

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

YAMAHA CORPORATION OF AMERICA

PETITIONER

v.

BLACK HILLS MEDIA, LLC

PATENT OWNER

CASE NO. IPR2013-00598

U.S. PATENT 8,214,873

DECLARATION OF GARETH LOY, D.M.A.

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I. INTRODUCTION AND QUALIFICATIONS

1. I have been retained by counsel for Patent Owner, Black Hills Media, LLC (“Patentee”) to provide opinions in connection with *Inter Partes* Review No. IPR2013-00598 of U.S. Patent No. 8,214,873 to Martin Weel (Ex. 1001, “the ‘873 patent”). Specifically, I have been asked to render an opinion of whether the grounds on which a trial was instituted in this proceeding render the claims at issue invalid. A current copy of my curriculum vitae is attached hereto as Exhibit A.

2. I am the President of Gareth, Inc., which provides software engineering, consulting, and litigation support to high-technology companies internationally. Gareth Inc. provides research and development services including product development, coding and documentation. Gareth Inc. also provides a wide variety of software engineering services including embedded systems, real-time systems, operating systems support and development, file systems, compilers, parallel processing systems, and digital signal processing (DSP) systems.

3. Gareth Inc. has prepared and provided compilers, interpreters and assemblers, enterprise software systems, chip architectures, software architectures, realtime operating systems, home entertainment systems, embedded systems, instruction set architectures, datasheets, databooks, user guides, and custom automated documentation systems. Technology clients have included Infineon, Philips Semiconductor, Trimedia Technologies, Equator Technologies, Pixim, Inc.,

Palm, Inc., Sonic Solutions, Sony Corporation of America, Chromatic Research, Raza Microelectronics, Cradle Technologies, Siemens Microelectronics, Zoran Corporation, Dolby Laboratories, and C-Cube Microsystems.

4. I have over 37 years of academic and professional experience in computer science, software development, embedded systems, networking, enterprise software systems, digital audio signal processing, and music technology. I received my doctorate from Stanford University in 1980, where I studied under John Chowning at the Center for Computer Research in Music and Acoustics, which was a center within the Stanford Artificial Intelligence Laboratory directed by John McCarthy at the time.

5. I was an early Apple Computer employee, having been hired there in 1979 full time while still in graduate school. I worked for Jef Raskin who reported directly to Steve Jobs, founder and CEO of Apple Computer. I left Apple in 1980 to teach at UCSD where I taught, for a decade, graduate and undergraduate courses in computer science and digital audio, and cofounded the Computer Audio Research Laboratory there.

6. I have published widely in various peer-reviewed journals, and have authored three books with the MIT Press, including Musimathics, a two-volume introduction and reference to the mathematics of music.

7. I have been a Software Architect for multiple consumer and professional products for large international electronics companies and have sustained a long and successful career at the cutting edge of software development and multimedia computing.

8. I am experienced in a variety of computer science domains, ranging from embedded systems, digital home entertainment systems, graphical user interfaces, real-time operating systems, parallel processing systems, signal processing computers, device drivers, and software for film, music, and audio. I have extensive experience in use of multiprocessor/multicore architectures to solve problems in digital audio signal processing. I have also provided expertise in compiler design, file systems, operating systems, handheld networked Personal Information Management (PIM) devices, network audio streaming systems, wireless remote control systems, digital loudspeaker systems, digital home entertainment systems, enterprise email systems, software for factory automation systems, interactive databases, enterprise software for managing of music libraries, MPEG audio compression, on-line gaming, composition systems, digital camera hardware and software, digital audio hardware and software technologies, and more.

9. I also have over seventeen years of experience as an expert witness on numerous cases. Most recently, I testified at an International Trade Commission

Investigation No. 337-TA-882 hearing involving the Weel '873 and '099 patents. I have also testified before a jury under oath, have provided Markman claim construction testimony, and have presented exhibits and Markman tutorials in federal court in trademark infringement, inequitable conduct, and patent technology litigation. I have been retained as an expert witness in such areas as software for handheld networked Personal Information Management (PIM) devices, digital music player software, enterprise email systems, software for factory automation systems, digital camera hardware and software, internet customer tracking systems, SAP billing systems, interactive databases, software for management of music libraries, Digital Audio Recording Devices (DARD), MPEG audio compression, on-line gaming, human interface design, music composition systems, MIDI systems, network audio streaming systems, rendering of 3D digital audio, and digital audio hardware and software technologies.

10. In connection with forming my opinions, I reviewed the documents listed in Exhibit B. Particularly, I analyzed the '873 patent and the art on which the trial was instituted. I also reviewed the September 19, 2013, Declaration of V. Michael Bove, Jr. ("Bove Declaration") and the Institution Decision dated March 20, 2013 ("the Institution Decision") as they relate to the grounds instituted by the Board. In addition, I also attended Dr. Bove's May 29, 2014, deposition. My opinions are set forth below. I make these statements based upon facts and matters

within my own knowledge or on information provided to me by others. All such facts and matters are true to the best of my knowledge and belief.

II. RELEVANT LEGAL STANDARDS

11. I understand from counsel that in the *inter partes* review proceeding, such as this one, the claims of a patent are construed from the perspective of one of ordinary skill in the art at the time of the claimed invention and are given their broadest reasonable construction consistent with the specification.

12. I understand that the ‘873 patent stems from an application filed on May 5, 2004. Therefore, the relevant time for both claim construction and any invalidity analysis is May 5, 2004. Based on my education, qualifications and experience, I believe that I am qualified to provide opinions about how one of ordinary skill in the art in May 2004 would have understood the prior art and the ‘873 patent.

13. It is my understanding that an invention is unpatentable if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. I further understand that obviousness is determined by evaluating: (1) the scope and content of the prior art, (2) the differences between the prior art and the claim, (3) the level of ordinary skill in the art, and (4) secondary considerations of non-obviousness. To establish

obviousness based on a combination of the elements disclosed in the prior art, it is my understanding that a petitioner must identify a specific combination that teaches all limitations and establish that a person of ordinary skill in the art at the time of the claimed invention would have found it obvious to make that combination.

14. To guard against hindsight and an unwarranted finding of obviousness, I understand that an important component of any obviousness inquiry is whether the petitioner has identified any teaching, suggestion or motivation that would have prompted a person of ordinary skill in the art to make the claimed combination and have a reasonable expectation of success in doing so. I understand that this test should not be rigidly applied, but can be an important tool to avoid the use of hindsight in the determination of obviousness.

15. I further understand that the teaching, suggestion, or motivation may be found explicitly or implicitly: (1) in the prior art; (2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or (3) from the nature of the problem to be solved. Additionally, I understand that the legal determination of the motivation to combine references allows recourse to logic, judgment, and common sense. In order to resist the temptation to read into prior art the teachings

of the invention in issue, however, it should be apparent that the expert is not conflating “common sense” and what appears obvious in hindsight.

16. I understand that if the teachings of a prior art reference would lead a person of ordinary skill in the art to make a modification that would render another prior art device inoperable, then such a modification would generally not be obvious. I also understand that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.

17. I understand that it is improper to combine references where the references teach away from their combination. I understand that a reference may be said to teach away when a person of ordinary skill in the relevant art, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In general, a reference will teach away if it suggests that the line of development flowing from the reference’s disclosure is unlikely to be productive of the result sought by the patentee. I understand that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the patentee. I also understand, however, that a reference does not teach away if it merely expresses a general preference for an alternative

invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed. Finally, I understand that dependent claims contain all of the limitations of the claims from which they depend.

III. BACKGROUND OF THE PROCEEDING

18. I understand that Yamaha Corporation of America (“Petitioner”) filed a petition requesting an *inter partes* review of claims 1, 2, 4-13, 15-31, 33-42, and 44-46 of the 873 patent. I understand that the Patent Trial and Appeals Board (the “Board”) instituted this proceeding on two grounds of obviousness as indicated in the table below.

References	Basis	Challenged Claims
Bi and Erikson	§ 103(a)	1, 2, 6-12, 15-31, 35-41, and 44-46
Bi, Erikson, and Janik ‘955	§ 103(a)	13 and 42

19. I also understand that Petitioner submitted proposed constructions for four claim terms: “identifier,” “directing the second device to receive a media item,” “download”, and “stream.” Pet. at 6-9. The Patent Owner responded to Petitioner’s proposed constructions and proposed alternative constructions for the terms. Prelim. Resp. at 8-12.

20. I further understand that the Board did not adopt the claim constructions as proposed by Petitioner and Petitioner’s expert, Dr. Bove, or as proposed by the Patentee in its preliminary response. Instead, the Board

determined that “identifier” and “directing the second device to receive a media item” are apparent in the context of the claims, and that “download” and “stream” have well-established ordinary meanings. The Board decided that these claim terms, and all other terms in the challenged claims, are to be given their ordinary and customary meaning. Inst. Decision at 9-10.

IV. DEFINITION OF THE PERSON OF SKILL IN THE ART

21. I understand that the Patentee proposed a definition of a person of ordinary skill in the art as having a bachelor’s degree in computer science or electrical engineering and one year of practical experience with networked media. I also understand that the Petitioner, on the other hand, proposed that a person of ordinary skill in the art would have *at least* a bachelor’s degree in computer science or electrical engineering and *at least one year* of practical experience. It is my opinion that the Petitioner’s definition is not correct because it is open-ended and overly expansive, and would include persons who are over qualified to be considered to have “ordinary skill in the art.” The Patentee’s definition, on the other hand, is closed-ended and more accurately reflects the qualifications and experience that a typical person of skill in the art would have had in 2004.

V. THE STATE OF THE PRIOR ART

22. I understand that the invalidity analysis starts at the relevant date of the technology at issue. As stated above, the relevant date for purposes of the ‘873 patent is the filing date of the earliest priority application, which is May 5, 2004.

23. The ‘873 patent is generally directed to accessing a playlist by a first device, for example, from a central server, and directing from the first device a second device to play selected media items off of the playlist.

24. In 2004, the primary mode of consumer digital audio media distribution was by compact discs (“CDs”), as well as by digital video disks (“DVDs”) for digital video media. (Bove Tr., Ex. 2012 at 120:5-121:19) In the early 2000’s, the availability of technology that allowed for compression of digital music and video files, for example, MPEG technology, such as MP3 for compression of audio files, began to allow convenient storage of multiple media files on a hard drive of a personal computer. Media compression provided by, for example, MPEG and MP3 standards allowed the data load on networks, storage systems, and microprocessors to be accommodated, enabling the delivery of audio and video media across networks to personal computers. Users could then download media from personal computers to handheld media players such as MP3 players. The media players could then be detached and carried portably, typically playing music via headphones.

25. At the time of invention of the '873 patent, the ability of consumers to share media files compressed via MP3 compression technology was being challenged by copyright holders. Copyright owners were concerned that, because digital media did not degrade on being copied the way analog media previously had, that copyright protections were being undermined by Internet media sharing services such as Napster. These legal battles discouraged consumer adoption of networked digital media generally, and discouraged persons of ordinary skill in the art from developing these technologies.

(See http://en.wikipedia.org/wiki/A%26M_Records,_Inc._v._Napster,_Inc. (site last visited on 6/6/2014); Ex. M¹, A&M Records, Inc. v. Napster, Inc. – Wikipedia.pdf, see especially the discussion of “Criticism and Impact”)

26. Nonetheless, since the early 2000's, advances in networking speed made file sharing more feasible. With regard to audio files, MP3 technology was utilized, for example, to copy media from a CD (i.e., “to rip the CD”) and store the media on a computer for later playback by the computer that was equipped with a sound card. For example, the Windows Media Player application available from Microsoft in 2004 could rip CDs from the CD-ROM drive of a personal computer. See, e.g., Ex. C, “Windows Media Player 9 Series, Copying music from CDs, ©

¹ Ex. A-N are the exhibits referenced in and appended to this Declaration of Gareth Loy, D.M.A.

2000-2002 Microsoft Corporation”) MP3 technology also facilitated downloading of media from servers on the Internet onto a computer, although the download speed was limited by network bandwidth available in those times.

27. Though the MP3 standard was published in 1983, it was not until the early 2000’s that MP3 began to be widely used by consumers. (Bove Tr., Ex. 2012 at 120:21-24) For example, Napster, an independent peer-to-peer file sharing service that operated between June 1999 and July 2001, allowed users to easily share their MP3 files. Portable MP3 players began to be available in the late 1990’s and early 2000’s. For example, the iPod from Apple computer was released on October 23, 2001.

(<http://www.ilounge.com/index.php/articles/comments/instant-expert-a-brief-history-of-ipod/#2004> (site last visited on 6/6/2014); Ex. E, “A Brief History of iPod.pdf,” see, e.g., p. 1 “Key Milestones in the Life of the iPod 2001”). MP3 media ripped from a CD or purchased online could be stored on a computer, and from there could be downloaded onto a portable MP3 player such as the iPod. These portable devices depended upon the services of a general-purpose computer such as a desktop or laptop personal computer to provide networking, computation, input/output ports, and bulk storage. The usage paradigm for an MP3 player, for example, was to tether it via a cable to a computer, run an application on the computer such as Microsoft Windows Media Player or Apple iTunes that accessed

a web site containing media content, and use that application to download media and playlists to the computer, and then, from the computer, to download a subset of the media to the MP3 player (limited because of the size of then-current memory technologies), which could then be detached and used portably.

28. In 2004, remote control of player devices was effected by the use of conventional optical infrared (CIR) technology, where a simple handheld device such as a dedicated remote control for a television or CD player was made up of simple circuits responsive to buttons a user would press; an infrared transmitter on the remote control would then direct a modulated infrared light beam to an infrared sensor on an associated player device communicating a simple code to control the transport mechanism or adjust the volume level of the player device.

([http://www.phidgets.com/docs/IR Remote Control Primer](http://www.phidgets.com/docs/IR_Remote_Control_Primer) (site last visited on 6/6/2014); Ex. G, “IR Remote Control Primer - Phidgets Support.pdf”)

Importantly, these simple dedicated remote controls were not provisioned to receive anything other than button presses by the person using the remote.

Specifically, they were not designed to connect to the Internet, display a device identifier, allow a user to select a displayed device, receive and display a playlist or a list of playlists, receive a media item, play a media item over speakers on the remote, and allow the user to direct the selected device to play the selected media

item by retrieving that item from a content server such that no user input was required at the player device.

