. 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 Rolf, Forta, O'Hara, Tagg, Pinard, Gatherer, and Hacker references provide sufficient detail to enable a person of ordinary skill in the art to practice

the limitations of the claims to which they apply without undue experimentation. To begin with, I am informed that, for purposes of assessing the prior art, the disclosures in issued U.S. patents (such as Rolf, Tagg and Pinard) are presumed enabling, and that this presumption extends to claimed and unclaimed material.

226. 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 ’718 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 ’718 patent itself acknowledges that “[t]he cellular telephone **202** may be any commercially available cellular phone.” (’718, 14:34-35.) As I discussed above, commercially available cell phones were also capable of accessing the Internet and displaying web content. In fact, by June 2001 there existed industry standards for providing websites to cell phones (e.g., WAP), and well-known companies such as Amazon and Yahoo! were specifically designing their websites to be accessible to cell phones. (Forta, Ex. 1004, at pp. 314-18.)

227. Orthogonal frequency-division multiplexing (OFDM) was also a well-known transmission technology. (*See* **Part III.E**.) As I explained in **Part III.E** above, the use of OFDM in cellular systems was well known years before the ’718

patent. Indeed, as I noted, telecom heavyweights such as Ericsson and Nokia were developing technologies and systems for using OFDM in cellular networks prior to June 2001.

228. Rolf, Forta, O’Hara, Tagg, Pinard, Gatherer, and Hacker all pre-date the ’718 patent, and those references themselves treat cell phones, digital signal processors, websites, 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 to the maturity of those technologies. Additionally, IEEE 802.11 wireless networking described in O’Hara, Tagg 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.)

229. The ability to add media selection, download, and playback (including streaming) to commercially available cell phones was also known. This is confirmed by Rolf, which predates the earliest possible priority date of the ’718

patent by more than six months and claims priority to the Rolf Provisional, which in turn predates the ’718 by more than a year and a half. Rolf describes in detail a system enabling a cell phone user to wirelessly select, download, and play music, using standard equipment. (E.g., Rolf, Abstract, 1:25-42.) In my opinion, the system described in Rolf could have been implemented using well-known hardware, networking, and software techniques familiar to persons of ordinary skill in the art.

230. In short, by June 2001, each aspect of the disclosures that I have cited from Rolf, Forta, O’Hara, Tagg, Pinard, Gatherer, and Hacker 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

231. 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 '718 patent claims at issue and/or offer testimony in support of this Declaration.

232. 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 13, 2017

Respectfully submitted,

Tal Lavian
Jan 13, 2017

Tal Lavian, Ph.D.
Sunnyvale, California

EXHIBIT A

Tal Lavian, Ph.D.

http://telecommnet.com
http://cs.berkeley.edu/~tlavian
tlavian@telecommnet.com

1640 Mariani Dr.
Sunnyvale, CA 94087
(408)-209-9112

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

<u>Nortel Networks</u>, 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

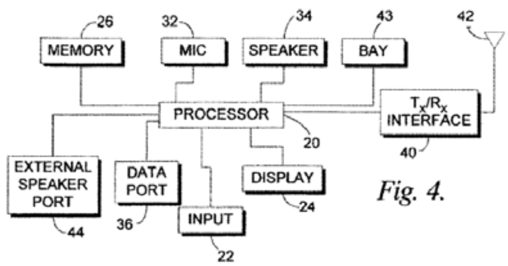
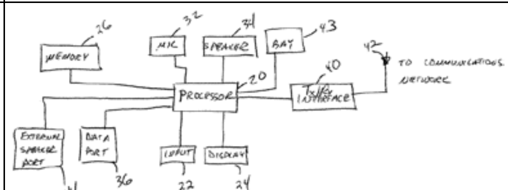
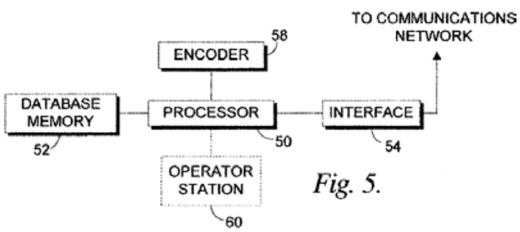
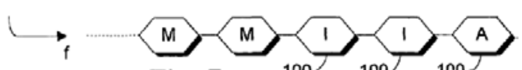
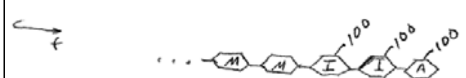
(Not an exhaustive list)

- 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?

EXHIBIT B

EXHIBIT B

Cite	Rolf	Rolf Provisional
Fig. 1	 Fig. 1.	 FIG. 1
Fig. 4	 Fig. 4.	 FIG. 4
Fig. 5	 Fig. 5.	 FIG. 5
Fig. 7a	 Fig. 7a.	 Fig 7a
1:17-21	"The present invention is generally directed to a system and method for wirelessly transmitting encoded music, via a wireless communications link, to a portable or mobile communications device which includes a player for playing the music or audio."	"The present invention is generally directed to a system and method for wirelessly transmitting encoded music, via a wireless communications link, to a portable or mobile communications device which includes a player for playing the music or audio." P. 1
1:25-38	"In one embodiment, the present invention is a system for transmitting encoded music from a remote, central facility to a wireless communications device, such as a cellular telephone or personal	"In one embodiment, the present invention is a system for transmitting encoded music from a remote, central facility to a wireless communications device, such as a cellular telephone or personal

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	digital assistant. In particular, a user of the cellular telephone (for example) may use the telephone to establish a wireless communications link with the remote, central facility, and then wirelessly download one or more selected music recordings for storage in a memory of the cellular telephone. In particular, the selected music recording(s) is/are transmitted via a wireless data communications link to the cellular telephone. Preferably, the music recordings are encoded and transmitted in packets, and may particularly be encoded by a compression algorithm into an encoded (such as MP3 or other) format."	digital assistant. In particular, a user of the cellular telephone (for example) may use the telephone to establish a wireless communications link with the remote, central facility, and then wirelessly download one or more selected music recordings for storage in a memory of the cellular telephone. In particular, the selected music recording(s) is/are transmitted via a wireless data communications link to the cellular telephone. Preferably, the music recordings are encoded and transmitted in packets, and may particularly be encoded by a compression algorithm into an encoded (such as MP3 or other) format." P. 1
1:39-42	"Using an input of the cellular telephone, a user may select one or more recordings for transmission to the cellular telephone. The selected music recordings, upon receipt by the cellular telephone, are stored in a memory."	"Using an input of the cellular telephone, a user may select one or more recordings for transmission to the cellular telephone. The selected music recordings, upon receipt by the cellular telephone, are stored in a memory." P. 1
1:64-67	"Additionally, the wireless communications device is preferably a cellular communications device and, in particular, is a cellular voice communications device, such as a cellular telephone."	"Additionally, the wireless communications device is preferably a cellular communications device and, in particular, is a cellular voice communications device, such as a cellular telephone." P. 2
2:1-6	"In accordance with yet an additional aspect of the present invention, the wireless	"In accordance with yet an additional aspect of the present invention, the wireless