29. CIR technology, introduced, as Dr. Bove points out (Bove Decl., ¶14) in the 1980's, was only designed for unidirectional transmission of individual low-bandwidth control codes from a handheld remote control to a consumer electronics device such as a TV or CD player. (<http://www.howstuffworks.com/inside-rc.htm/printable> (site last visited on 6/6/14); Ex. H, "HowStuffWorks Inside a TV Remote Control.pdf") CIR remote controls are still ubiquitous even today because of their simplicity and low cost, and because the typical usage paradigm of most media players is that the user must be in line-of-sight with (typically in the same room as) the controlled system. Optical technologies such as IrDA (Infrared Data Association) have been developed to improve data throughput and reliability (e.g., for communications between a personal computer and an IrDA mouse or keyboard), but IrDA has even shorter range than standard CIR systems (IrDA range is one meter) and are subject to the same line-of-sight restrictions as CIR devices. (<http://www.irda.org> (site last visited on 6/6/2014); Ex. I, "Welcome to IrDA.pdf"; http://en.wikipedia.org/wiki/Infrared_Data_Association (site last visited on 6/6/2014); Ex. J, "Infrared Data Association - Wikipedia, the free encyclopedia.pdf")

30. Although in 2004, a handful of networked and cellular-enabled portable devices with general purpose processors such as the Pocket PC (http://en.wikipedia.org/wiki/Pocket_PC_2002 (site last visited on 6/6/2014); Ex. K, “Pocket PC 2002 - Wikipedia, the free encyclopedia.pdf”) and the Smartphone (<http://en.wikipedia.org/wiki/Smartphone> (site last visited on 6/6/2014); Ex. L, “Smartphone - Wikipedia, the free encyclopedia.pdf”) were available, in the time frame of the ‘873 patent, wireless handheld remote control systems did not allow a mobile device to display a device identifier, allow a user to select a displayed device, receive and display a playlist, and allow the user to direct the selected device to play the selected media item by retrieving that item from a content server, or perform other capabilities of the Weel ‘873 remote. These capabilities would eventually evolve in subsequent years as the utility of such advanced mobile devices was further developed.

31. Indeed, Dr. Bove testified that he was not aware of anyone in 2004 selling a PDA (e.g., a pocket PC) that would be able to control a playback device to play a media item obtained from a content server. (Bove Tr., Ex. 2012, at 129:7-130:1. Dr. Bove was also not aware of any infrared remote (CIR) controls in 2004 that had bidirectional communication with player devices. (Bove Tr., Ex. 2012, at 130:7-12).

VI. THE '873 PATENT

32. In comparison to the prior art systems described above as well as those brought forward by Petitioner, Weel's inventions, as described in the '873 patent, dramatically changed the way users control, direct, and experience media. For example, with Weel's system, one could receive a playlist on a wireless handheld remote control directly from a playlist server via a network (Fig. 1; Bove Tr. Ex. 2012, at 138:9-17; 145:22-146:4; 163:11-164:3), and play it either directly through loudspeakers on the remote or through one's home sound system by directing the sound system to retrieve the content from a content server (Bove Tr. Ex. 2012, at 168:9-24), and one could then carry the remote (either with the received playlist in its memory, or received again at the destination) to a friend's house across town and direct the friend's sound system to play the same (or other) content from the same (or other) content server. There was no capability similar to this in May 2004.

33. Weel further envisioned an embodiment where a user need not even be within miles of the player device in order to control it if the remote control were a cell phone. ('873 at 14:25-48 and Fig. 8) In this way, the user could, for example, control playback on any system to which the user had access from any location reachable by cell phone service by utilizing a server to bridge between the cell phone network and the player system's network ('873 at 14:25-48 and Fig. 8).

For example, the user could control his/her home system or the distant friend's system, or any other to which he/she had access, from a remote third location such as an office or a car or a mountain top, so long as there is cellular service, and the cellular remote user's credentials allow access to the players. Weel's invention also provides lengthy disclosure of device discovery, user ID, and password protection that would be appropriate for such a powerful system. ('873 at 13:34-15:5) Thus, Weel invented a digital entertainment network that is "a fully integrated plug and play technology platform that delivers secure anytime, anywhere, on-demand multimedia content for digital home systems." ('873 at 7:12-15) There was no capability similar to this in May 2004.

34. Integral to Weel's entertainment network is an independent, adaptable remote control that could be used with various player devices to play various, specified media content. For example, a remote control of Weel could be used in different locations with different player devices via a network to receive playlists, select media items for playback, receive media from a content server, and play the media on the player device that the user selected. The remote control "controls a plurality of second devices, such as a television, a DVD player, and a stereo system." ('873 at 9:34-36; Bove Tr. Ex. 2012, at 172:9-14, Petitioner's expert Dr. Bove agreeing that one of ordinary skill in the art would understand that the first device in the '873 patent directs the second device to play a selected media item.)

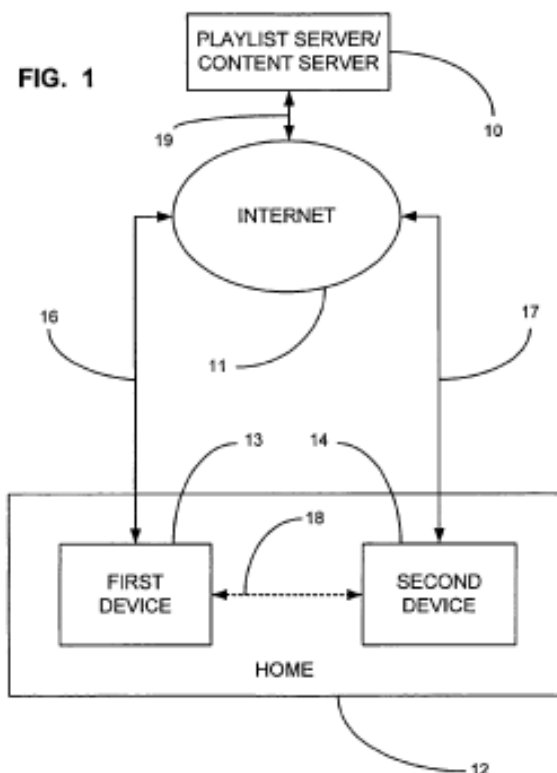
35. Furthermore, Weel's invention solved the problem of the prior art where users had "little or no control over which music selections are played." ('873 at 2:37-43)

36. Weel replaced prior art conventional content agnostic remotes (which were limited to basic operations such as selecting a previous track or next track, without specifying which particular media is referenced) with an intelligent networked remote that was capable of displaying and receiving user input with respect to player device selection as well as media item selection, and directing the player device to receive a media item identified from a content server (e.g., the Internet). Ways in which Weel's wireless handheld remote control was uniquely forward-looking additionally include at least the following features: "playlists can be requested by the remote control and downloaded from the playlist server via the Internet" ('873 at 15:32); "songs may be downloaded to the remote control" ('873 at 15:34; Bove Tr., Ex. 2012, at 165:24-166:4); "songs may be played on the remote control" ('873 at 15:35; Bove Tr., Ex. 2012, at 168:9-24); and "listening may be via one or more speakers built into the remote control" ('873 at 15:41; Bove Tr., Ex. 2012, at 168:9-24). There was no capability similar to this in May 2004.

37. Weel's invention provides for maximal efficiency and power in user experience and control of media content. It has revolutionized the user's ability to

use and interact with the media by enabling the user to control the device on which to play the media and to select a specific media item to be played from a playlist.

38. Weel gave users the power to select player devices, select playlists, and select specific media items from those playlists providing “secure anytime, anywhere, on-demand multimedia content for digital home systems.” (‘873 at 15:32-41) The result is a dramatic increase in the power provided to users to control their media experience.



39. As shown in Fig. 1 of the ‘873 patent, the architecture of the Weel inventions describes a first device 13 which acts as a controller (‘873 at 8:57-58; 9:27-29), a second device 14 which typically acts as a player device (‘873 at 9:29-32), which the first device can select with a user first input (‘873 at 11:60-67), and

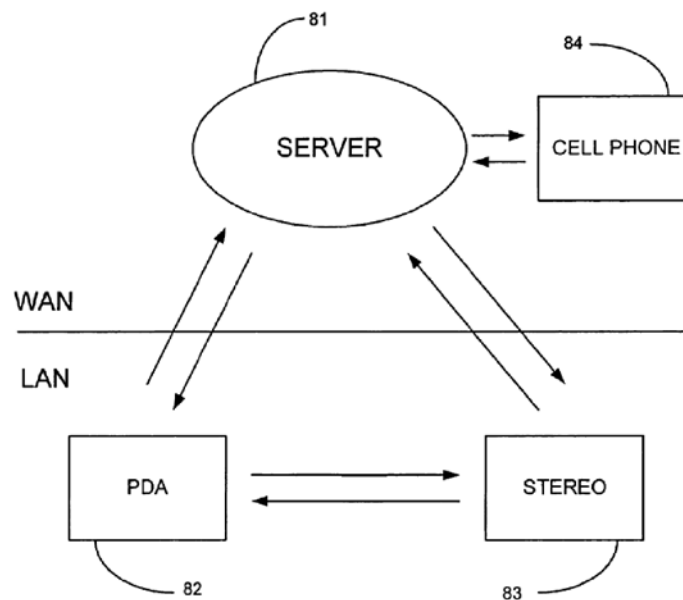
a playlist server/content server device which is in bi-directional communication with the Internet 11 as well as with the first device 13 and second device 14 (‘873 at 8:65-9:7). According to one embodiment of the invention, the first device 13 is capable of directing the second device 14 to communicate with the content server via the Internet to receive media from the content server for playback. (‘873 at Fig. 4, 4:46-60; 11:60-12:23)

40. Thus, the ‘873 patent provides for the interoperability of three classes of devices: the controller device (first device 13), player device (second device 14), and content server 10 (via the Internet 11), such that any controller device could interact with any playback device, and both of which have independent capability to contact any content provider to receive media, thereby maximizing the flexibility of the system to respond to the user’s media needs as well as the user’s location.

41. Figure 1 and the specification of the ‘873 patent illustrate and describe, respectively, all three classes of devices – the controller (first device 13), player (second device 14), and content server 10 (content provider, e.g., via the Internet 11) – as internet connected. (‘873 at 8:51-57, 8:65-9:3) Moreover, the controller (first device 13) and player (second device 14) are independent of each other in that they have the ability to independently communicate with the content server via the Internet to request and receive media content for playback. (‘873 at

8:57-59, 9:15-17, 9:55-56, etc.) Thus, unlike the conventional tethered remote controls of 2004 where a remote and a controlled device were dedicated to each other, Weel's remote control could interoperate at a high level with many player devices made, potentially, by multiple different manufacturers, so that Weel's controller was much more versatile and general purpose than the remote controls of the prior art.

FIG. 8



42. As shown in Fig. 8, a cell phone 84 could be used to control a stereo 83 via server 81 that bridges between the cellular network and a wide-area network (WAN) that further communicates with the local-area network (LAN). ('873 at 14:25-48 and Fig. 8) No tethered remote of the prior art systems envisioned the versatility of such a configuration. Further, Weel discloses device discovery, user

ID, and password protection that would be appropriate for such a powerful system.
(‘873 at 13:34-15:5)

43. In my opinion, in May 2004, the prior art did not provide a blueprint for the technology claimed in the ‘873 patent or render it obvious. Furthermore, in view of the technology background given above, it is my opinion that a person of ordinary skill in the art at the time of the invention would not have had any reason or motivation to – or indeed have been able to – jump to the insight and inventions of Mr. Weel evidenced in his patent claims. As I will demonstrate below, none of the prior art references and their combinations teach, suggest, or provide the motivation for a person of ordinary skill in the art to make the claimed inventions of the ‘873 patent and have a reasonable expectation of success in doing so.

VII. OPINION ON CLAIM CONSTRUCTION OF THE TERM “PLAYLIST” OF THE ‘873 PATENT

44. I understand that in an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear.

45. I understand that the Board has interpreted the term “playlist” in the related patent to the ‘873, U.S. Patent 8,230,099, subject of IPR2013-00597, to mean “a list of media selections.” (IPR2013-00597, Paper 15, p. 9) The term “playlist” also appears in the ‘873 patent and particularly in claims 1, 17, 23, 25-27, 30 and 46. I believe that the Board’s interpretation of the term “playlist” is not

consistent with both its plain and ordinary meaning and its broadest reasonable construction in light of the specification of the ‘873 patent.

46. A playlist is not merely “a list of media selections,” but, consistent with how a person of ordinary skill in the art would use and understand the term in the context of the ‘873 patent, the term “playlist” means “a list of media items arranged to be played in a sequence.” For example, the Broadcast Dictionary, published online by the Broadcast Educators, LLC, defines the term playlist as “A list of clips to be played in order.”

(<http://dictionary.broadcasteducators.com/sections/p> (site last visited on 6/6/2014);

Ex. F, “P | Broadcast Dictionary.pdf”)

47. The ‘873 patent uses the term “playlist” throughout the specification and the claims in the context of displaying playlist names, selecting a playlist name, receiving the playlist, selecting a song from a playlist, playing the song, the songs could be played in random order or in the order selected, or in some other desired order. (‘873 at 2:41-58, claims 13 and 42, etc.). The specification states that:

Selecting at least one song from a the playlist optionally comprises selecting a plurality of songs from the playlist and playing the selected song(s) then comprises playing the plurality of songs. The songs may be played in the order selected, in random order, or in any other desired order.

(‘873 at 3:20-24) This passage from the ‘873 specification connotes, that the songs in a playlist are arranged in an order; the songs could be played in random order or in the order selected, or in some other desired order.

48. Consistent with how a person of ordinary skill in the art would understand the term “playlist” in 2004, Petitioner’s expert, Dr. Bove, appropriately agreed at his deposition that a playlist is a list of items arranged in an order, explaining that “being a list, items on a list are in an order.” (Bove Tr., Ex. 2012, at 294:2-25; see also 295:1-10; 221:14-21; 215:1-4 (stating that a playlist, “by virtue of it being a list, the items appear in an order”; 215:20-216:2 (stating that “I think the plain meaning of ‘list’ implies that there is an order in which items appear. That makes it a list.”))

49. In response to the question from counsel whether there is a difference between a list of media items and a playlist of media items, Dr. Bove explained that the only critical difference is that a “playlist implies that a piece of software would be able to do something with it,” and a “list of media items” could be written on a piece of paper but it could not be played “unless it had been converted to a machinery to perform.” (Bove Tr. Ex. 2012, at 216:3-13) I agree with Dr. Bove that the only difference between the playlist and a list is the presence of software/machine that would play the playlist, and believe it is consistent with the understanding by a person of ordinary skill in the art in 2004.

50. Dr. Bove also agreed that a playlist is a list of items designed to be played, stating that the “items on the list are intended to be played or at least potentially played. So one could select one or some other subset thereof and play those individual items rather than playing the entire list.” (Bove Tr., Ex. 2012, at 216:23-217:7) I agree with Dr. Bove that a playlist is a list of items designed to be played, and believe it is consistent with the understanding by a person of ordinary skill in the art in 2004.

51. Dr. Bove also conceded that the items in a playlist are played in a sequence unless the user selects a different order: “commonly a user interface would provide the ability to play the items in the sequence in which they appear, as well as playing them potentially in some other order or selecting some subset and playing the subset.” (Bove Tr., Ex. 2012, at 217:21-218:4) I believe that a person of ordinary skill in the art in 2004 would have known and understood that the items in a playlist are played in a sequence by the machine unless a user directs the machine to play the playlist in some other order.

52. Thus, consistent with the specification of the ‘873 patent, and as consistent with Dr. Bove’s testimony, it is my opinion that the term “playlist” means “a list of media items arranged to be played in a sequence.”

VIII. THE PRIOR ART OF THE INSTITUTED GROUNDS

53. In this section of my declaration, I provide an overview of the prior art on which the review was instituted. Namely, as described in more detail below, the prior art by Bi, Erekson, and Janik.

A. United States Patent Application 2002/0087996 to Bi

54. United States Patent Application 2002/0087996, titled “Interactive Remote Control Of Audio Or Video Playback And Selections,” (Ex. 1012, “Bi”), was filed on November 6, 2001, and stems from a provisional application filed on November 10, 2000.

55. Bi attempts to “provide a system which enables digital content, such as Internet-based or digital audio to be played, for example, on an analog radio without tying up a personal computer.” (Bi at 0006). To that end, Bi discloses a remote control of an audio or video playback application running on a personal computer or other computing platform. (Bi at 0007)

56. The remote control of Bi (referred to as the “navigator 260” in Bi) is dedicated to the computing platform running on a personal computer. (Bove Tr., Ex. 2012, at 174:23-177:6, (Petitioner’s expert, Dr. Bove, testifying that Bi’s navigator communicates with an audio/video player application 151 running on computing platform 100; that Bi’s navigator does not directly communicate with

either the data server or the Internet and has to direct the computing platform 100 to communicate with the data server or the Internet.))

57. Indeed, consistent with claim 1 of Bi, Bi's system is comprised of three components: a computing platform, a digital content player application, and a remote control:

1. A system for controlling playback of digital content, the system comprising:

a computing platform including playback hardware for converting said digital content to audio signals for playback by an analog playback device;

a digital content player application, resident on said computing platform, for playback of said digital content; and

a remote control device for communicating with said computing platform over a predetermined communication link and controlling said digital content playback application.

(Emphasis added)

58. The high-level architecture of Bi's system is shown in Figure 1, where we see in principal part a data server 102 containing digital audio or video data 103, Internet or other computer network 101, a computing platform 100 (e.g., a PC) which communicates with the data server 102 via the Internet 101 and runs an audio or video player application 151, and a navigator 260 (which is an "interactive remote control device"). Consistent with Dr. Bove's testimony and as shown in Fig. 1 of Bi, it is my opinion that a person of ordinary skill in the art

would understand reading Bi that the navigator 260 communicates with the computing platform 100 but cannot directly access or communicate with the data server 102. (Bove Tr., Ex. 2012 at 174:23-177:6) It is my opinion, and Dr. Bove so confirmed at his deposition (Bove Tr., Ex. 2012 at 180:9-13), that Bi does not provide any motivation to a person of ordinary skill in the art in 2004 to redesign Bi's navigator so as to enable it to communicate with the data server 102. Erikson, as explained in more detail below does not provide any such motivation either.

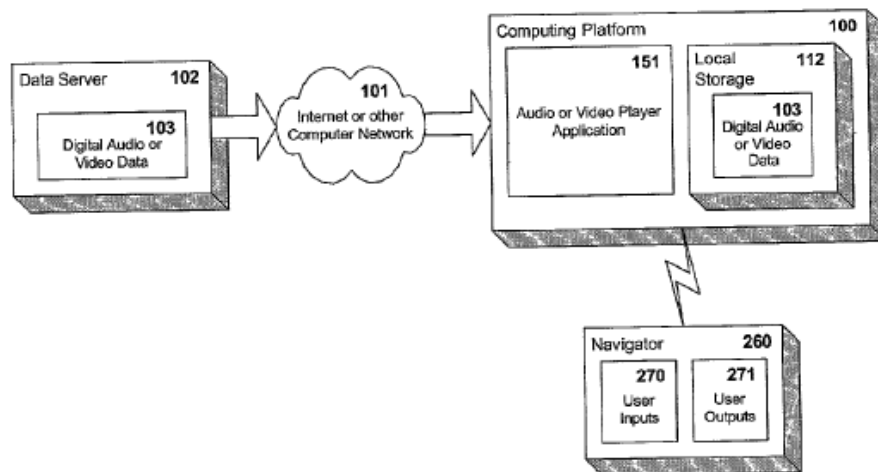


Figure 1

59. A person of ordinary skill in the art would understand that Bi discloses that the computing platform 100 communicates with the navigator 260 via an audio or video player application 151 running on a computing platform 100, where the communication “may be either wired or wireless.” (Bi at [0018]) The

navigator control manager 154 running on the computing platform 100 takes user inputs (such as buttons, dials, and touch screens) from navigator user controls 264 via a wireless data communications interface 269. (Fig. 2; [0020] and [0030])

60. The commands that the computing platform 100 can receive from the navigator 260, and the actions that the computing platform 100 can execute in response are shown in Figure 7 and disclosed in paragraphs [0031] and [0032]. Likewise, the commands that the navigator can receive from the computing platform, and the actions that the navigator can execute in response, are shown in Figure 8 and disclosed in paragraphs [0033] and [0034].

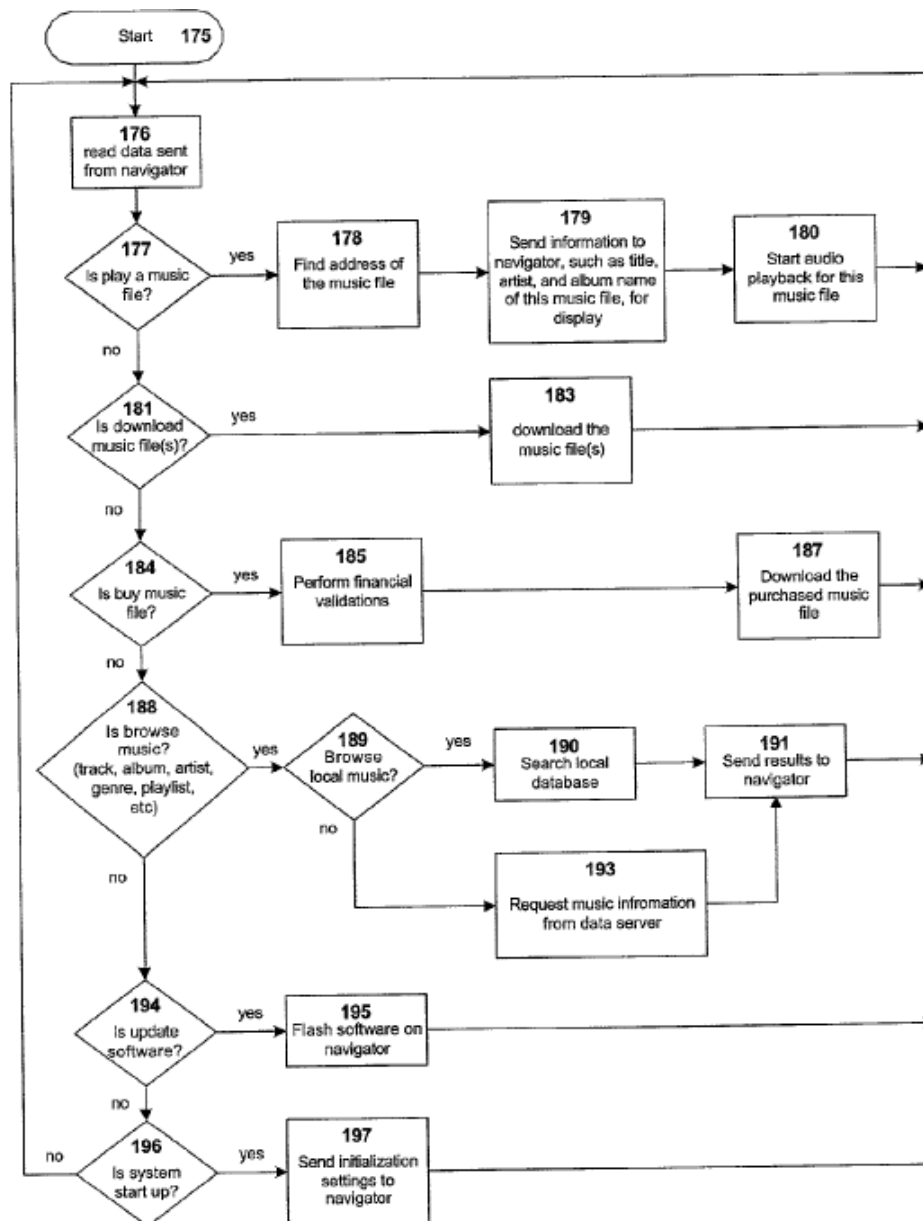


Figure 7

61. According to Figure 7, the navigator control manager 154 reads data sent from the navigator 260 and interprets the data as one of the following six commands:

- (1) “play a music file” 177
- (2) “download music file(s)” 181

- (3) “buy music file” 184
- (4) “browse music” 188
- (5) “update software” 194
- (6) “system start up” 196

62. With respect to the “play music file” command 177, a person of ordinary skill in the art reading Bi in 2004 would understand that if the navigator control manager 260 receives a “play a music file” command 177, it finds the “address of the music file” 178 and then it sends “information to the navigator 260 in step 179, such as the music title, the artist, and the album name for display”, and then it starts step 180 consisting of “audio playback.”

63. A person of ordinary skill in the art reading Bi in 2004 would further understand that, according to Figure 7, if the navigator control manager 154 running on the computing platform receives a “browse music” command 188, it looks to see if it is a command to “browse local music”; if yes, it searches local database 190 and then sends results to navigator 191; if no, it requests music information from data server 193 and then sends results to the navigator. (Bi at [0032])

64. Figure 5 of Bi shows the architecture of the navigator 260 (remote control). A person of ordinary skill in the art reading Bi in 2004 would understand that the navigator 260 contains a processor 261, a wireless data communications

interface 269, and an IR transmitter 265, as well as other components as illustrated in Figure 5.

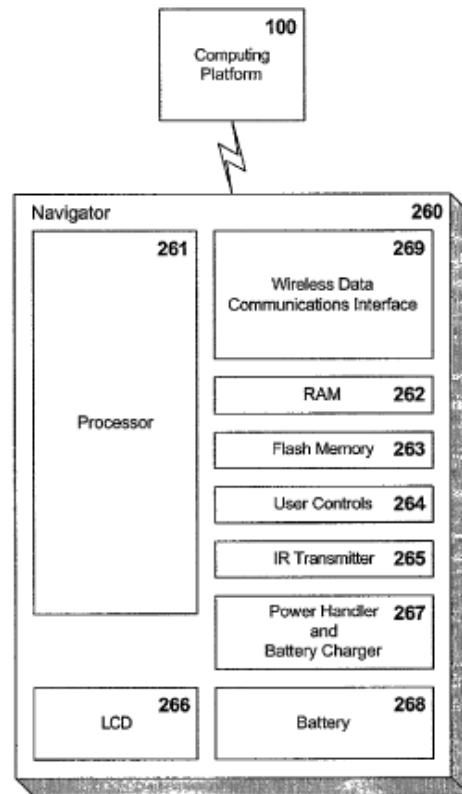


Figure 5

65. A person of ordinary skill in the art reading Bi in 2004 would understand that the processor 261 “handles the data communications with the wireless data communications interface 269... and takes user inputs 270 from the user controls 264, which are typically buttons and dials, and sends this information to the wireless data communications interface 269 for wireless transmission to the computing platform 100 and eventually back to the audio or video player application 151 running on the computing platform 100.” (Bi at [0028])

66. According to Bi, the wireless data communications interface 269 could be “a Bluetooth, HomeRF, or IEEE 802.11 interface.” (Bi at [0028]) A person of ordinary skill in the art reading Bi in 2004 would understand that the wireless data communications interface 269 on the navigator 260 is not capable of communicating directly with the Data Server 102 or the Internet 101. (Bove Tr., Ex. 2012, at 176:14-177:17, Dr. Bove agreeing that Bi discloses “only wireless data communication to computing platform 100”) Thus, a person of ordinary skill in the art reading Bi in 2004 would understand that the navigator 260, therefore, is merely an extension of the computing platform 100, whose sole function is “*for communicating with said computing platform over a predetermined communication link and controlling said digital content playback application.*” (Bi, claim 1) Importantly, the navigator 260 is an extension of the computing platform because (1) the navigator 260 cannot itself obtain content from the data server 102 or the Internet 101 since Bi does not provide for the navigator to communicate directly with the Internet/data server; (2) even if the navigator 260 were to communicate with the Internet/data server, Bi does not disclose or suggest storing media content on the navigator 260 (the flash memory 263 on the navigator is for storing programs and data to be used by the navigator system to manage communications with the computing platform); and (3) since Bi does not describe that the navigator 260 stores any media content (Bi also does not suggest that such

ability would be beneficial), Bi also does not describe or suggest that the navigator share media content with the computing platform 100. In my opinion, a person of ordinary skill in the art would understand Bi to disclose a simple passive relationship where the navigator 260 is a surrogate of the computer platform and has no independence from it.

67. I agree with the testimony of the Petitioner's expert's, Dr. Bove, that Bi does not disclose or provide for any motivation to a person of ordinary skill in the art to enable the navigator 260 of Bi to connect directly to the Internet 101 or the data server 102. (Bove Tr., Ex. 2012, at 180:9-13)

68. Furthermore, as admitted by the Petitioner's expert, Dr. Bove, "the Bi reference does not disclose selection and control of multiple devices on the display." Bove. Decl. at 27. I agree with Dr. Bove's opinion and believe that a person of ordinary skill in the art in 2004 would also understand that Bi did not envision displaying on the navigator 260 multiple playback devices from which a user could select at least one device for playback.

69. A person of ordinary skill in the art reading Bi in 2004 would understand that the navigator 260 contains an IR transmitter 265 that "allows the navigator 260 to control audio playback equipment, such as a stereo." (Bi at [0029]; Bove Tr., Ex. 2012, at 284:9-13)

70. In Bi, the “processor 261 controls an infrared LED, or IR transmitter, 265 that is used to control audio or video playback devices, such as a stereo or television, that support infrared control.” (Bi at [0036]) Thus, a person of ordinary skill in the art reading Bi in 2004 would understand that the navigator 260 of Bi can communicate both (1) wirelessly, with the computing platform 100 via the Bluetooth, HomeRF, or IEEE802.11 interface and (2) optically, using an IR transmitter, with analog playback devices that support such communication. (Bi at [0028] and [0036]).

B. United States Patent 6,622,018 to Erikson

71. United States Patent 6,622,018 to Rich Erikson, is titled “Portable Device Control Console With Wireless Connection” (“Erikson,” Exhibit 1013) and was filed on April 24, 2000. In the “Technical Field”, Erikson states, “The present invention relates to systems and devices connected using wireless links, such as systems and devices that use the Bluetooth technology. In particular, the present invention pertains to a method and system for controlling remote devices over a wireless connection.” (Erikson at 1:6-10)

72. In the “Background Art” section, Erikson points out the large “number of devices and appliances in the typical living room or family room of a residential dwelling” including “lamps, light switches, a thermostat, and consumer electronic devices such as televisions, video cassette recorders, and stereos”.