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	communications device of the present invention (whether it be handheld or installed within a vehicle) retrieves recorded music from a personal storage unit of the user."	communications device of the present invention (whether it be handheld or installed within a vehicle) retrieves recorded music from a personal storage unit of the user." P. 2
2:52-57	"It should be understood that the transmittal of the recording to the personal storage account may embody transmitting only a portion of the recording, such as the title and memory (e.g., address) storage location of the recording, such that the personal storage account serves as a directory or index for retrieval of acquired or accumulated recordings."	"In accordance with an additional aspect of the present invention, information pertaining to the music recording, such as the artist, title of the recording, an album from which the recording came, the date of the recording, etc. is also transmitted with the recorded music, such that the informational data is displayed on a display of, or associated with, the wireless communications device when the particular recording is being played. Additionally, it is an aspect of the present invention that an identifier, such as a server address, associated with the remote central facility is encoded along with the transmitted data, such that a selected input on (or associated with) the wireless communications device may be pressed for automatically reconnecting with the central facility or personal storage unit." PP. 3-4 "In accordance with an aspect of the invention, information relating to a music recording is preferably transmitted along with music recording data for storage in memory 26. For example, data

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		indicative of the artist, the title of the recording, the album or CD from which the recording came, the recording label, the date of the recording, or any other desired information may be stored along with the recording at storage facility 14, and transmitted for storage in memory 26. Preferably, the informational data is stored as a header (e.g., in one or more integrally transmitted data packets) (See Fig. 1), such that processor 20 outputs the information to display 24." P. 22
2:62-67	"Upon access to the personal storage account by the account holder (via a communications device), and after entry of any required passwords, the user may select one or more recordings for streaming or download, whereupon the recording(s) will be retrieved."	"A plurality of recordings may be stored in the personal storage unit. The personal storage unit is accessible via a wireless communications link from the wireless communications device, to thereby enable the retrieval of selected music from the user's own storage facility. Additionally, such a system permits the user to easily mix recordings from a number of different recordings from his or her own storage unit." PP. 2-3 "In accordance with one aspect of the invention, personal storage unit 16 may also be a memory storage location at the central facility 14, or other remote site. In this way, a user of device 12 may have a personal account for storing pure based recordings, such that the account (e.g., personal storage unit

Cite	Rolf	Rolf Provisional
		16) is accessible via device 12 and other devices (such as a personal computer).” P. 16 “In accordance with yet an additional object of the present invention, the music recordings transmitted to the wireless communications device from the central storage facility, or from the personal storage unit of the user, may be transmitted in a real, or substantially real, time basis. In other words, rather than downloading one or more recordings to a memory within the wireless communications device, encoded music may be streamed directly from its source, for input into a buffer within the communications device, and for play at the communications device, without being otherwise stored in the device. In other words, the music is played as it is streamed from the central storage facility or personal storage unit of the user.” P. 4 “In making the purchase, the user may select whether to have the sound recording or its associated album downloaded to the wireless communications device (if memory space permits), or to a remote personal storage unit or account of the user, or to have the sound recording or album stored on a

Cite	Rolf	Rolf Provisional
		storage medium and transmitted to an address of the user by mail or courier.” PP. 5-6 “In summary, the wireless communications device may be used to download selected, encoded music recordings and played via the vehicle speakers., or to stream a real time encoded broadcast.” P. 25
3:11-12	“Additionally, it is an aspect of the present invention that an identifier, such as a server address, associated with the remote central facility is encoded along with the transmitted data...”	“Additionally, it is an aspect of the present invention that an identifier, such as a server address, associated with the remote central facility is encoded along with the transmitted data...” P. 4
3:17-21	“In preferred embodiments of the present invention, the wireless communications link established between the wireless communications device and the central facility is a cellular communications link and, more particularly, is an Internet link.”	“In preferred embodiments of the present invention, the wireless communications link established between the wireless communications device and the central facility is a cellular communications link and, more particularly, is an Internet link.” P. 4
3:64-4:3	“For example, when a music recording is being played at the wireless communications device, data indicative of that recording may be displayed on the display, and, additionally, a selected key on the wireless communications device may be pressed to transmit a signal to the source of the stream that the user of wireless communications device wishes to purchase the music recording.”	“For example, when a music recording is being played at the wireless communications device, data indicative of that recording may be displayed on the display, and, additionally, a selected key on the wireless communications device may be pressed to transmit a signal to the source of the stream that the user of wireless communications device wishes to purchase the music recording.” P.

Cite	Rolf	Rolf Provisional
		5
4:65-67	"FIG. **4** is a block diagram of a conventional wireless communications device utilized in accordance with the principles of the present invention;"	"FIG. 4 is a block diagram of a conventional wireless communications device utilized in accordance with the principles of the present invention;" P. 7
5:1-2	"FIG. **5** is a block diagram of a central facility of the present invention;"	"FIG. 5 is a block diagram of a central facility of the present invention;" P. 7
5:18-22	"With reference initially to FIG. **1**, a system of the present invention for playing encoded music on a wireless communications device is denoted generally by reference numeral **10**. In particular, system **10** has a wireless communications device **12**, such as a cellular telephone."	"With reference initially to FIG. 1, a system of the present invention for playing encoded music on a wireless communications device is denoted generally by reference numeral 10. In particular, system 10 has a wireless communications device 12, such as a cellular telephone." PP. 7-8
5:30-39	"A communications link may be established between wireless communications device **12** and a remote storage facility, denoted by reference numeral **14**. The remote storage facility may, for example, be at an address on the world wide web, and includes a data base having a plurality of music recordings therein. Preferably, the music recordings are categorized by a plurality of selectable fields, such as 'title', 'artist', 'album or CD type', 'recording label', etc. Additionally, the music recordings are preferably encoded in an encoded format, such as MP3 (Mpeg-1 Audio layer 3)."	"A communications link may be established between wireless communications device 12 and a remote storage facility, denoted by reference numeral 14. The remote storage facility may, for example, be at an address on the world wide web, and includes a data base having a plurality of music recordings therein. Preferably, the music recordings are categorized by a plurality of selectable fields, such as 'title', 'artist', 'album or CD type', 'recording label', etc. Additionally, the music recordings are preferably encoded in an encoded format, such as MP3 (Mpeg-1 Audio layer 3)." P. 8