(Erekson at 1:14-18) “Each of these devices requires manual interaction by a user in order to turn them off or on, to raise or lower levels, and so on.” (Erekson, 1:20-22) Altogether, there are “countless devices and appliances that require manual interaction in order to use and control...” (Erekson, 1:24-25)

73. Erekson addresses the “associated shortcomings” of remote control devices, such as requiring a “separate remote control device” for each device. (Erekson at 1:31) Erekson criticizes “universal remotes” because they “often do not have the resources” to work with all devices, may not be capable of “controlling a new device,” and may be “difficult to use.” (Erekson at 1:31-43) Erekson criticizes wired remotes as having “a number of shortcomings” including being “cumbersome” and “complex”, as well as “difficult and expensive to backfit.” (Erekson at 1:53-64) Erekson also criticizes the “limited range” of infrared remote controls: “... the remotes can only be used for line-of-sight applications. Devices behind an object, around a corner, or in another room cannot be controlled if they are not in the line of sight of an infrared remote.” (Erekson at 1:45-52) Erekson states, “Accordingly, a need exists for a device and/or method that can be used to remotely control a variety of different devices and appliances, including new devices,” that is also “simple” and “portable.” (Erekson at 1:65-67)

74. Erekson further states that the “present invention is discussed primarily in a context in which devices and systems are coupled using wireless

links, and specifically with regard to devices and systems compliant with the Bluetooth technology.” (Erekson at 4:41-44) A person of ordinary skill in the art reading Erekson in 2004 would understand that Erekson discloses replacing the plethora of dedicated remote controls listed above with a portable device, which can use its Bluetooth transceiver and appropriate software to discover, select, and control a variety of remote devices also equipped with Bluetooth transceivers and appropriate software. (Erekson at 4:41-62)

75. Erekson states that a “cursor control or directing device” such as a “touch-screen device” on the portable device allows for flexible remote device discovery, selection, and control. (Erekson at 5:63-6:4) To that end, Erekson states that “... a stylus can be used to select a command for controlling a remote device by touching the stylus to display device 105.” (Erekson at 6:5-7)

76. Erekson describes that a “Portable computer system 100, either automatically or in response to a user input, transmits broadcast message 640 for the purpose of discovering compliant devices in the room.” (Erekson at 8:38-41) A network connection is established therebetween via Bluetooth. “Portable computer system 100 can then transmit a command 660 to a selected remote device (e.g., remote device B 620). Command 660 is a command for controlling the remote device in some prescribed manner (e.g., turning the device off or on, raising

or lowering a level, etc.) based on the type of device and its capabilities. (Erekson at 8:56-61)

77. A person of ordinary skill in the art would understand that Erekson thus describes a way to consolidate multiple remote controls into a single remote control device that can control other consumer electronics devices that have wireless-networked capability. Thus, once a user selects a particular device using Erekson's remote, the user can use the remote to perform low level functions that are ordinarily provided for on the console of the device being controlled (e.g., to adjust volume, to turn the device on/off, and so forth). A person of ordinary skill in the art would also understand that Erekson portrays a one-to-one correspondence between the conventional controls on the device such as discrete knobs and switches and the controls available on the remote control. Erekson states, "Each of the remote devices is manifested on a display device of the portable computer system, and one of the devices is selected using, for example, a stylus element." (Erekson at 2:27-30) But Erekson is silent about the nature of the controls on the controlled devices that are to be manipulated by his system, and in particular, he never describes the controls as being elements of a graphical user interface residing on a controlled device. Indeed, a person of ordinary skill in the art would understand that Erekson does not disclose combining or extending control functions to achieve novel efficiencies, and, therefore, the controls on Erekson's

remote are merely surrogates for the physical controls on the controlled device. Further, a person of ordinary skill in the art in 2004 would understand that to use Erikson's system to control multiple devices, the user must serially select each device in turn. Erikson does not, for example, disclose selecting multiple devices simultaneously or controlling one device via another (Bove Tr., Ex. 2012, at 189:25-190:7 (Dr. Bove agreeing that Erikson "does not disclose that a controlled device does control another controlled device.")). Therefore, it is my opinion that a person of ordinary skill in the art would understand that higher level functions described and claimed in the '873 patent, as explained below, are not envisioned by Erikson.

78. It is my opinion that at least the following functions, described and claimed in the '873 patent, are not described or taught in Erikson: (1) receiving on the remote control a playlist that contains a plurality of media item identifiers (Bove Tr., Ex. 2012, at 180:16-181:17); (2) selecting at least one media item identifier from the received playlist; (3) directing from the remote control the player device to receive a media item identified by at least one media item identifier from a content server without user input via the player device (Bove Tr., Ex. 2012, at 181:18-22); (4) displaying on the remote control a plurality of playlist names; (5) selecting one of a plurality of play list names; (6) sending at least one attribute of a playlist to a playlist server.

79. A person of ordinary skill in the art would understand that Erikson does not disclose or suggest downloading any media (such as a song playlist or video playlist) onto the player device from a content server, let alone having any functionality on the remote that would direct or control such functionality. (Bove Tr., Ex. 2012, at 180:16-181:23 (admitting that Erikson's remote does not receive any media content); 180:24-181:4 (admitting that Erikson's remote does not receive any playlists); 181:13-17 (admitting that Erikson's remote does not receive any songs); 181:18-22 (admitting that Erikson does not disclose sharing of media content between the Erikson remote and devices being controlled); 187:6-8 (admitting that Erikson "is not the sort of media sharing that we have been discussing with respect to... the '873 patent"); 188:7-10; 189:25-190:7 (admitting that Erikson does not describe communication between the devices being controlled); 189:13-16 (same))

80. Notably, Erikson mentions a "stereo" device only in passing. (Erikson at 1:18 and 28, listing stereos as a device commonly found in homes). It is my opinion that for a user to be able to download a song onto a music player in Erikson, assuming the device in Erikson is enabled for downloading, the user would have to interact directly with the music player in order to do that. In contrast, the '873 patent requires that the music player receive a media item

selected from a playlist without user input at the music player. See, for example, independent claims 1, 17, 23, 25, 26, 27, 30, and 46.

81. Furthermore, a person of ordinary skill in the art in 2004 would understand that Erikson's devices (the remote control and devices being controlled) do not communicate with any other third device, let alone with a content server. Petitioner's expert, Dr. Bove, so agreed at his deposition. (Bove Tr., Ex. 2012, at 193:1-12; see also 186:2-187-16 (Dr. Bove distinguishing Erikson from the '873 patent and stating that Erikson does not disclose "the sort of media sharing that we have been discussing with respect to, let's say the '873 patent.")) Thus, consistent with Dr. Bove's testimony, a person of ordinary skill in the art reading Erikson would understand that it does not teach or suggest that a controlled device, for example a stereo, communicate with anything other than the remote control device (via the transceiver 108), let alone with a content server. (Bove Tr., Ex. 2012, at 180:16-181:23 (admitting that Erikson's remote does not receive any media content); 180:24-181:4 (admitting that Erikson's remote does not receive any playlists); 181:13-17 (admitting that Erikson's remote does not receive any songs); 181:18-22 (admitting that Erikson does not disclose sharing of media content between the Erikson remote and devices being controlled); 187:6-8 (admitting that Erikson "is not the sort of media sharing that we have been discussing with respect to... the '873 patent"); 188:7-10; 188:15-189:24 (Dr. Bove

agreeing at 189:13-16 that “in Figure 6, the portable computer system 100 communicates with the devices individually, but it does not show communication between the devices”); 189:25-190:7(admitting that Erikson does not describe communication between the devices being controlled); 189:13-16 (same); 193:1-12 (Dr. Bove referring to Bluetooth as “a protocol” and agreeing that Erikson’s remote control controls directly the device to which it has connected))

C. United States Patent Application 2003/0045955 to Janik

82. United States Patent Application No. 2003/0045955 to Craig M. Janik, titled “Audio Converter Device and Method for Using the Same” (“Janik,” Exhibit 1011) was filed on September 1, 2001. Janik is generally directed to an audio converter device that decompresses digital audio data and converts the digital audio data into analog electrical data, and then transfers the analog electrical data to an audio playback device. (Janik at Abstract) Janik provides no disclosure of a system and method for controlling a remote device over a wireless connection for purposes of media sharing.

83. In a single instance at para. 0099, Janik states that one of the features of a user-programmable user-defined button is to “shuffle the tracks in the existing playlist.” (Janik at 0099)

84. Petitioner’s expert, Dr. Bove, admitted during his deposition that the only disclosure of Janik in support of obviousness over the combination of Bi and

Erekson in view of Janik that is being relied upon by the Petitioner is the disclosure that tracks in an existing playlist can be shuffled. (Bove Decl. at 33, relying only on para. 0099 of Janik; Bove Tr., Ex. 2012 at 272:6-273:5)

IX. THE PRIOR ART COMBINATIONS DO NOT RENDER THE ‘873 CLAIMS OBVIOUS

85. As discussed above, neither the stereo of Bi nor the remote of Erekson is capable of receiving information from a content server. In Bi, the navigator 260 communicates with a stereo via an IR transceiver and the stereo itself is not capable of communicating with a content server. In Erekson, the remote control communicates with household devices like light switches and stereos via Bluetooth, and provides no teaching or motivation for enabling light switches or stereos to receive, obtain, and/or send content to and from a content server. As explained more fully below, it is my opinion that a person of ordinary skill in the art in 2004 would have no motivation to combine Bi’s system with Erekson’s remote to arrive at the inventions of the ‘873 patent. More so, the combination of Bi’s system with Erekson would result in an inoperable system, unsatisfactory for its intended purpose, because Erekson’s *Bluetooth/Wi-Fi* remote (the only type of a remote disclosed in Erekson) cannot control an *analog* stereo of Bi.

A. There Is No Motivation To Combine Bi and Erikson, and Bi, Erikson and Janik

86. As explained in detail below, it is my opinion that short of hindsight, there is no motivation why a person of ordinary skill in the art would combine the prior art of Bi and Erikson, and Bi, Erikson, and Janik.

87. As already described earlier in this declaration, Weel's invention provides for sharing of files, playlists, or media items between different player devices. Weel's invention further allows a user to take his/her remote (the first device of the '873 claims) and playback media content on any player (the second device of the '873 claims). To do that, a person of skill in the art would understand that Weel's remote/first device must be capable of selecting or choosing from among different playback devices/second devices and communicating directly with the Internet.

88. As already described earlier in this declaration, Bi, however, neither envisions a navigator capable of interoperating with multiple computer platforms nor envisions a navigator capable of being an independent, stand-alone device that can directly communicate with the Internet. (Bove Tr., Ex. 2012 at 176:14-177:17; 180:9-13) Similarly, Erikson does not envision sharing of media content between different devices. (Bove Tr., Ex. 2012 at 180:18-22) Indeed, no device in Erikson is capable of sharing any media content via the wireless network. (Bove Tr., Ex. 2012, at 186:2-187-16 (Dr. Bove distinguishing Erikson from the '873 patent and

stating that Erikson does not disclose “the sort of media sharing that we have been discussing with respect to, let’s say the ‘873 patent.”)) Furthermore, to the extent Erikson is describing controlling multiple devices, it is describing only sequential low-level control of those devices. Erikson’s remote affects only the device to which it is connected. There is no reaching through the controlled device of Erikson to obtain information from, or provide information to, another device. (Bove Tr., Ex. 2012 at 188:7-10; 189:25-190:7; 188:15-189:24 (Dr. Bove agreeing at 189:13-16 that “in Figure 6, the portable computer system 100 communicates with the devices individually, but it does not show communication between the devices”; 193:1-12) In other words, Erikson does not describe the “directing” limitation of the claims of the ‘873 patent, among numerous other limitations, as outlined above.

89. Dr. Bove incorrectly asserts in his declaration that one of ordinary skill in the art would be motivated to employ Erikson’s remote control with the Bi system because “a single remote control could advantageously be used to control the computing platform as described in Bi and a stereo that receives its analog output as noted at [0021] of Bi, as well as other devices used with the stereo, such as a CD player.” Bove Decl. at 27.

90. I take issue with Dr. Bove’s opinion for several reasons. First, Dr. Bove’s opinion is based on impermissible hindsight and uses the ‘873 patent as a

roadmap to pick out elements of disparate prior art that, if properly considered from the perspective of one of ordinary skill in the relevant art in May 2004, lack any motivation for their combination. Indeed, Dr. Bove admitted at his deposition that Bi does not disclose any motivation for its navigator to have direct connection to the data server or the Internet, stating “I believe the Bi reference is silent on that point.” (Bove Tr., Ex. 2012 at 180:9-13)

91. Erikson, similarly, provides no teaching, suggestion, or motivation to have its remote control connect to the data server or the Internet. Indeed, Dr. Bove admitted that Erikson has nothing to do with “the sort of media sharing that we have been discussing with respect to, let’s say, the ‘873 patent.” (Bove Tr., Ex. 2012 at 187:4-8) According to Dr. Bove, the only problem that the combination of Erikson and Bi solves is the replacement of the infrared circuitry of Bi with the Bluetooth circuitry of Erikson, stating that “one reading Bi would see the discussion of infrared, and then one reading Erikson would say whatever you can do with infrared you can do better with Bluetooth.” (Bove Tr., Ex. 2012 at 288:14-289:3) Assuming, arguendo, that combining Bi and Erikson is beneficial – which it is not as explained in more detail below – the combination still does not render the remote control of the ‘873 patent because the combined Bi/Erikson remote, just like its respective remotes, would not have any capability to connect to the

data server or the Internet to obtain, send, or receive any media content as taught by the '873 patent.

92. Second, the opinion misapprehends the disclosure in Bi of a *single remote* (i.e., the navigator 260) to communicate both with the computing platform 100 and a stereo. Dr. Bove's declaration identifies as the sole reason for the motivation to combine the "Erekson remote control with the Bi system" is to provide "*a single remote control [that] could advantageously be used to control the computing platform as described in Bi and a stereo that receives its analog output as noted at [0021] of Bi, as well as other devices used with the stereo, such as a CD player.*" Bove Decl. at 27. But, as described earlier, Bi itself discloses a single remote (the navigator 260) that controls both the computing platform (see Bi at [0018]-[0019]) and a stereo (see Bi at [0029] and [0036]). Thus, because Bi already provides a single remote to control both a computing platform and a stereo, there is no motivation to combine Bi with Erekson in order to achieve that which Bi already provides.

93. Moreover, Erekson's remote could not communicate with Bi's stereo because the stereo in Bi is not Bluetooth enabled, and even if it were, Erekson's Bluetooth remote would not be able to direct a stereo of Bi to receive a media item from a content server (independent claims 1, 23, 26, 30, and 46), obtain a media item from a content server (claims 17 and 27), or send information to a content

server (claim 23) without the user input via the second device, as required by all of the independent claims. Notably, Dr. Bove admitted that he was “not certain” whether in 2004, stereo players were Bluetooth-enabled. (Bove Tr., Ex. 2012 at 203:8-204:4) Dr. Bove agreed, however, that both devices, a remote control and a stereo, need to be Bluetooth enabled to communicate. (Bove Tr., Ex. 2012 at 203:4-204:4) Thus, as admitted by Dr. Bove, because Erikson’s remote would not be able to communicate with Bi’s stereo, the combination of Bi and Erikson renders the resulting system inoperable.

94. Dr. Bove misapprehends the point of Mr. Weel’s invention as described and claimed in the ‘873 patent. In the ‘873 patent, the first device, which is the remote, can select the second device to receive, obtain, and/or send media content to and from a server. A person of skill in the art would understand that this feature of the ‘873 inventions provides great flexibility in allowing a user to utilize a single remote to play media on different second devices, each of which can receive content from a server. Thus, Weel’s invention allows a user to roam widely, even from house to house or around the world, to any location where a second device can connect to a content server and access his/her content therefrom. In contrast, even if a person of ordinary skill in the art in 2004 were motivated to combine Bi and Erikson, which such person was not, the combination does not result in the system of the ‘873 patent where the first device/navigator could

communicate with multiple second devices/playback devices so as to direct them to receive, obtain, or send a media item from a content server.

B. The Combination Of Bi In View Of Erekson Would Yield an Inoperable System, and, Therefore Does Not Render the ‘873 Patent Obvious

95. Petitioner admits that Bi does not disclose “the display of multiple devices for selection and control” (Petition at 31), but contends that Erekson cures this deficiency, stating the combination provides “the ability to select and control multiple devices, such as the computing platform and an amplifier used to play audio signals from the platform (¶ [0021] of Bi).” Petition at 32-33. As an initial matter, Bi makes no reference to an amplifier in the cited paragraph [0021] or anywhere else. Putting that aside, Bi makes reference to “a stereo and headphones,” which Bi describes as “analog audio” devices. The audio must be converted from a digital format to analog at the computing platform and provided to the stereo or headphones. In the cited ¶ [0021], Bi states, “The audio or video playback hardware 119 converts the digital audio or video data 103 to analog audio or video 109, which can then be connected to a stereo or headphones for listening or to a TV for viewing.”

96. In attempting to argue for the combination of Bi and Erekson, Dr. Bove at his deposition pointed out that Bi discloses in his navigator that there are “two separate pieces of circuitry in this system” (Bove Tr., Ex. 2012 at 200:19-

20), which he identifies in Bi Figure 9 as the IR transmitter system (265) and the wireless data communications interface (269). Dr. Bove argues that “Erekson, for example, points out the shortcoming of an arrangement like this.” (Bove Tr., Ex. 2012 at 200:21-23) Effectively, Dr. Bove is arguing that because Erekson taught away from IR controls and sought to replace them with Bluetooth or Wi-Fi, that importing Erekson’s approach to the navigator of Bi would constitute a simplification, and therefore an improvement warranting the effort to combine.

97. However, contrary to Dr. Bove's argument, having “two separate pieces of circuitry in this system” of Bi (Bove Tr., Ex. 2012 at 200:14-17) is not a disadvantage but is necessary for the Bi remote to control both the computing platform and an analog stereo. Bi foresees the invention of his navigator as consolidating control of networked digital media via Wi-Fi without having to reengineer the enormous installed base of conventional IR-controlled analog stereo systems already existing in people's homes.

98. Combining Bi and Erekson would require replacing or reengineering all of those millions and millions of legacy IR-controlled analog stereo systems in everyone's household for the dubious advantage of removing a small amount of circuitry in Bi’s navigator. At minimum, removing the IR control from Bi’s navigator (for that is the upshot of Dr. Bove’s argument) would lessen the utility of Bi’s invention for that large class of customers with existing IR-controlled sound

systems, even if that lost functionality were replaced by Erekson's system, because the customers would have to replace or modify their existing systems to avail themselves of the alleged improvement. Bi's intent is clear: he merely wants to be able to control an analog stereo from the same navigator that is used to control his computer platform to help consolidate the number of remote controls people would have to manipulate to use his system effectively. Bi envisions accomplishing this consolidation through the simple expedient of combining a small amount of IR circuitry with the Wi-Fi circuitry on the navigator. Thus, having "two separate pieces of circuitry in this system" of Bi (Bove Tr., Ex. 2012 at 200:14-17) is not a disadvantage but is necessary for the Bi remote to control both the computing platform and an analog stereo, and to avoid having to replace or reengineer everyone's legacy analog stereo to become a Bluetooth- or Wi-Fi-controlled system.

99. As I have discussed elsewhere in this report, Erekson teaches selecting and controlling individual devices that can be communicated with directly using Bluetooth or Wi-Fi (i.e., IEEE 802.11 standard, Erekson at 4:52; 4:42-53) Bi teaches using Bluetooth or Wi-Fi to communicate with the computer platform and an IR transmitter to control an analog device such as a stereo. (Bi at [0024], [0028], [0029] and [0036]). Erekson teaches away from the use of IR remote controls. (Erekson at 1:45-52) Combining Bi with Erekson would yield an

inoperative system that cannot control a stereo because in Bi the analog stereo cannot be controlled directly by the navigator using Bluetooth or Wi-Fi but in Erekson it would be required to.

100. In order for a combination of Bi and Erekson to be rendered operable, a person of ordinary skill in the art in 2004 would be required to *invent* additional structure to overcome the contradiction between the disclosures of Bi and Erekson outlined above.

101. Thus, the person of ordinary skill in the art could consider incorporating the “analog audio” functionality such as “stereo or headphones” directly into the computing platform, whereby the distinction Bi makes between them would disappear, and they would be “controlled” by the navigator through its connection to the computer platform. This would require physically integrating these components. This would at least require careful thought and execution, and would result in the best of circumstances with suboptimal performance because it would require dictating these components as design elements rather than leaving them to the choice of users, thereby limiting the utility of the combination of Bi and Erekson. Further, this approach does not avail itself of Erekson’s invention, as there is still only one device for Erekson’s version of Bi’s navigator to “discover,” namely, the computer platform, so that the combination of Bi and Erekson would add nothing to the functionality in this case.

102. There are also nontrivial engineering requirements for successfully integrating “analog audio” functionality into a digital environment. The engineering challenges include supplying high-quality analog audio power to the analog components that must be separated from the power supplied to the rest of the digital electronics in the now-combined analog audio/computer platform. The person of ordinary skill in the art would be required to have sufficient mastery of analog audio signal processing, digital audio signal processing, electrical engineering, power management, grounding and analog/digital isolation, as well as the capabilities to implement the rest of the systems of Bi and Erikson. This would either require a person of ordinary skill in the art with substantially more than ordinary experience in the art, or would require undue experimentation. And the result would have less utility than the system of Bi alone to users wanting to combine Bi’s system with their own analog audio “stereo or headphones.”

103. Alternately, the person of ordinary skill in the art could consider incorporating that portion of Erikson’s invention, which allows a device to be discovered, selected, and controlled, into Bi’s “analog audio” functionality such as “stereo or headphones.” This would make more sense on its face, because in this case the user could use Erikson’s version of Bi’s navigator on the one hand to discover, select, and control the computer platform, and on the other hand, to discover, select, and control the “analog audio” functionality. However, the

engineering challenges are similar to the foregoing scenario, because the component that allows Erikson's devices to be discovered is digital, but Bi's "stereo and headphones" are "analog audio." Therefore, here as well, the person of ordinary skill in the art would be required to reduce to practice the combination of digital and analog circuits with the concomitant mastery of the relevant technologies described above. This would likewise require a person of ordinary skill in the art to have substantially more than ordinary experience in the art.

104. It is my opinion that a person of ordinary skill in the art in 2004, could rely on no known methods for combining Bi's dedicated remote control for control of audio with Erikson's generic multi-device remote.

105. **Hardware.** The navigator functionality disclosed in Bi uses a "thin client" model where the limited processing functions in the navigator rely upon the more substantial capabilities of the computer platform. A thin client is "a computer or a computer program that depends heavily on some other computer (its server) to fulfill its computational roles."

(http://en.wikipedia.org/wiki/Thin_client (site last visited on 6/6/2014; Ex. N, "Thin client - Wikipedia, the free encyclopedia.pdf") Bi's navigator corresponds to a thin client system insofar as its functions are limited to receiving and immediately transmitting user inputs, and receiving and immediately posting user outputs to an LCD display, and nothing else. As shown in Figure 8 of Bi, the

navigator's computational responsibilities are limited to just two trivial I/O operations: forwarding user button presses to the computer platform 292, and displaying graphics received from the computer platform 294. This design comports with the operating environment of the navigator in the 2004 time-frame: a portable device running on battery power in an age of limited battery life and power-hungry microprocessors and memories would properly be designed to have extremely limited capabilities in order to conserve power. A person of ordinary skill in the art in 2004 would understand that Bi designed his system in this fashion so as to limit the computational requirements in the navigator and thereby facilitate increased battery life, given the power supply limitations of 2004-era batteries, and the inefficient power utilization of microprocessors, memory, and wireless transceivers. These design ideals are appropriately reflected in the architecture of Bi's navigator.

106. A person of ordinary skill in the art at the time of the invention would understand that the computational capabilities of the navigator described in Bi would have to be dramatically increased over the disclosure of Figure 8 to handle the increased computational requirements of Erikson.

107. Erikson's wireless remote control would have to have substantially more memory and computing power than Bi's navigator to perform its more sophisticated set of functions. This in turn would require greater computational

power and more memory in order to implement Erikson's wireless remote control. To incorporate Erikson's system into Bi's navigator would require the person of ordinary skill in the art either to lessen the running time between battery replacement or recharge, decreasing the utility of Bi's invention, or increase the weight and bulk of the device to accommodate increased power supply, also decreasing the utility of Bi's invention.

108. A person of ordinary skill in the art would also understand that to combine Bi's navigator with the functions of Erikson's wireless remote control would require a redesign of the simple software of Bi's navigator to accommodate the more sophisticated functions required to implement Erikson's discovery, selection, and control paradigm. This would include replacing whatever synchronization facility the navigator's transceiver may have to connect to the computer platform with a general-purpose discovery and identification facility that can recognize multiple types of devices by their profile, and be able to store the state of each controlled device upon disconnection and recall that state upon reconnection. This facility would have to have a dictionary of device profiles, a way of searching using the wireless transceiver for discoverable devices, a way to recognize and connect to discoverable devices, and the means to interrogate available devices to determine their profile, identify the particular device, and then handshake with them. The dictionary entry of the selected device would also

incorporate a module that the hybridized navigator would utilize to control the selected device. This would include a list of the individual controls, their type, their range of values, graphical icons to display for each one, textual information describing each control and perhaps a help system to provide information to the user to understand the effect of each control. It would also include — according to Erikson — a facility to download new types of devices as they become available so as to extend the capability of the navigator to recognize new device types. It would further require the remote to synchronize with the state of the controlled device in order to meaningfully reconnect with it.

109. A person of ordinary skill in the art would understand that there is no facility indicated in Bi for how the additional capabilities disclosed in Erikson could be interpolated into the structure of Bi's navigator. Indeed, the person of ordinary skill in the art would be required to perform this step without any insight from Bi or Erikson, because neither foresaw the prospect of being combined with the other, and each considered that their invention was a complete stand-alone solution to the problems their individual inventions posed.

110. Even if at a conceptual level a person of ordinary skill in the art understood what Petitioner singles out as the obvious advantage of the combination of Erikson and Bi, the person of ordinary skill in the art would be required to perform extensive experimental systems hardware and software development in

order to realize the combination, and the result would meet neither the objectives of Erikson's nor Bi's inventions.

111. The changes required would need a more robust (and more power-hungry) microprocessor and more memory, which would either reduce the battery lifespan of the navigator, or require that it carry more bulky batteries, making the device have a shorter lifespan between charges or to become heavier, more awkward, and more expensive. In comparison, the navigator system of Bi could be implemented in a small and inexpensive read-only memory because the operations are elementary and fixed-function. They are elementary in the sense that very few steps are required to perform the required operations; they are fixed-function in the sense that the steps never change. That is, in Bi's navigator, the Input and Output Drivers 282 (Fig. 3) are described as follows: "Access to user inputs 270 and user outputs 271 is handled through input and output drivers 282 on the navigator 260."

112. On the other hand, the system of Erikson requires a substantial read-write memory and enough processing power to identify multiple devices, store the device identifiers that are discovered, receive device selection from the user choosing one of them, establish communication with the server system, retrieve the corresponding control functions of the selected device, resynchronize their state, and provide a user input system to control the selected device.

113. Additionally, the person of ordinary skill in the art would understand that Bi envisions the navigator and computer platform to be one system, whereas Erikson envisions his wireless remote control and all the devices with which it can interact to be separately engineered. Bi's system does not envision anything outside the use of a dedicated wireless remote control to manage entertainment; Erikson does not envision anything beyond use of a nondedicated wireless remote control for device discovery, selection, and control. The person of ordinary skill in the art would be required to understand how the purpose of the nondedicated remote of Erikson could be combined with the purpose of the dedicated remote of Bi. This is a contradiction that would require the person of ordinary skill in the art to experiment.

114. Though Erikson mentions control of a "stereo" in his Background section, he is referring only to prior art devices. Erikson provides no embodiments for a stereo or any other audio device, so it would be up to the person of ordinary skill in the art to adapt Erikson's system to the task. However, the system of Bi is not just a stereo, so the redesign of the combination of Bi and Erikson that would be required would all be uncharted territory. Thus a skill beyond that of a person of ordinary skill in the art in 2004 would be required to adapt the hardware of Bi to the system of Erikson. And recall that our POSA is a college graduate with a year's experience.

115. **Software.** Fundamental changes would have to be incorporated into the software that implements the state machines shown in Figures 7 and 8 of Bi to incorporate the required functions of Erikson. The navigator and computer platform would need additional software to handle device identification, display, selection, and control. Bi's disclosure for his navigator does not have any of these capabilities; therefore there is no known structure in Bi that could be extended to support these additional capabilities. This would require a redesign from scratch, requiring that the person of ordinary skill in the art architect a new software system not envisioned by either Bi or Erikson.

116. Another dilemma facing a person of ordinary skill in the art implementing the combination of Bi and Erikson is adapting the general nature of Erikson's invention to Bi's particular system. Bi expresses no concept corresponding to Erikson's general device discovery, display, selection and control system. Not only would a person of ordinary skill in the art have to reengineer the software and hardware of Bi's invention — with all the challenges described above — to accommodate the specific additional capabilities of Erikson, but the person of ordinary skill in the art would also have to develop the structure of Erikson's device discovery, display, selection and control system in a general architecture that could provide the combination of Erikson and Bi as a particular embodiment. That is, the person of ordinary skill in the art would be required to solve the

general problem described by Erikson, to create a general device registry that would allow, among other things, for a device that combines Bi and Erikson to be entered into that registry, such that the registry would be able to account for a general discovery process of which the combination of Bi and Erikson would be a particular instance.

117. This would include specifications for how to organize and describe the classes of devices that can be recognized by the system of Erikson. It would also include the promulgation and distribution of templates corresponding to the different device configurations. It would also require an Internet registry server where various classes and versions of Erikson's devices could be characterized and differentiated. It would also require an Internet server system for distribution and updating of device templates to navigators capable of selecting devices so that they would be able to know the characteristics of the devices to which they were connecting. It would advantageously also include device descriptions in a device-independent form such that different navigators with different capabilities could select the same devices regardless of the hardware and software systems of which they were made.

118. Each of these design issues represents an engineering challenge to a person of ordinary skill in the art faced with the task of combining the entertainment system of Bi with the general-purpose device discovery system of

Erekson. The fundamental problem is that by combining the general device discovery system of Erekson with Bi, the person of ordinary skill in the art is faced with reducing Erekson's general system to practice, and then applying that general solution of Erekson's invention to the special-purpose system of Bi that has no notion whatsoever of device discovery.

119. It further requires excising those parts of Bi that would interfere with this generalization of capability, and would also require substantial augmentation of the hardware and software of the navigator to support this generalization in functionality. It would also require support systems such as Internet-based servers to which suitably equipped navigators could connect to receive device descriptions corresponding to the devices the navigator finds in its environment. And this Internet service would itself have to have a general structure to encode the device templates and to differentiate them one from the other.