Cite	Rolf	Rolf Provisional
5:46-53	"As will become apparent from the detailed discussion below, the wireless communications device **12** may be utilized to establish a communications link with the remote storage facility **14**. Then, using a keypad and input on the wireless communications device, or by voice commands, one or more selected music recordings may be retrieved from the storage facility **14**, for transmission, via wireless communications link, to the device **12**."	"As will become apparent from the detailed discussion below, the wireless communications device 12 may be utilized to establish a communications link with the remote storage facility 14. Then, using a keypad and input on the wireless communications device, or by voice commands, one or more selected music recordings may be retrieved from the storage facility 14, for transmission, via wireless communications link, to the device 12." P. 8
5:63-66	"In the embodiment of the present invention illustrated in FIG. **2**, a wireless communications device **12** communicates with a central facility **14** for retrieval of one or more stored music recordings. "	"In the embodiment of the present invention illustrated in FIG. 2, a wireless communications device 12 communicates with a central facility 14 for retrieval of one or more stored music recordings. " P. 9
6:20-30	"In accordance with yet an additional aspect of the invention, a music recording desired to be played on wireless communications device **12** need not be fully stored within the device **12**. In this regard, for example, a music recording stored in central facility **14** or personal storage unit **16** may be streamed to the wireless device **12** via an established communications link. In such an instance, data packets are streamed through a buffer for play by a player each of which are in a memory **26** (see FIG. **4**), such that, as one data	"In accordance with yet an additional aspect of the invention, a music recording desired to be played on wireless communications device 12 need not be fully stored within the device 12. In this regard, for example, a music recording stored in central facility 14 or personal storage unit 16 may be streamed to the wireless device 12 via an established communications link. In such an instance, data packets are streamed through a buffer for play by a player each of which are in a memory 26 (see FIG. 4), such that, as one data

Cite	Rolf	Rolf Provisional
	packet is played within the buffer, and then exits the buffer, an additional data packet is streamed into the buffer."	packet is played within the buffer, and then exits the buffer, an additional data packet is streamed into the buffer." PP. 9-10
6:53-7:7	"In accordance with a particular aspect of the present invention, at least a portion of that informational data is associated with a selected input on communications device **12**, such that upon activation of the input, the user of communications device **12** may order (for purchase) an authorized copy of the recording, or the album upon which the recording is placed. In this regard, upon activation of the key associated with the informational data, in one embodiment, while pressing the key associated with the selected information, data indicating that the user desires to make a purchase is transmitted to the station/source **17** or other facility. It should also be understood that the informational data may be retained at the server which is sourcing the recording, such that activation of a selected input causes a signal to be transmitted to the server, the receipt of which is matched with the information pertaining to the recording being transmitted. In any case, the purchase can be effected via the station/source **17** or other site, such as indicated by music storage source **19**, either through appropriate inputs on the	"In accordance with a particular aspect of the present invention, at least a portion of that informational data is associated with a selected input on communications device 12, such that upon activation of the input, the user of communications device 12 may order (for purchase) an authorized copy of the recording, or the album upon which the recording is placed. In this regard, upon activation of the key associated with the informational data, in one embodiment, while pressing the key associated with the selected information, data indicating that the user desires to make a purchase is transmitted to the station/source 17 or other facility. It should also be understood that the informational data may be retained at the server which is sourcing the recording, such that activation of a selected input causes a signal to be transmitted to the server, the receipt of which is matched with the information pertaining to the recording being transmitted. In any case, the purchase can be effected via the station/source 17 or other site, such as indicated by music storage source 19, either through appropriate inputs on the

Cite	Rolf	Rolf Provisional
	communications device **12**, or by establishment of a voice communications link with the central facility **14**."	communications device 12, or by establishment of a voice communications link with the central facility 14." PP. 10-11
7:8-18	"In addition to the user having a choice of whether to buy the single being played, or the entire album on which the single is located, the user also has the opportunity to select the manner in which the purchased recording or album will be distributed to the user. For example, the purchased recording or album may be downloaded to the wireless communications device **12** (if memory space suffices) or, alternatively, may be downloaded to the user's personal storage unit **16**. Alternatively, the user can select to have a storage medium upon which the music is recorded (such as a CD, for example) mailed to a selected address of the user."	"In addition to the user having a choice of whether to buy the single being played, or the entire album on which the single is located, the user also has the opportunity to select the manner in which the purchased recording or album will be distributed to the user. For example, the purchased recording or album may be downloaded to the wireless communications device 12 (if memory space suffices) or, alternatively, may be downloaded to the user's personal storage unit 16. Alternatively, the user can select to have a storage medium upon which the music is recorded (such as a CD, for example) mailed to a selected address of the user." P. 11
7:19-23	"Accordingly, the present invention provides a very unique feature for the distribution and purchasing of music recordings, by allowing an individual to make a purchase of a recording and/or its associated album upon hearing the recording."	"Accordingly, the present invention provides a very unique feature for the distribution and purchasing of music recordings, by allowing an individual to make a purchase of a recording and/or its associated album upon hearing the recording." P. 11
7:49-55	"With additional reference to FIG. **4**, wireless communications device **12** has a processor **20**. Connected to processor **20** are an input (such as a keypad **22**), a display **24**, a	"With additional reference to FIG. 4, wireless communications device 12 has a processor 20. Connected to processor 20 are an input (such as a keypad 22), a display 24, a

Cite	Rolf	Rolf Provisional
	memory **26**, a microphone **32**, a speaker **34**, and a port **36**. Additionally, a DTMF encoder/decoder (or just an encoder, if desired) **38**, and a transceiver **40**, and antenna **42** are connected as shown."	memory 26, a microphone 32, a speaker 34, and a port 36. Additionally, a DTMF encoder/decoder (or just an encoder, if desired) 38, and a transceiver 40, and antenna 42 are connected as shown." P. 12
8:54-55	"With reference initially to FIG. **5**, a block diagram of the central facility **14** is illustrated and described."	"With reference initially to FIG. 5, a block diagram of the central facility 14 is illustrated and described." P. 14
8:56-9:18	"In particular, a central facility **14** has a processor **50**. Connected to the processor **50** are a data base memory **52** and a interface **54** (such as a transceiver or modem) for transmitting and receiving communications signals. In addition, the central facility **14** may also have an encoder **58** and an operator station **60**. The encoder **58** is a set of processing instructions stored in a memory for encoding music recordings stored within data base memory **52**. In particular, when wireless communications device **12** accesses the central facility **14** via the communications network for purpose of retrieving one or more selected recordings, the encoder **58** may be utilized to encode the music, according to any preferred encryption and/or compression algorithm (such as mp3, liquid audio, etc.), for transmission of the encoded recording(s) to the wireless	"In particular, a central facility 14 has a processor 50. Connected to the processor 50 are a data base memory 52 and a interface 54 (such as a transceiver or modem) for transmitting and receiving communications signals. In addition, the central facility 14 may also have an encoder 58 and an operator station 60. The encoder 58 is a set of processing instructions stored in a memory for encoding music recordings stored within data base memory 52. In particular, when wireless communications device 12 accesses the central facility 14 via the communications network for purpose of retrieving one or more selected recordings, the encoder 58 may be utilized to encode the music, according to any preferred encryption and/or compression algorithm (such as mp3, liquid audio, etc.), for transmission of the encoded recording(s) to the wireless

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	communications device **12**. Alternatively, the music recording stored within data base memory **52** may be stored in an encoded/compressed manner, such that the encoder **58** is not necessary. While the operator station **60** is not necessary, it may be provided for allowing the user of wireless communications device **12** to have a voice conversation with an operator employed at the operator station **60**. As will be appreciated, in the absence of an operator, processor **50** invokes application software for providing a menu driven system to wireless communications device **12**, such that the wireless communications device **12** can be utilized to select recording via a menu or listing of recordings. Alternatively, the central facility **14** may be equipped with a voice response system, such that an individual at wireless communications device **12** makes necessary entries/selections via voice commands."	communications device 12. Alternatively, the music recording stored within data base memory 52 may be stored in an encoded/compressed manner, such that the encoder 58 is not necessary. While the operator station 60 is not necessary, it may be provided for allowing the user of wireless communications device 12 to have a voice conversation with an operator employed at the operator station 60. As will be appreciated, in the absence of an operator, processor 50 invokes application software for providing a menu driven system to wireless communications device 12, such that the wireless communications device 12 can be utilized to select recording via a menu or listing of recordings. Alternatively, the central facility 14 may be equipped with a voice response system, such that an individual at wireless communications device 12 makes necessary entries/selections via voice commands." PP. 14-15
9:39-42	"Alternatively, it should be understood and appreciated that the encoded music received by the personal storage unit **16** may be stored in an encoded fashion, such that the decoder/encoder is unnecessary."	"Alternatively, it should be understood and appreciated that the encoded music received by the personal storage unit 16 may be stored in an encoded fashion, such that the decoder/encoder is unnecessary." PP. 15-16
10:6-20	"In particular, with reference to FIG. **7a**, data is transmitted in a	"In particular, with reference to FIG. 7 a, data is transmitted in a

Cite	Rolf	Rolf Provisional
	plurality of data packets **100**. In particular, for example, the first set of data packets, including one or more packets **100**, may include information pertaining to an identifier or address associated with a source of the streamed data. In the example of FIG. **7a**, the packet is marked with a 'A', and is an initially transmitted packet. Additional packets may contain information pertaining to a music recording being transmitted, and as illustrated in FIG. **7a**, any such packets are designated by a 'I'. The remainder of the packets include data indicative of the music recording being transmitted, and are labeled 'M'. In the example of FIG. **7a**, the address identifier and the information pertaining to the music recording are transmitted first, and thus serve as a header."	plurality of data packets 100. In particular, for example, the first set of data packets, including one or more packets 100, may include information pertaining to an identifier or address associated with a source of the streamed data. In the example of FIG. 7 a, the packet is marked with a 'A', and is an initially transmitted packet. Additional packets may contain information pertaining to a music recording being transmitted, and as illustrated in FIG. 7 a, any such packets are designated by a 'I'. The remainder of the packets include data indicative of the music recording being transmitted, and are labeled 'M'. In the example of FIG. 7a, the address identifier and the information pertaining to the music recording are transmitted first, and thus serve as a header." P. 16
10:44-48	"For example, data packets received by wireless communications device **12** are processed by processor **20**, and passed through at least one buffer."	"For example, data packets received by wireless communications device 12 are processed by processor 20, and passed through at least one buffer." P. 17
10:57-59	"As illustrated, each of the buffers **102**, **104** have corresponding buffer locations, indicated as Bdn, for streaming data packets..."	"As illustrated, each of the buffers 102, 104 have corresponding buffer locations, indicated as Bdn, for streaming data packets..." P. 17
11:48-51	"In accordance with an aspect of the present invention, data indicative of a site at which the	"In accordance with an aspect of the present invention, data indicative of a site at which the

Cite	Rolf	Rolf Provisional
	particular music recording is being played (and/or it associated album or video) can be ordered is transmitted and associated with a particular input…”	particular music recording is being played (and/or it associated album or video) can be ordered is transmitted and associated with a particular input…” P. 19
11:54-57	“Accordingly, while listening to the music recording, an individual may activate the order key and be connected with a source for ordering that particular music recording.”	“Accordingly, while listening to the music recording, an individual may activate the order key and be connected with a source for ordering that particular music recording.” P. 19
11:61-12:2	“Additionally, upon activation of the order key, either a data, a voice, or a combined voice/data link may be established with the source at which the music recording is to be purchased, and the purchase may be conducted in a purely electronic fashion, or by speaking with an operator. Preferably, such a link terminates the link with the streaming source, although terminating the initial link may not be necessary if there is sufficient bi-directional bandwidth available.”	“Additionally, upon activation of the order key, either a data, a voice, or a combined voice/data link may be established with the source at which the music recording is to be purchased, and the purchase may be conducted in a purely electronic fashion, or by speaking with an operator. Preferably, such a link terminates the link with the streaming source, although terminating the initial link may not be necessary if there is sufficient bi-directional bandwidth available.” P. 19
12:4-12	“For example, purchase may be made such that a complete copy of the sound recording (or its associated album) is downloaded to the memory **26** within wireless communications device **12**. Alternatively, the user can specify, either by input, or through a previously established account with the source at which the recording is being purchased, to have the music	“For example, purchase may be made such that a complete copy of the sound recording (or its associated album) is downloaded to the memory 26 within wireless communications device 12. Alternatively, the user can specify, either by input, or through a previously established account with the source at which the recording is being purchased, to have the music