120. For the reasons stated above, the combination of Bi and Erekson does not render the '873 patent obvious.

C. The Combination of Bi and Erekson Fails To Disclose Material Limitations of the '873 Patent Claims

121. It is my opinion that the combination of Bi and Erekson does not disclose or render obvious the limitation of "receiving on the first device a playlist, the received playlist comprising a plurality of media item identifiers" present in claims 1, 2, 6-13, 15, 16, 23, 24, 30, 31, 35-42, and 44-46; the limitation of

“obtaining a playlist on a first device over a network, the playlist comprising a plurality of song identifiers” of claims 17-22; the limitation of “receiving, on the first device, the playlist from the playlist server, the received playlist corresponding to the at least one attribute and comprising a plurality of media item identifiers” present in claims 25, 26; the limitation of “sending, from the first device at least one attribute of a playlist corresponding to a selected playlist name to a playlist server” present in claim 27-29.

122. Petitioner argues that Bi discloses receiving a playlist on the first device, which Petitioner takes to mean the navigator 260 of Bi. For support, Petitioner refers to the capability of Bi shown in Figure 7 and disclosed in paragraphs [0031] and [0032], where one of the commands that can be processed by the navigator control manager 154 is “browse music” in diamond 188. In response to receipt of this command the navigator control manager executes the steps to the right of that diamond (189, 190, 191, and 193).

123. The relevant branch of that set of steps is the one where the browse request is directed to a data server 193. In 191, the navigator control manager 154 will “Send results to navigator.” Petitioner jumps to the conclusion that because one of the search criteria can be “playlist,” that therefore the “results” sent “to the navigator” must be a playlist. This is speculation and arguing from hindsight.

124. Bi, however, fails to specify what the “results” constitute. The only thing that a person of ordinary skill in the art in 2004 could conclude is that the “results” are interpreted by the navigator as “user outputs 271.” (Bi at [0020]) Although Bi states, “The navigator 260 may be configured to display user outputs 271, such as graphics and text for display on an LCD 266 (FIG. 5) or control of LEDs, from the audio or video player application 151 running on the computing platform 100” (Bi at [0018]), nowhere does Bi characterize or suggest that the user outputs are a playlist.

125. At most, Bi discloses in Figure 7 that the criterion provided to a browse operation can be a playlist identifier, but a search criterion that identifies a playlist is not a playlist, it is just that: a search criterion. Even if a user can specify an attribute of a playlist as a browse criterion in step 188 of Bi Figure 7, a person of ordinary skill in the art understands that such a browse criterion is simply a pattern to be supplied to a search engine, and is not itself a playlist.

126. A person of ordinary skill in the art would further understand that the result of browsing in step 193 of Figure 7 is simply “music information,” and Bi does not suggest that such “music information” is a playlist. For example, the “music information” resulting from a browse command could be in the form of album art, or liner notes, or concert reviews, or advertising, or information allowing the user to purchase the music. Bi is silent on the meaning of “music

information.” Apart from saying that the “results” are sent “to the navigator 260 in step 191” [0032], Bi is silent about what constitutes browse “results,” or what the navigator is expected to do with them, should it receive them (which is not indicated).

127. Indeed, the only explicit discussion of what the navigator should display in Bi concerns not the processing of browse results, but the display of playback information in response to a “play music file command”, where Bi states that, “music title, the artist, and the album name” are sent to the navigator “for display to the user.” Absent from this list is any indication that a playlist is received by the navigator, or that a playlist is displayed to the user.

128. Bi also does not disclose that the computing platform 100 receives the browse results from the data server 102 in the form of a playlist, i.e., as a list of media items arranged to be played in a sequence. Further, Bi does not disclose that the computing platform 100 communicates the browse results in the form of a playlist to the navigator 260. In addition, there is no indication in Bi that the navigator 260 presents the browse results as a playlist to a user.

129. To summarize, there is no disclosure anywhere in Bi of the disposition or processing of browse results. There is no disclosure that browse results take any specific form apart from the general notion of “music information” and “results”. There is no disclosure that the browse results either constitute, or can be

interpreted as, a playlist. There is no disclosure that a playlist is received at the navigator. There is no disclosure of selecting from browse results. Even if a user can specify an attribute of a playlist as a browse criterion in step 188 of Bi Figure 7, a person of ordinary skill in the art would understand that Bi does not disclose receiving a playlist.

130. Finally, even if one assumes — despite Bi’s silence to the contrary — that the navigator could somehow present the browse results as a playlist or playlists to the user, it is still not necessarily the case that the navigator would receive the “browse results” as a playlist from the computer platform. Indeed, Bi’s step 191 in Figure 7 indicates only that that it will “Send results to navigator,” which “results” a person of ordinary skill in the art would understand to mean browse results, i.e., the result of the computer platform processing the browse command received from the navigator in step 188. However, even if such a person of ordinary skill in the art were to understand that the browse results could somehow be turned into a playlist on the navigator itself (if it somehow had sufficient computer power and software to do so, which is not indicated) the navigator would still not be receiving a playlist. Therefore, Bi does not disclose, “receiving on the first device a playlist.” The combination of Bi with Erikson does not cure this deficiency because, as described earlier, Erikson’s remote is not capable of receiving a playlist.

131. Bi and Erekson do not render claims 25, 26, 27-29 obvious for additional reasons. As explained above, in Bi, the first device (navigator 260) cannot communicate with a playlist server 102 and, therefore, does not meet the following limitations:

- a. “sending [from the first device] at least one attribute of a playlist corresponding to [the][a] selected playlist name to a playlist server” of claims 25 and 26;
- b. “receiving, on the first device, the playlist from the playlist server, the received playlist corresponding to the at least one attribute and comprising a plurality of media item identifiers” of claims 25 and 26;
- c. “sending, from the first device, at least one attribute of a playlist corresponding to a selected playlist name to a playlist server” of claims 27-29; and
- d. “receiving [on the first device] a playlist from the playlist server, the received playlist corresponding to the at least one attribute and comprising a plurality of media item identifiers” of claims 27-29.

Instead, as explained earlier in this declaration, in Bi, the navigator 260 communicates with the computing platform 100. Erekson, as discussed earlier in

this declaration, does not disclose a remote control that communicates with a playlist server or any data server. The combination of Bi and Erikson, therefore, does not render claims 25, 26 and 27-29 obvious for these additional reasons.

D. The Combination of Bi, Erikson and Janik Does Not Render Claims 13 and 42 Obvious

132. The combination of Bi, Erikson, and Janik does not render claims 13 and 42 of the ‘873 patent obvious at least for the reasons set out above with respect to the combination of Bi and Erikson and additional reasons presented below.

133. As stated earlier, Dr. Bove testified at his deposition that the only disclosure of Janik on which he relied in support of obviousness over the combination of Bi and Erikson in view of Janik is the disclosure of the shuffling feature. (Bove Decl. at 33, relying only on para. 0099 of Janik; Bove Tr., Ex. 2012 at 272:6-273:5)

134. In his declaration, Dr. Bove stated: “The Janik ‘955 reference discloses shuffle playback at [0099],” and defines shuffle playback as “random playback”. (Bove Decl. at 33) Dr. Bove further stated that a shuffling feature would have been “obvious to implement in an audio playback system such as that disclosed by combination of the Bi and Erikson references.” (Id.)

135. Claims 13 and 42 of the ‘873 patent are copied in full below:

13. The method as recited in claim 1, wherein the user second input selects the plurality of media item identifiers from the received playlist in a first order; and wherein directing the

second device to receive the media item identified by the at least one media item identifier from the content server further comprises directing the second device to receive a plurality of media items identified by the plurality of media item identifiers from the content server in an order other than the first order.

42. The device as recited in claim 30, wherein the user second input selects the plurality of media item identifiers from the playlist in a first order, and wherein directing the second device to receive the media item identified by the at least one media item identifier from the content server further comprises directing the second device to receive a plurality of media items identified by the plurality of media item identifiers from the content server in an order other than the first order.

136. Here are the relevant disclosures from Janik:

In [0046], Janik discloses “The fundamental operation of the digital streaming audio system” as follows: “LAN transmission of digital audio files 116 from a local source that is a personal computer (PC34) 24, to a digital audio converter 32 that receives the stream and converts it into a signal that can be input into a conventional stereo system 40.”

In [0047], Janik discloses, “The function of the PC 34 in the digital streaming audio system is to acquire, store, manage, and serve digital audio content to digital audio converter 32.”

In [0050], Janik discloses, “The function of digital audio converter 32 is to receive digital audio streams sent from the PC 34, decode and de-compress the digital audio in real time, convert it from a digital format into a analog electrical signals, specifically a left analog audio signal and a right analog audio signal.”

In [0051] and [0052], Janik discloses, “Digital audio converter 32 includes an LCD 50 that is used to display data relevant to the audio content being played, such as track 220 titles”, and also discloses “control buttons” on “an IR remote control 52” “to provide a user interface for controlling the digital streaming audio system”. Circuitry in the “digital audio converter 32”

“connects an infra-red (IR) control sub-system 34 for processing IR commands from the remote control 52.”

137. Janik combines a standard PC running a “media manager” software application with a wireless LAN-enabled digital-to-analog converter (DAC), the analog output of which is connected to an audio system. A person of ordinary skill in the art in 2004 would understand that the DAC also provides a thin client user interface for controlling the operations of the PC to deliver content to the audio system via the DAC.

138. A person of ordinary skill in the art would understand that the PC receives commands from the remote control that are communicated to it via the thin client IR receiver on the DAC, and the PC drives the thin client display on the DAC, thereby minimizing fabrication costs of the DAC through the use of the thin client architecture. Therefore, the remote does not communicate directly with the DAC, but only with the PC, which is the only agent in Janik that has the capacity to execute commands.

139. A person of ordinary skill in the art would understand that Figure 10, describing “a graphical user interface flow chart to describe the user interface structure,” demonstrates that all commands generated by the IR remote can only be executed in the PC, and that none of the commands are directly processed by the DAC. The PC, then, is the only agent in Janik that can receive commands.

140. In terms of the ‘873 patent, the PC is the content server, the LAN-enabled DAC is the second device, and the remote is the first device. Therefore, since there is no possibility of the second device being directed from the first device, it is not possible for Janik to read on the directing limitations of the ‘873 patent.

141. Petitioner does not demonstrate, and Janik does not disclose, “directing, from the first device, the second device to receive a media item” as recited in independent claim 1 or “directing, from the device, the at least one second device to receive the media item” as recited in claim 30.

142. Petitioner does not demonstrate, and Janik does not disclose, “directing the second device to receive a plurality of media items identified by the plurality of media item identifiers from the content server in an order other than the first order.”

143. As Dr. Bove conceded, Janik makes a one-word reference to the term “shuffle” in [0099]. Here is the entire portion of the reference Dr. Bove cites regarding the “shuffle” functionality in Janik:

“Some possible functions for user-defined button 124 are: delete currently playing track from the current playlist; purchase the currently streaming digital audio file 116 (if it is a sample digital audio file); **shuffle the tracks in the existing playlist**; repeat the current playlist, if the active level is the playlist level; repeat the current channel if the active level is a channel.” (Janik at [0099], emphasis added)

144. The ‘873 claims require (a) the user second input (b) to select a plurality of media item identifiers from a received playlist in a first order, and then require (c) the first device to direct the second device to receive the identified media items “from the content server in an order other than the first order.”

145. Janik does not disclose that the command to shuffle is the user second input; Janik does not disclose that a plurality of media item identifiers is selected, let alone that they are selected in a first order; Janik does not disclose that the selected media item identifiers are received in an order other than the first order; indeed, Janik does not disclose receiving a playlist at all.

146. Note that Janik requires that the tracks to be shuffled are “in the existing playlist”, and are not, as required by the ‘873 claims, tracks that are received from the content server in an order other than the first order. Therefore, it would be clear to a person of ordinary skill in the art in 2004 that the tracks to be shuffled are tracks that are shuffled in place, not tracks that are received, in an order other than the first order, from the content server. In other words, Janik describes a system where shuffling transpires in the existing playlist in the player device.

147. I am being compensated at my standard consulting rate of \$450/hour. My compensation is not contingent upon the substance of my advice, the opinions I render, or the testimony that I may give.

148. All of the statements made in this declaration of my own knowledge are true, and all statements made on information and belief are believed to be true. These statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.

Dated: June 13, 2014

Signature: Carolee L. Lee

EXHIBIT A

Dr. Gareth Loy – Curriculum Vitae

Curriculum **V**itae

Dr. Gareth Loy, DMA
Stanford, 1980

President, Gareth, Inc.
POB 151185, San Rafael, CA 94915
(415) 927-2916
dgl@GarethInc.com
<http://www.GarethInc.com>

Professional Summary

Dr. Loy has over 36 years of academic and professional experience in computer science, software development, embedded systems, networking, enterprise software systems, digital audio signal processing, and music technology. His practice encompasses a wide range of computer technology disciplines.

His doctorate is from Stanford, 1980, where he studied under Dr. John Chowning at the Stanford Artificial Intelligence Laboratory and the Center for Computer Research in Music and Acoustics.

He has published widely in various juried journals, and has authored three books with the MIT Press, including *Musimathcs*, a two-volume text on the mathematics of music, and *Music and Connectionism*, a collection of articles on artificial neural networks and music research.

He was a Researcher and a Lecturer for graduate and undergraduate courses in computer science and digital audio at UCSD for a decade, cofounded the Computer Audio Research Laboratory, conducted computer systems research, and built numerous other computer laboratories there.

He has been Software Architect for consumer and professional products for large international electronics companies, and has sustained a long and successful career at the cutting edge of software development and design using multiprocessor/multi-core architectures for signal processing and control.

Dr. Loy has over sixteen years of experience as an expert witness on numerous cases. He has testified before the International Trade Commission, and before a jury in Federal Court, has testified at Markman claim construction hearings, been deposed numerous times, authored numerous reports and declarations, and has presented exhibits and Markman tutorials in Federal Court. Case types include patent litigation, trademark infringement, copyright litigation, and inequitable conduct. He has worked on complex international patent cases, and has provided expertise on such diverse areas as compilers, file systems, operating systems, handheld networked Personal Information Management (PIM) devices, enterprise email systems, software for factory automation systems, interactive databases, enterprise software for management of music libraries, MPEG audio compression, on-line gaming, composition systems, digital

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camera hardware and software, digital audio hardware and software technologies, and more. (See the Summary of Testifying Experience.)