Cite	Rolf	Rolf Provisional
	recording downloaded to a remote, personal storage unit...”	recording downloaded to a remote, personal storage unit...” PP. 19-20
12:49-55	“In use, a user of communications device **12** may establish a communications link via the communications network with the remote storage facility **14**. In a preferred embodiment, the facility **14** has a uniform resource locator (URL) on a global communications network (such as the world-wide web), and device **12** accesses the facility **14** via a server in the communications network. “	“In use, a user of communications device 12 may establish a communications link via the communications network with the remote storage facility 14. In a preferred embodiment, the facility 14 has a uniform resource locator (URL) on a global communications network (such as the world-wide web), and device 12 accesses the facility 14 via a server in the communications network. “ P. 21
13:5-13	“As described, the personal storage unit **16** may be a memory storage location at an address on the global communications network and, indeed, may be located at the remote storage facility **14**. In such an instance, when a communications link with a remote storage facility **14** is established with wireless communications device **12**, the user can select whether he or she wishes to select new recordings, or enter his or her personal storage unit account for retrieval of recordings that have already been purchased.”	“As described, the personal storage unit 16 may be a memory storage location at an address on the global communications network and, indeed, may be located at the remote storage facility 14. In such an instance, when a communications link with a remote storage facility 14 is established with wireless communications device 12, the user can select whether he or she wishes to select new recordings, or enter his or her personal storage unit account for retrieval of recordings that have already been purchased.” PP. 21-22
13:38-41	“Preferably, the informational data is stored as a header (e.g., in one or more integrally transmitted data packets) (See FIG. **1**), such that processor **20** outputs the information to display **24**.”	“Preferably, the informational data is stored as a header (e.g., in one or more integrally transmitted data packets) (See FIG. 1), such that processor 20 outputs the information to display 24.” P. 22

Cite	Rolf	Rolf Provisional
14:35-53	"However, in accordance with an additional aspect of the invention, a concert schedule of the artist or group that recorded the song being played may be accessed at the source, for the purpose of buying concert tickets. Accordingly, upon hearing a particular song, a user of communications device **12** can activate a single input and establish a communications link with a source for purchasing concert link may be a voice communications link or, alternatively, may be a voice and/or data communications link, such that the tickets may be purchased electronically. In particular, while the concert information may be available at the described source, it should be understood and appreciate that additional data may be encoded in the data stream, and associated with a different input, such that activation of a first input establishes a communications link with a first source at which the music recording may be purchased, while activation of a second input establishes a communications link with a second source at which concert tickets may be purchased."	"However, in accordance with an additional aspect of the invention, a concert schedule of the artist or group that recorded the song being played may be accessed at the source, for the purpose of buying concert tickets. Accordingly, upon hearing a particular song, a user of communications device 12 can activate a single input and establish a communications link with a source for purchasing concert link may be a voice communications link or, alternatively, may be a voice and/or data communications link, such that the tickets may be purchased electronically. In particular, while the concert information may be available at the described source, it should be understood and appreciate that additional data may be encoded in the data stream, and associated with a different input, such that activation of a first input establishes a communications link with a first source at which the music recording may be purchased, while activation of a second input establishes a communications link with a second source at which concert tickets may be purchased." PP. 24-25
14:55-58	"It should also be understood that, while the invention has been described with respect to music or sound recordings, various features of the invention are applicable to	"In particular, the data stream is a stream of data packets which are streamed through a buffer of the wireless communications device

Cite	Rolf	Rolf Provisional
	recordings of other types, such as video recordings."	for decoding and play." P. 5 "In accordance with an aspect of the present invention, data indicative of a site at which the particular music recording is being played (and/or it associated album or video) can be ordered is transmitted and associated with a particular input, as evidenced by 'order' on the display at which location is associated with a particular keypad input on the wireless communications device." P. 19

EXHIBIT C

EXHIBIT C

<table>
<tr><th>Issued Claims in Rolf</th><th>Exemplary Support in Rolf Provisional</th></tr>
<tr><td></td><td>Note: The entirety of the Rolf Provisional would have been understood by a person of ordinary skill to disclose the support for the issued claims in Rolf. I intend this chart simply to highlight exemplary portions, not to be an exhaustive mapping of all support.</td></tr>
<tr><td colspan="2">Claim 1</td></tr>
<tr><td>A system for playing prerecorded music, said system comprising:</td><td>A person of ordinary skill would have understood that the Rolf Provisional describes a system for playing music, including the ability to download and stream music for replay that has been previously recorded. See, e.g.:

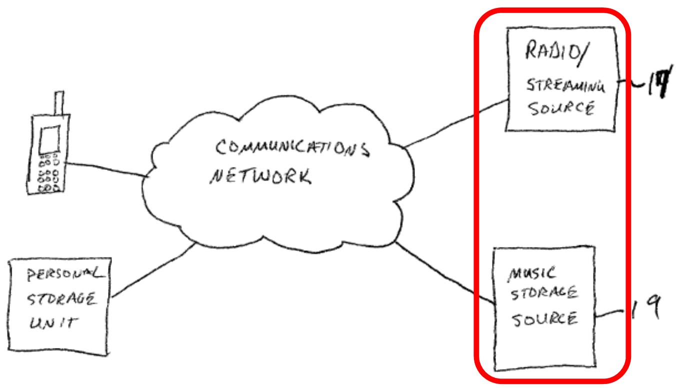


Fig. 3 (annotated). Showing two sources of prerecorded music available for download and playback.

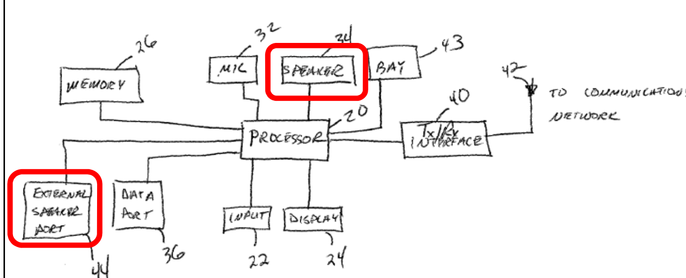
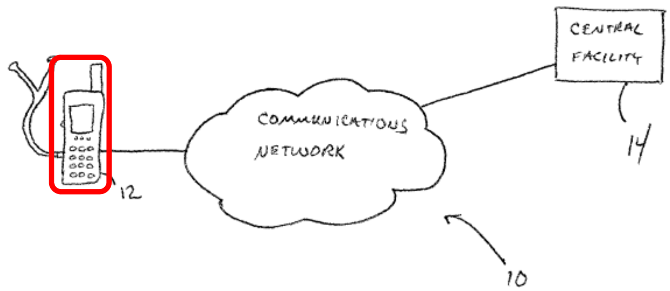
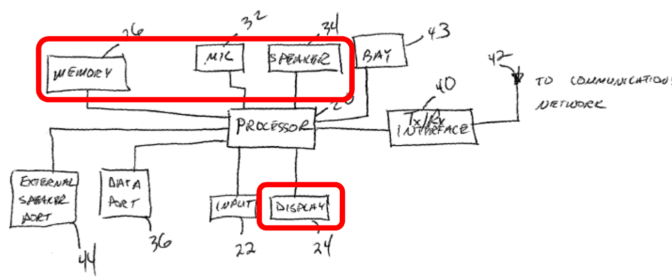
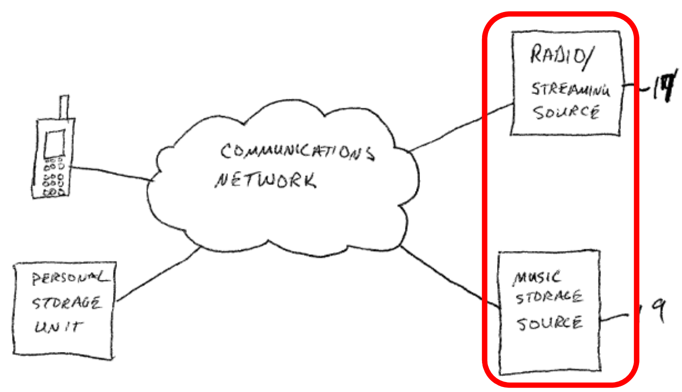


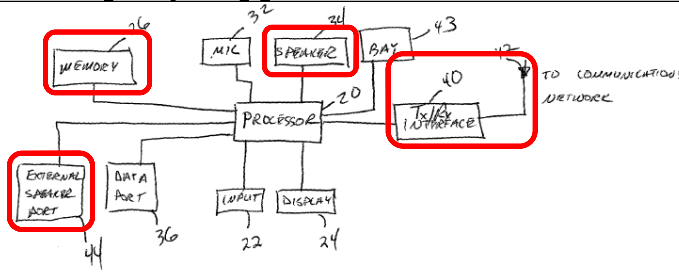
Fig. 4 (annotated). Showing the internals of a cellular phone, having both internal speaker</td></tr>
</table>

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	and external speaker port for playing prerecorded music. "The present invention is generally directed to a system and method for wirelessly transmitting encoded music, via a wireless communications link, to a portable or mobile communications device which includes a player for playing the **music or audio**." P. 1 (emphasis added). "Using an input of the cellular telephone, **a user may select one or more recordings for transmission to the cellular telephone.** The selected music recordings, upon receipt by the cellular telephone, are stored in a memory. In one embodiment, the memory is an internal memory. Alternatively, the memory may be a separate cartridge or memory stick (such as a flash memory cartridge) for movable installation in a bay on the telephone. **A player within the cellular telephone may then be initiated to play the music recordings, for output on a speaker.** In particular, the speaker may include earphones or earplugs connected to a port on the cellular telephone. Alternatively, the player may output the music through an internal speaker of the cellular telephone." PP. 1-2 (emphasis added).
a portable, handheld wireless cellular telephone having a memory, a display[,] a player, a microphone for voice communications, and a speaker; and	A person of ordinary skill would have understood that the Rolf Provisional describes a cellular telephone with the components and features claimed in this limitation. *See, e.g.*: "In particular, system 10 has a **wireless communications device 12, such as a cellular telephone**. Preferably, wireless

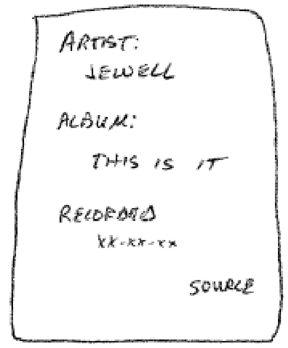
Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	communications device 12 is a digital, cellular communications device, and is **portable and handheld**.” P. 8 (emphasis added).  Fig. 1 (annotated). Showing a portable, handheld wirless cellular telephone.  Fig. 4 (annotated). Showing the internals of the cellular telephone, including a memory, a display, a microphone, and a speaker. The cellular telephone also has a player: “The present invention is generally directed to a system and method for wirelessly transmitting encoded music, via a wireless communications link, to **a portable or mobile communications device which includes a player for playing the music or audio**.” P. 1 (emphasis added). The microphone component is used to facilitate voice communication:

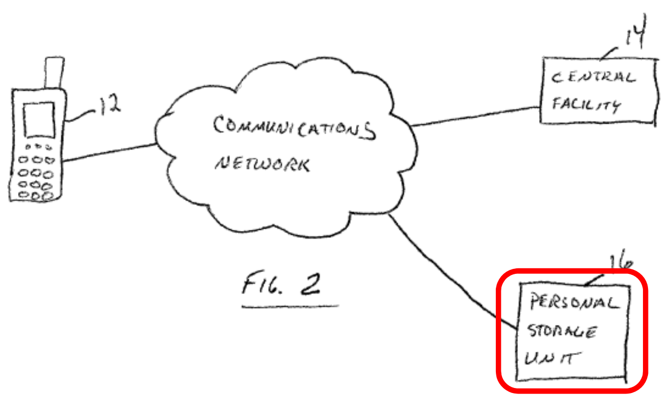
Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	"Additionally, the wireless communications device is preferably a cellular communications device and, in particular, is a **cellular voice communications device**, such as a cellular telephone." P. 9 (emphasis added). "In this regard, and in accordance with an aspect of the invention, a user of communications device 12 **may establish a communications link** with a central facility, such as storage facility 14, and utilizing inputs on the device, such as a keypad, **or a microphone (where the inputs are by voice)**, make appropriate selections for retrieving an encoded player for storage in the communications device 12." P. 13 (emphasis added). "Preferably, the wireless communications device is also a **voice communications** device, such that **voice connections** may be made with the device, as well." P. 25 (emphasis added).
a remote storage facility, wherein said remote storage facility stores a plurality of music recordings,	A person of ordinary skill would have understood that the Rolf Provisional describes a remote storage facility that stores multiple music recordings. *See, e.g.*:  Fig. 1 (annotated). Showing a central facility that is remote from the cellular telephone.