Expertise

- Large Scale Software Architecture/Analysis in C, C++, ObjectiveC, Java, etc.
- Mobile phones, mobile computing, cell phones, digital cameras, PDAs, iPhone, iPad, etc.
- Software Architecture for consumer and professional computer products
- Internet commerce
- User interfaces, design, architecture
- Enterprise applications and databases
- Networked file systems
- Operating systems
- File backup/restore and archiving
- Real-time and parallel processing systems
- Enterprise networked systems
- Digital Audio Signal Processing and Acoustics
- MP3, MPEG, Audio Compression Standards
- Music Technology

Education

<u>Year</u>	<u>College or University</u>	<u>Degree</u>
1980	Stanford University	DMA – Doctor of Musical Arts in digital audio technology: computer science, digital signal processing (DSP), digital audio, computer systems for audio, real-time systems for music, music composition. Thesis research conducted at the Stanford Artificial Intelligence Laboratory (SAIL), and the Center for Computer Research in Music and Acoustics (CCRMA). Thesis: compiler for Systems Concepts Digital Synthesizer + award-winning composition <i>Nekyia</i> . Foundational research in digital audio that led to hardware and software systems to compute digital audio in real time.
1975	San Francisco State University	B.A., Music/Music Technology

Projects and Skills

- 35+ years experience as a C/C++/ObjectiveC/Java software engineer, software systems architect
- Early Apple employee (1979)
- Lecturer and researcher for a decade at UCSD
- Architected numerous large-scale enterprise software and hardware systems
- Developed and debugged prototype multiprocessor systems, real-time systems, embedded systems, file systems
- Wrote assemblers, compilers, linkers/loaders

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- Created hundreds of user-level applications on numerous platforms
- Built home entertainment systems, professional audio recording systems
- Designed, developed and implemented embedded systems for handheld applications
- Direction and management of research and software development projects
- Digital audio signal processing, systems software for custom computing platforms
- Parallel-processing systems software
- Operating systems: PC, UNIX, Mac, Windows, Developer Studio, LINUX, VxWorks, and WindRiver platforms
- Computer programming language development with yacc and lex
- Real-time programming with VxWorks
- Systems programming, device drivers, file systems, systems administration
- Multiprocessor systems programming
- Multimedia computing
- Design, debug, and document complex processor Instruction Set Architectures
- Build automatic document generation systems that create finished documents directly from commented code sources, or create instruction set architecture documents directly from machine description files.
- Design, comprehend, and document software, hardware, and VLSI architectures.
- Collaborate with designers to patent intellectual property, review patents for applicability, and drive the review process with the US Patent Office.

Professional Experience

From: 1998
To: Present
Organization: Gareth, Inc., Corte Madera (Marin County), CA.
Title: President
Summary: Provide software and hardware engineering, and litigation support to high-technology companies, internationally.

From: 2003
To: 2004
Organization: Sony Corporation of America
Title: Software Architect, Super Audio CD Project
Summary:

- Developed 48-track pro-audio recording system for authoring next-generation audio media, including SACD/DSD audio discs, DVD, and Blu-Ray discs.
- System included synchronous Internet transmission of digital audio, custom hardware interfacing, complex user interface design, real-time operating systems (VxWorks), code development in C++, interfacing to traditional recording devices.
- Improved system design to meet project goals
- Met aggressive project deadlines.
- Manager: Ethan Grossman (currently at Digidesign)

From: 1994
To: 1998
Organization: Chromatic Research, Inc.
Summary: Senior Information Engineer
1997-1998:

- Wrote hardware architecture documentation for next-generation multi-media

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- processor
- Wrote software API reference documentation for multi-media processor

Senior Digital Audio Engineer

- 1994-1997:
- Reverse-engineered popular FM synthesis chip, and reduced it to software simulation running on Mpact processor
 - Reviewed extensive music synthesis patent law, advised on patent protection strategies and work-arounds to patented signal-processing technologies.
 - Led wave-table synthesis project, hired & managed voicers, licensed sound libraries, specified the synthesis architecture, interfaced between marketing, engineering and voicers
 - Represented Chromatic at the MMA's IASIG 3DWG (3D audio industry group of the MIDI Manufacturer's Association)
 - Spearheaded the successful effort to open Microsoft's 3D audio API to hardware acceleration
 - Consulted on 3D audio subsystem design

From: 1994
To: 1994
Organization: Sonic Solutions; Novato, CA
Title: Senior Digital Audio Engineer
Summary: Specified, architected, and implemented track-based recording system for automatic dialog replacement (ADR) and Foley, involving user interface design, new core functionality for rapidly capturing and easily comparing multiple session takes.

From: 1988
To: 1993
Organization: Frox, Inc., Milpitas, CA
Title: Digital Audio Systems Architect and Project Lead
Summary:

- Member of VLSI design team that developed a custom stream-oriented move engine that linked an array of up to 16 Motorola 56000's, operating synchronously at the instruction and sample level. Features included subsampling, 24x24 AES-EBU serial link I/O, and both asynchronous parameter update and synchronous data movement to/from a host computer
- Debugged brass-board and ASIC implementation of move-engine with architects.
- Designed and implemented the user interface, system model, and control system for a parallel-processing multiple-DSP audio subsystem
- Developed user interface for audio system based on proprietary Frox "wand" remote controller.
- Implemented Lucasfilm THX processing, Dolby ProLogic, concert hall simulation and other forms of audio processing
- Wrote marketing documentation, white papers, delivered papers at conferences (AES and ICMA), and wrote support documentation
- The FroxSystem received the Industrial Design Excellence Award (IDEA) Bronze Award for excellence in User Interface Design; Popular Science Magazine's Best of What's New Award for Audio and Video Products, AudioVideo Magazine's Grand Prix Award, CES/EIA Innovations '93 Award

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From: 1980
To: 1989
Organization: University of California, San Diego, CA
Concurrent appointments: Computer Audio Research Laboratory, Center for Music Experiment, UCSD Music Department
Title: Researcher, Lecturer, Administrator, with concurrent appointment as Director of Research at the Computer Audio Research Laboratory (CARL), part of the Center for Music Experiment (CME), an Organized Research Unit (ORU) of the University of California, San Diego (UCSD)
Summary:

- Lecturer in graduate computer music sequence: principles and practice of digital audio and computer science, and undergraduate musical acoustics, and electronic music
- Conducted original research in computer architectures and software for digital signal processing of music and musical performance
- Wrote numerous scholarly articles for various publications on original research topics
- Responsible for development and distribution of the CARL Software Distribution, a collection of research software developed at CARL for use at collaborating sites
- Supervised staff and research assistants, directed projects in digital interfaces for music instrument gesture capture, digital audio, signal processing
- Designed, specified, and installed computing laboratories and instructional facilities

From: 1979
To: 1980
Organization: Apple Computer, Inc., Cupertino, CA
Title: Technical writer
Summary:

- Wrote user manuals for the original Apple II: Fortran, Basic, text editing
- Developed Apple's first self-documenting text editing paradigm
- Worked with Jef Raskin (my boss) on the very earliest research platforms that would eventually become the Macintosh computer. Raskin worked directly for Steve Jobs.

From: 1974
To: 1975
Organization: San Francisco State University
Title: Lecturer
Summary:

- While still a graduate student, I was appointed to be a Lecturer by the Music Department to replace faculty on sabbatical.
- I taught electronic music theory and practice.

Litigation Support Experience

Summary of Testifying Experience:

- **21 cases** as Testifying Expert, Expert of Record
- **27 total cases** to date
- **Trial testimony**
 - 2014: ITC: Black Hills Media LLC v. Samsung, et al., patent litigation
 - Two days of testimony under oath
 - 1995: Industrial Indemnity Co. v. Apple Computer, Inc., trademark infringement
 - Three days of testimony under oath
- **Markman Claim Construction hearings**
 - 2011: Gibson v. 745 (Seven45) LLC, patent infringement
 - 2011: MONKEYmedia Inc. v. Apple, Inc., patent infringement
 - 2011: MONKEYmedia Inc. v. Disney, Inc. et al., patent infringement
- **Markman tutorials**
 - 2004: Seer Systems, Inc. v. Beatnick, Inc. & Microsoft Inc., patent infringement
- **Depositions**
 - 2013: ITC: Black Hills Media v. Samsung, LG, Panasonic, Toshiba
 - 4.5 days of deposition
 - 2012: MobileMedia Ideas LLC v. Apple
 - 2011: Gibson Guitar Corp. v. 745 LLC
 - 2011: MONKEYmedia Inc. v. Apple
 - 2011: MONKEYmedia Inc. v. Disney et al.
 - 2009: 1st Media. v. Electronic Arts, inequitable conduct
 - 2004: Seer Systems, Inc. v. Beatnick, Inc. & Microsoft Inc., patent infringement
 - 1995: Industrial Indemnity Co. v. Apple Computer, Inc., trademark infringement

Expert Engagement:

Type of Matter: Patent litigation before International Trade Commission
Law Firm: Mintz Levin
Case Name: “In the Matter of certain digital media devices, including televisions, Blu-Ray disc players, home theater systems, tablets and mobile phones, components thereof and associated software, DN 2954. Filed with the ITC.”
Complainant Black Hills Media, LLC alleges violations of section 337 of the Tariff Act of 1930 (19 U.S.C. 1337).
Complainant: Black Hills Media, LLC
Respondents: Samsung, LG, Panasonic, Toshiba, Sharp
Patents at issue:

- 8,214,873 — Method, system, and computer-readable medium for employing a first device to direct a networked audio device to render a playlist
- 8,028,323 — Method and system for employing a first device to direct a networked audio device to obtain a media item
- 8,230,099 — System and method for sharing playlists

Services Provided: **Testifying expert** for infringement and validity, for complainant Black Hills Media, LLC.
Two days testimony at ITC hearing in February 2014; 4.5 days of deposition; expert reports on infringement and validity; witness statements on infringement and validity, product testing, wireshark internet packet analysis; source code analysis.

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Disposition: Ongoing
Date: 2013 –
Contact: James Conley (858) 314-1500, Howard Wisnia (858) 314-1500, Joe Hameline (617) 348-1651.

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Desmarais LLP
Case Name: MobileMedia Ideas LLC v. HTC Corp. and HTC America, Inc., Case 2:10-cv-00112-DF (2:2010cv00112), Eastern District of Texas. Judge Folsom.
Services Provided: **Testifying expert for plaintiff Mobile Media Ideas (MMI)** for infringement and validity.
Patents at issue:

- 5,490,170 — Coding apparatus for digital signal

Disposition: Settled
Date: 2011 – 2013
Contact: Laurie Stempler, 212-351-3423

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Proskauer Rose
Case Name: MobileMedia Ideas LLC v. Apple Inc., Case 1:10-cv-00258-SLR-MPT (1:2010cv00258), Wilmington Delaware, Judge Robinson.
Patents at issue:

- 5,490,170 — Coding apparatus for digital signal
- 6,393,430 — Method and system for automatically recording music data files by using the hard drive of a personal computer as an intermediate storage medium
- 6,446,080 — Method for creating, modifying, and playing a custom playlist, saved as a virtual CD, to be played by a digital audio/visual actuator device
- 7,349,012 — Imaging apparatus with higher and lower resolution converters and a compression unit to compress decreased resolution image data
- 6,725,155 — Method and apparatus for information processing, and medium for information processing
 - GPS routing and navigation systems

Services Provided: **Testifying expert for plaintiff Mobile Media Ideas (MMI)** for infringement and validity. Reports (1/13/2012), depositions (4/13/2012).
Disposition: Jury found direct infringement and upheld the validity of the asserted patents.
Date: 2011 – 2012
Contact: Alan Federbush, 212.969.3211

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Proskauer Rose
Case Name: MobileMedia Ideas LLC v. Research In Motion Limited and Research In Motion Corporation, No. 3:11-cv-02353-N (3:2011cv02353), Northern District of Texas, Judge Godbey.
Patents at issue:

- 6,446,080 — Method for creating, modifying, and playing a custom playlist, saved as a virtual CD, to be played by a digital audio/visual actuator device

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- 7,349,012 — Imaging apparatus with higher and lower resolution converters and a compression unit to compress decreased resolution image data
 - Digital camera resolution conversion and compression system

Services Provided: **Testifying expert for plaintiff MMI** for infringement and validity.
Disposition: Concluded
Date: 2011 – 2013
Contact: Alan Federbush, 212.969.3211, John Kitchura, (617) 526-9676

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Harness & Dickey
Case Name: Gibson Guitar Corp. v. 745 LLC; Case No. 3:11-cv-00058, before Hon. Sharp, Magistrate Judge Brown, Middle District of Tennessee, Nashville
Patent at issue:

- 5,990,405 — System and method for generating and controlling a simulated musical concert experience

Services Provided: **Testifying expert for defendant 745 LLC**, for infringement and validity. Reports, declarations, deposition, Markman claim construction hearing.
Disposition: Settled on terms favorable to my client
Date: 2011 – 2012
Contact: Kara Fussner, Rudolph Telsher, Harness & Dickey: (314) 446-7664

Expert Engagement:

Type of Matter: Patent litigation, ITC
Law Firm: Jones Day
Case Name: International Trade Commission (ITC) Investigation 337-TA-797 “On certain motion-sensitive sound effects devices and image display devices and components and products containing same”, Inv. No. 337-TA-773; ALJ Gildea;
Patent at issue:

- 6,150,947 — Programmable motion-sensitive sound effects device

Services Provided: **Testifying expert: non-infringement/invalidity for respondent Kyocera**. Prior art research.
Disposition: Settled.
Date: 2011.
Contact: Blaney Harper, Jones Day: 202.879.3939
Jose Patiño, Jones Day, San Diego: 858.314.1200

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Flachsbart & Greenspoon
Case Name: RMail Ltd. v. Amazon.com, Inc. et al., E. Dist. Texas, 2:10-cv-00258-TJW
Patent at issue:

- 6,571,334 — Apparatus and method for authenticating the dispatch and contents of documents
- 6,182,219 — Apparatus and method for authenticating the dispatch and contents of documents

Services Provided: **Testifying expert for plaintiff RMail**. Software discovery, infringement analysis.
Disposition: Settled
Date: 8/5/2011
Contact: Robert Greenspoon, Flachsbart & Greenspoon 312-551-9500

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Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Irell & Minella, LLP
Case Name: International Trade Commission (ITC): Microsoft Corporation v. Tivo Inc., “Certain Set-Top Boxes and Hardware and Software Components Thereof”, Investigation No. 337-TA-761 (ITC), No. 2:11-cv-00134 (W.D. Wash.) ALJ: Gildea.
Complainant: Microsoft Corporation
Respondent: Tivo Inc.
Patents at issue:

- 5,585,838 — Program time guide
- 5,731,844 — Television scheduling system for displaying a grid representing scheduled layout and selecting a programming parameter for display or recording
- 6,028,604 — User friendly remote system interface providing previews of applications
- 5,758,258 — Selective delivery of programming for interactive televideo system

Services Provided: **Testifying expert for defendant Tivo.** Report.
Disposition: Settled
Date: 3/28/2011
Contact: Eric Carsten, Chris Vanderlaan, Irell & Minella, (310) 203-7031

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Graves Dougherty Hearon & Moody
Case Name: MONKEYmedia Inc. v. Apple, Inc. Case No. 1:2010cv00319, Texas Western District, Austin, Judge Sam Sparks, patents at issue: Seamless Contraction
Patents at issue: Seamless contraction patents:

- US 6,177,938 — Computer user interface with non-salience deemphasis
- US 6,219,052 — Computer user interface with non-salience deemphasis
- US 6,335,730 — Computer user interface with non-salience deemphasis

Seamless expansion patents

- US 6,393,158 — Method and storage device for expanding and contracting continuous play media
- US 7,467,218 — Method and storage device for expanding and contracting continuous play media
- US 7,890,648 — Audiovisual presentation with interactive seamless branching and/or telescopic advertising

Services Provided: Consulting expert for plaintiff: infringement analysis. **Testifying expert for plaintiff MONKEYmedia:** claim construction. Markman claim construction hearing.
Disposition: Ongoing
Date: 2010 –
Contact: Steve Smit, Graves Dougherty Hearon & Moody: 512-480-5600

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Graves Dougherty Hearon & Moody
Case Name: MONKEYmedia Inc. v. Disney, Inc. et al. Case No. 1:10-cv-00533-SS, Texas Western District, Austin, Judge Sam Sparks

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Patents at issue: Seamless Contraction:

- 6,335,730 — Computer user interface with non-salience deemphasis

Seamless Expansion:

- US 6,393,158 — Method and storage device for expanding and contracting continuous play media
- US 7,467,218 — Method and storage device for expanding and contracting continuous play media
- US 7,890,648 — Audiovisual presentation with interactive seamless branching and/or telescopic advertising

Services Provided: Consulting expert for plaintiff: infringement analysis. **Testifying expert for plaintiff MONKEYmedia**: claim construction on Seamless Contraction Patents.