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	This is where music recordings are stored. "In use, a user of communications device 12 may establish a communications link via the communications network with the **remote storage facility 14**." P. 21 (emphasis added). The remote storage facility stores multiple music recordings:  Fig. 3 (annotated). Showing two categories of music recordings stored at the remote storage facility for both streaming and full download. "As will by now be appreciated in view of the foregoing, the communications device 12 may also be used for retrieving **one or more music recordings from a remote storage facility 14**…" P. 21 (emphasis added).
wherein said wireless cellular telephone is used to wirelessly select and retrieve from said remote storage facility at least one of said music recordings for complete storage of said music recording in said memory, and for playback through said speaker by said player,	A person of ordinary skill would have understood that the Rolf Provisional describes a wireless cellular telephone selecting and retriving at least one music recording for storage and playback on the cellular phone. *See, e.g.*:

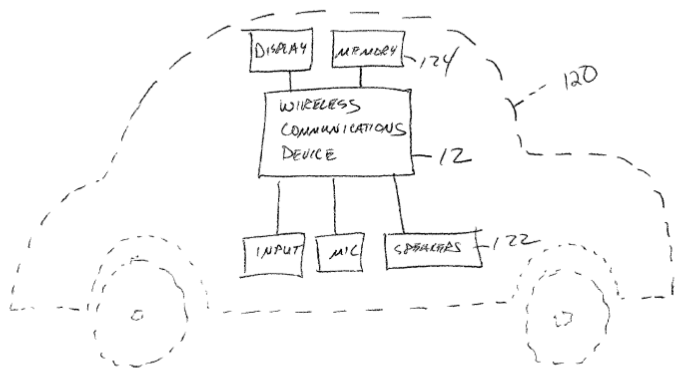
Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	 Fig. 4 (annotated). Showing the internals of the cellular telephone, including a memory where music recordings are stored, an internal speaker, an external speaker port for playback, and a wireless transciever and antenna. The cellular phone wirelessly selects and retrieves music recordings and stores them in its internal memory: "In particular, a user of the cellular telephone (for example) may use the telephone to establish a wireless communications link with the remote, central facility, and then **wirelessly download one or more selected music recordings for storage in a memory of the cellular telephone**." P. 1 (emphasis added). "**Using an input of the cellular telephone, a user may select one or more recordings for transmission to the cellular telephone**. The selected music recordings, upon receipt by the cellular 20 telephone, are **stored in a memory**." P. 1 (emphasis added). The player within the cellular telephone then plays back the music recording stored in the memory of the cellular telephone through the speaker (either internal or external):

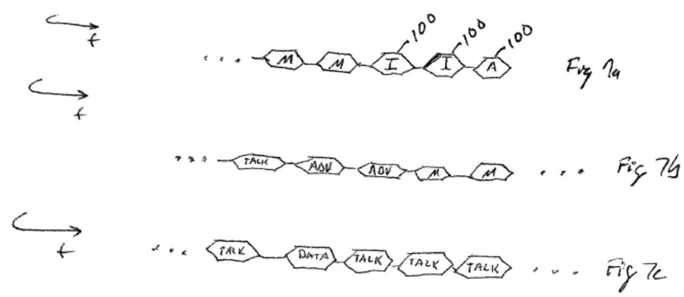
Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	"Once an encoded **music recording is stored in memory 26, or on a memory cartridge, of the wireless communications device 12**, the input 22 may be utilized to control the **player to play the recording**. In this regard, when a music recording is retrieved from memory for play, the player decodes the encoded data packet according to conventional steaming techniques in the buffer. **The player outputs the music via speaker 34** or, in the event earplugs or headphones are connected to port 44 of communications device 12, then **the music is outputted via the headphones or earplugs**." P. 22 (emphasis added).
wherein at least one of a name of an artist who recorded said selected music recording and a title of said music recording is wirelessly transmitted from said storage facility in conjunction with said music recording and is displayed on said display of said cellular telephone in conjunction with playback of said music recording, and	A person of ordinary skill would have understood that the Rolf Provisional describes transmitting artist name and title corresponding to a music recording to the cellular telephone for display during playback of the music recording. *See, e.g.*: "In accordance with an additional aspect of the present invention, **information pertaining to the music recording, such as the artist, title of the recording**, an album from which the recording came, the date of the recording, etc. **is also transmitted with the recorded music, such that the informational data is displayed on a display** of, or associated with, the wireless communications device **when the particular recording is being played**." PP. 3-4 (emphasis added).

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	 Fig. 9a. Showing a display on the user's cellular telephone of artist name and title associated with a music recording (in this case a collection of individual songs within an album by the artist Jewell).
wherein said storage facility further comprises a personal account associated with at least one of said cellular telephone and a user of said cellular telephone,	A person of ordinary skill would have understood that the Rolf Provisional describes a storage facility with personal accounts associated with particular cellular telephones and/or users. *See, e.g.*: "For example, **a user may have** a CD tower, flash memory unit, etc. in his or her home or apartment, or may have **a personal storage account at a central facility**." P. 2 (emphasis added). "The personal storage unit may comprise a personal computer or an entertainment center, including such components as a display screen (e.g., TV or information TV), stereo, speakers, etc, or as stated, **an account at a storage location**." P. 3 (emphasis added). "In accordance with one aspect of the invention, personal storage unit 16 may also be a memory storage location at the central facility 14, or other remote site. In this way, a

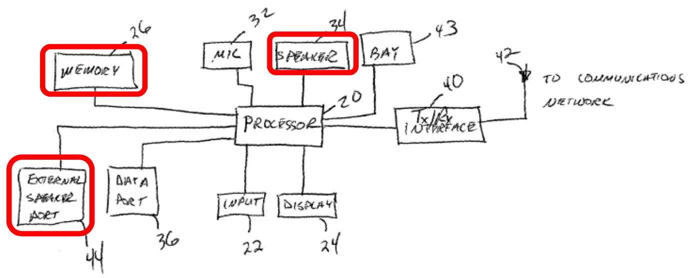
Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	user of device 12 may have a personal account for storing pure based recordings, such that the account (e.g., personal storage unit 16) is accessible via device 12 and other devices (such as a personal computer)." P. 16 (emphasis added).
wherein at least a title of said selected and retrieved music recording is stored in said personal account.	A person of ordinary skill would have understood that the Rolf Provisional describes the system storing at least a title of the selected and retrieved music recording in the personal account. *See, e.g.*: The Rolf Provisional describes embodiments where the personal account is comprised of a personal storage unit at a storage location within the central facility or another location:  FIG. 2 Fig. 2 (annotated). Showing remote personal storage unit. "**The personal storage unit may comprise** a personal computer or an entertainment center, including such components as a display screen (e.g., TV or information TV), stereo, speakers, etc, or as stated, **an account at a storage location**." P. 3 (emphasis added). "In accordance with one aspect of the

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	invention, **personal storage unit 16 may also be a memory storage location at the central facility 14, or other remote site**. In this way, a user of device 12 may have a personal account for storing pure based recordings, such that **the account (e.g., personal storage unit 16)** is accessible via device 12 and other devices (such as a personal computer).” P. 16 (emphasis added). The Rolf Provisional describes that information such as the title of a music recording is transmitted along with the music and stored together at both the storage facility and in the cellular telephone: “In accordance with an additional aspect of the present invention, information pertaining to the music recording, such as the artist, **title of the recording**, an album from which the recording came, the date of the recording, etc. is also transmitted with the recorded music…” P. 3 (emphasis added). “For example, data indicative of the artist, **the title of the recording**, the album or CD from which the recording came, the recording label, the date of the recording, or any other desired information **may be stored along with the recording at storage facility 14, and transmitted for storage in memory 26**.” P. 22 (emphasis added). A person of ordinary skill would have understood that the Rolf Provisional describes embodiments where the title of music recordings could be stored along with the music recordings themselves in a personal storage unit or personal account.

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
Claim 2	
The system as set forth in claim 1, in combination with a vehicle, wherein said wireless cellular telephone is installed in said vehicle.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 combined with and installed in a vehicle. *See, e.g.*:  Fig. 10. Showing the system described in my analysis of claim 1 above, as combined with and installed in a vehicle, in this case an automobile. "In an alternate embodiment, the wireless communications device is **utilized in combination with a vehicle**, and a player, a memory for storing the music, and at least one speaker, are **located within the vehicle, such that selected recordings may be retrieved from the remote central facility, and played in the vehicle**." P. 2 (emphasis added).
Claim 3	
The system as set forth in claim 1, wherein a selected music recording is wirelessly transmitted from said remote storage facility in data packets.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 where wireless transmission is carried out using data packets. *See, e.g.*: "In particular, the data stream is **a stream of data packets** which are streamed through a

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	buffer of the wireless communications device for decoding and play." P. 5 (emphasis added).  Figs. 7a, 7b, 7c. Showing packetization of transmissions of music recordings. "With reference now to Fig. 7, a representative example of how **data packets** are transmitted in accordance with a protocol of the present invention is illustrated. In particular, with reference to Fig. 7a, data is transmitted in a plurality of **data packets** 100." P. 16 (emphasis added).
Claim 4	
The system as set forth in claim 3, wherein said data packets are transmitted via a third generation network.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 3 where the data packets are transmitted through a third generation network. *See, e.g.*: "In preferred embodiments of the present invention, the wireless communications link established between the wireless communications device and the central facility is a cellular communications link and, more particularly, is an Internet link. In other words, the encoded music and/or informational data is preferably transmitted via a packet switch network, and particularly is preferably transmitted at transmission

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	speeds greater than 50 KHz, such as by a next- or **third-generation wireless communications network**." P. 4 (emphasis added). "In accordance with a preferred aspect of the present invention, the music recordings are encoded in **data packets for transmission via a packet switched network**. In particular, it is preferred that the wireless communications network be a next or **third generation network**, such that data transmissions are at sufficiently high speeds, and preferably greater than 50 KHz." P. 22 (emphasis added).
Claim 5	
The system as set forth in claim 1, wherein said retrieved music recording is encoded in mp3 format.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 where the music recording is encoded in mp3 format. *See, e.g.*: "Preferably, the music recordings are encoded and transmitted in packets, and may particularly be **encoded by a compression algorithm into an encoded (such as MP3 or other) format**." P. 1 (emphasis added). "Additionally, the music recordings are preferably **encoded in an encoded format, such as MP3 (Mpeg-1 Audio layer 3)**." P. 8 (emphasis added).
Claim 6	
The system as set forth in claim 1, wherein said at least one music recording stored in said memory can be played without the need to establish and maintain a communications link with said	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 where music recordings can be played without the need to establish and maintain communication links with the remote storage facility. *See, e.g.*:

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
remote storage facility.	The most obvious situation where a music recording can be played without a communications link to the remote storage facility is where the music recording was transmitted to and stored on the cellular telephone itself (i.e. not streamed). The Rolf Provisional discloses this:  Fig. 4 (annotated). Showing the internals of the cellular telephone, including an internal memory, internal speaker, and external speaker port for playback. "Once an encoded **music recording is stored in memory 26, or on a memory cartridge, of the wireless communications device 12**, the input 22 may be utilized to control the **player to play the recording**. In this regard, when a music recording is retrieved from memory for play, the player decodes the encoded data packet according to conventional steaming techniques in the buffer. **The player outputs the music via speaker 34** or, in the event earplugs or headphones are connected to port 44 of communications device 12, then **the music is outputted via the headphones or earplugs**." P. 22 (emphasis added). A person of ordinary skill would have understood from this disclosure that music

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	stored on internal memory could later be replayed without the need for a communications link to a remote storage facility.
Claim 7	
The system as set forth in claim 1, wherein said system further makes said selected and retrieved music recording available for download to a personal computer associated with a user of said cellular telephone.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 making the music recording available for download to a personal computer associated with a cellular telephone user. *See, e.g.*: The Rolf Provisional discloses an embodiment where the personal storage unit itself, which is associated with the user, is a personal computer: "**The personal storage unit may comprise a personal computer** or an entertainment center, including such components as a display screen (e.g., TV or information TV), stereo, speakers, etc, or as stated, an account at a storage location." P. 3 (emphasis added). "**In this embodiment, when a user selects one or more recordings from the central facility**, rather than the recordings being transmitted to the wireless communications unit directly via a wireless communications link, **they are rather transmitted to the personal storage unit of the user.**" P. 3 (emphasis added). The Rolf Provisional also discloses an embodiment where the personal account is accessible via a personal computer: "In accordance with one aspect of the invention, personal storage unit 16 may also

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	be a memory storage location at the central facility 14, or other remote site. In this way, a user of device 12 may have a personal account for storing pure based recordings, **such that the account (e.g., 5 personal storage unit 16) is accessible via device 12 and other devices (such as a personal computer)**." P. 16 (emphasis added). A person of ordinary skill would have understood from this disclosure that the personal computer in either embodiment could download music recordings.
Claim 8	
The system as set forth in claim 1, wherein said selected and retrieved music recording is purchased from said remote storage facility.	A person of ordinary skill would have understood that the Rolf Provisional describes the system of claim 1 where the music recording is purchased from the remote storage facility. *See, e.g.*: "Alternatively, the signal may be transmitted to a **remote music storage facility for effecting a purchase of the recording** or its associated album. In this regard, the purchase can be conducted in an electronic input mode or, alternatively, a **link may be established for transmitting voice communications to and from the source or music storage facility (as the case may be) at which the sound recording or its associated album is to be purchased**." P. 5 (emphasis added). "As such, the **purchase** can be effected via the station/source 17 or other site, such as indicated by music storage source 19, either through appropriate inputs on the communications device 12, or **by establishment of a voice communications link with the central facility 14**." P. 11

Issued Claims in Rolf	Exemplary Support in Rolf Provisional
	(emphasis added). "In such an instance, when a communications link with a **remote storage facility 14** is established with wireless communications device 12, **the user can select whether he or she wishes to select new recordings, or** enter his or her personal storage unit account **for retrieval of recordings that have already been purchased.**" PP. 21-22 (emphasis added).