Disposition: Ongoing

Date: 2010 –

Contact: Steve Smit, Graves Dougherty Hearon & Moody: 512-480-5600

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Stroock & Stroock & Lavan

Case Name: Mirror Worlds, LLC v. Apple Computer, Inc. Case No. 6:2008cv00088, Texas Eastern District Court, Tyler, Judge Leonard Davis

Patents at issue:

- 6,006,227 — Document stream operating system
- 6,638,313 B1 — Document stream operating system
- 6,725,427 B2 — Document stream operating system with document organizing and display facilities
- 6,768,999 B2 — Enterprise, stream-based, information management system

Services Provided: **Consulting expert** for plaintiff (expert of record: Dr. John Levy): infringement analysis. Source code analysis. Technology analysis of Apple Computer OSX operating system and applications software source code for products including Spotlight, CoverFlow, Finder, and Time Machine in Tiger and Leopard releases, IOS operating system and applications software source code for iPod, iPhone, Apple TV, and xServe. This was a very large-scale discovery project, requiring analysis of approximately 1.5 billion lines (not bytes, lines) of disclosed source code.

Disposition: On 10/1/2010 a jury in EDT found Apple willfully infringed, and set a \$625 million dollar judgment. Judge Davis subsequently reversed the judgment while upholding the validity of the patents.

Date: 2009 – 2010.

Contact: Kenneth Stein, Stroock & Stroock: 212-806-5491

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Robins, Kaplan, Miller & Ciresi LLP

Case Name: St. Clair Intellectual Property Consultants v. Samsung Electronics Co., Ltd., et al., Case No. 1:04-cv-1436-JJF-LPS, United States District Court for the District of Delaware, Judge: Joseph J. Farnan

Patents at issue:

- 5,138,459 — Electronic still video camera with direct personal computer (PC) compatible digital format output
- 6,094,219 — Electronic still video camera with direct personal computer (PC) compatible digital format output

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Services Provided:

- 6,323,899 B1 — Process for use in electronic camera

Consulting expert for plaintiff (expert of record: Tom Gafford): infringement analysis of digital camera technology. Reviewed thousands of digital camera technical drawings, schematics, block diagrams, parts lists, service manuals, engineering product specifications, technical manuals, industry standards, and user guides for specific analog and digital technologies such as CCDs, SDRAM, video DSPs, microprocessors, embedded software APIs, and other camera technologies at issue, wrote reports.

Disposition: All work for client completed in 2009. (Note: Samsung settled before my work on this case began.)

Date: 2009.

Contact: Robins Kaplan: Seth Northrop: 612.349.8500; Brock Spect: 612.349.8500

Expert Engagement:

Type of Matter: Inequitable conduct

Law Firm: Flachsbart & Greenspoon, LLC

Case Name: 1st Media. v. Electronic Arts, Inc., Harmonix Music Systems, Inc., Microsoft Corporation, Viacom, Inc. and Sony Computer Entertainment America, Inc., Case No. 2:07-cv-1589-JCM-RJJ, United States District Court, District of Nevada, Judge: Kent J. Dawson

Patent at issue: US 5,464,946 — Karaoke information entertainment system

Services Provided: **Testifying expert:** Inequitable Conduct. Evaluate materiality of pertinent prior art for plaintiff's patent, rendering expert opinion, deposition, declarations, briefs.

Disposition: The Court of Appeals reversed the District Court, finding for 1st Media.

Date: 2009 – 2012

Contact: William W. Flachsbart, Robert Greenspoon, 312-551-9500

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Flachsbart & Greenspoon, LLC

Case Name: ValueClick, Inc. v. Tacoda, Inc., Case No. 2:2008cv04619, California Central District Court, Western Division - Los Angeles Office, Judge Dale S. Fischer

Patents in suit:

- 5,848,396 — Method and apparatus for determining behavioral profile of a computer user
- 5,991,735 — Computer program apparatus for determining behavioral profile of a computer user

Services Provided: **Testifying expert:** Patent infringement. Patent and technology infringement analysis of Tacoda's internet behavioral advertising product, rendering expert opinion, declarations, briefs.

Disposition: Dismissed.

Date: 2008 – 2010.

Contact: William W. Flachsbart, Robert Greenspoon, 312-551-9500

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Quinn Emanuel Erquhart Oliver & Hedges, LLP

Case Name: Activision Publishing, Inc. v. Gibson Guitar Corporation.
Case No. CV08-01653 MRP (SHx)
Central District Court of California, Hon. Mariana R. Pfaelzer

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Patent at issue: • US 5,990,405 — System and method for generating and controlling a simulated musical concert experience

Services Provided: **Testifying expert for infringement, for plaintiff:** Patent infringement. Patent and technology infringement analysis of Activision's Guitar Hero product, rendering expert opinion, declarations, briefs.

Disposition: Activision sued Gibson for declaratory judgment of patent non-infringement and invalidity and related issues. Activision's motion for Summary Judgment was granted. The parties subsequently settled.

Date: 2008 – 2009.

Contact: James M. Glass (212) 849-7000, Edward J. DeFranco (212) 849-7000

Expert Engagement:

Type of Matter: Copyright litigation

Law Firm: Cooley Godward Kronish LLP

Case Name: Atlantic Recording Corp. et al v. XM Satellite Radio Inc., 06 CV 3733 (LAK), Famous Music LLC et al v. XM Satellite Radio Inc., 07 CV 2385 (LAK) and Nota Music Publishing, Inc. v. XM Satellite Radio Inc., 07 CV 4682 (LAK), Southern District Court of New York, Judges Batts and Kaplan

Services Provided: **Testifying expert:** Copyright infringement. Analysis of XM Satellite *INNO* product to help determine whether it meets the statutory definition of a Digital Audio Recording Device (DARD) under the terms of the Audio Home Recording Act of 1992.

Disposition: Settled.

Date: 2008 – 2011.

Contact: Steven A. Wieder (212) 479-6263

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Flachsbart & Greenspoon, LLC

Case Name: 1st Technology LLC, v. Tiltware LLC, Civil Action No. 2:06-cv-323-LDG-RJJ, U.S. District Court, Nevada

Patent in suit: • 5,564,001 A — Communications system

- A communications system for transmitting interactive multimedia information over a communication medium having limited bandwidth

Services Provided: **Testifying expert:** Internet gambling. Forensic analysis of software application, "Full Tilt Poker" to determine infringement. Wrote expert report showing infringement of every element of asserted claims. Analysis was performed on executable application and DLLs downloaded from Tiltware's Internet site. Analysis was performed without benefit of source code: use of Internet packet sniffing and reverse engineering of downloaded databases established infringement sufficient to obtain favorable settlement.

Disposition: Settled.

Date: 2008 – 2009.

Contact: Robert Greenspoon, 312-551-9500

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: McKool Smith

Case Name: Visto Corporation v. Good Technology, Inc., Case No. 2:06-cv-00039-TJW, U.S. District Court, Eastern District of Texas, Marshall Division, Judge T. John

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Ward

Patents at issue:

- 6023708 — System and method for using a global translator to synchronize workspace elements across a network
- 6085192 — System and method for securely synchronizing multiple copies of a workspace element in a network
- 6151606 — System and method for using a workspace data manager to access, manipulate and synchronize network data
- 6708221 — System and method for globally and securely accessing unified information in a computer network
- 7039679 — System and method for globally and securely accessing unified information in a computer network

Services Provided: **Consulting expert** for plaintiff (expert of record: Tom Gafford): analysis of email server applications regarding synchronization of personal information management (PIM) data to portable, wireless handheld devices (Good Mobile Messaging). Conducted extensive discovery of multiple large enterprise database systems (Microsoft Exchange, Lotus Notes, others), Good's proprietary network operations systems, and Good handheld devices for Personal Information Management (PIM) manufactured and distributed by Good over the course of 6 years. Conducted detailed review of over 12 gigabytes of C++ and Java source code to establish how PIM data were synchronized between enterprise databases and handheld devices. Longitudinal detailed review of multiple versions of Good's system.

Disposition: Settled.

Date: 2007-2008.

Contact: Eric Robinson, Bo Davis, McKool Smith, 214.978.4063

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: McKool Smith

Case Name: Visto Corporation v. Research In Motion, Ltd. (RIM), Case No. 2-06-CV-181-TJW, U.S. District Court, Eastern District of Texas, Marshall Division, Judge T. John Ward

Patents at issue:

- 6023708 — System and method for using a global translator to synchronize workspace elements across a network
- 6085192 — System and method for securely synchronizing multiple copies of a workspace element in a network
- 6151606 — System and method for using a workspace data manager to access, manipulate and synchronize network data
- 6708221 — System and method for globally and securely accessing unified information in a computer network
- 7039679 — System and method for globally and securely accessing unified information in a computer network

Services Provided: **Consulting expert** for plaintiff (expert of record: Tom Gafford): analysis of email server applications regarding synchronization of personal information management (PIM) data to portable, wireless handheld devices (Research In Motion/BlackBerry). Conducted extensive discovery of multiple large enterprise database systems (Microsoft Exchange, Lotus Notes, others), RIM proprietary network operations systems, and RIM handheld devices for Personal Information Management (PIM) manufactured and distributed by RIM over the course of five years. Conducted detailed review of over 130 gigabytes of C++ and Java source

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code to establish how PIM data were synchronized between enterprise databases and handheld devices. Longitudinal detailed review of multiple versions of RIM's system.

Disposition: Settled.
Date: 2007-2008.
Contact: Eric Robinson, Bo Davis, McKool Smith, 214.978.4063

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Vanek, Vickers & Massini
Case Name: Premiere International Associates LLC v. Apple Computer, Inc. No. 05-CV-506, U.S. District Court Eastern District of Texas Marshall Division, Judge T. John Ward.

Patents at issue:

- 6,763,345 — List building system
 - A system for creating a list of selected works
- 6,243,725 — List building system
 - A system for creating and editing play lists

Services Provided: **Consulting expert** /software analyst for plaintiff (expert of record: Tom Gafford): white-box analysis of Apple iTunes software source code written in C/C++, and iTunes Store (iTMS) enterprise software source code written in java and SAP/ABAP. White-box source code analysis was performed on seven versions of iTunes from the original release through version 7.1 for infringement of more than 100 claims. Each version of iTunes constituted in excess of 800,000 lines of C/C++. Analysis was performed on Windows (using Visual Studio .NET IDE) and Macintosh (using XCode and CodeWarrior IDEs). Static analysis of enterprise software source code for Apple's iTunes Store, which handles transactions with iTunes users on the front end and manages a large enterprise database. Over 1.4 million lines of java. Identify relevant files and functions for the various claims, debug the code, plant breakpoints, caption and print stack traces, identify what the program was doing and identify specific lines of code for potential infringement. Conducted extensive source code review of Apple iTunes application to determine potential infringement of playlist technology. Determined the exact manner of iTunes operation for playlist management in the form of stack traces, documented significance of breakpoints to infringement arguments

Disposition: Settled.
Date: 2006-2007.
Contact: Joe Vanek, Vanek, Vickers & Massini, 312.224.1502

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Quarles & Brady
Case Name: Case settled before being filed.

Patents at issue:

- 5,693,902 — Audio block sequence compiler for generating prescribed duration audio sequences
- 5,877,445 — System for generating prescribed duration audio and/or video sequences

Services Provided: **Testifying expert** – music composition, software architecture, digital audio. Software analysis of Sony Corporation of America product Cinescore 1.0. Reviewed Cinescore 1.0 for potential infringement of patents relating to

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automatic composition of music. The patents covered a method of music composition by audio segment concatenation. Drafted potential infringement report.

Disposition: Settled.
Date: 2007.
Contact: David R. Cross, Quarles & Brady 414.277.5669

Expert Engagement:

Type of Matter: Patent litigation support
Firm: S-Systems, Inc.
Case Name: Digeo, Inc. v. Audible, Inc., Case No. C05-00464-JLR, Seattle.
Patent at issue:

- 5,734,823 — Systems and apparatus for electronic communication and storage of information

Services Provided: **Consulting expert:** software architecture, digital audio. Analysis of a large (over 13,000 files) C++ project that implemented a Windows .NET application to perform management of audio content, encryption, audio downloading from the Internet, and device integration for handheld players. The assignment was to determine whether the application could be shown to infringe patent claims. I was tasked to identify the relevant files, compile them, correct program errors and create workarounds so that the executing application could be evaluated, evaluate the execution of the code, plant breakpoints, walk the stack, identify what the program was doing and identify specific lines of code for potential infringement.

Disposition: Settled.
Date: 2006.
Contact: Please contact Gareth Loy for information about this reference.

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: Wilmer Hale
Case Name: Information Technology Innovation, LLC v. Motorola, Inc. et al.
Patent at issue:

- 4,796,194 — Real world modeling and control process
 - A process for modeling a manufacturing plant

Services Provided: **Testifying expert for infringement:** software architecture. Wrote infringement report evaluating a 1300-line Fortran 77 software program dating from 1986. Project required me to compile and run the software, which involved identifying numerous bugs in the code and providing workarounds so that the code could be evaluated at runtime.

Disposition: Settled.
Date: 2006.
Contact: John Hintz: John.Hintz@WilmerHale.com

Expert Engagement:

Type of Matter: Patent litigation
Law Firm: McDermott, Will & Emery
Case Name: Audio MPEG, Inc. v. Creative Labs, Inc., Creative Holdings, Inc., and Creative Technology Ltd., Case No. 2:05CV185--JBF-FBS
Patents at issue:

- Rault et. al., 5,214,678 — Digital transmission system using subband coding of a digital signal
- Lokhoff 5,777,992 — Decoder for decoding and encoded digital signal

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- and a receiver comprising the decoder
- Lokhoff 5,323,396 — Digital transmission system, transmitter and receiver for use in the transmission system
- Lokhoff 5,539,829 — Subband coded digital transmission system using some composite signals
- Grill et al. 5,579,430 — Digital encoding process
 - A digital coding process for at least one of transmitting and storing acoustical signals

Services Provided: **Testifying expert:** Mathematics of MPEG/MP3 audio, subband coding, frame size, intensity stereo. Detailed claims analysis. Wrote numerous reports regarding the mathematics of MPEG/MP3 encoding/decoding process. Researched the history of the development of this highly mathematical discipline from its origins in the short time Fourier transform through its modern implementations by Fraunhofer and others.

Disposition: Settled.

Date: 2005 – 2006.

Contact: Robert Blanche, Chris Bright, Lucy Koh: 650.813.5133

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Weil, Gotshal, Manges

Case Name: Seer Systems, Inc. v. Beatnick, Inc. & Microsoft Inc., Case No. C 03 4636 JSW (EDL), Northern District of California, San Francisco Division, Judge: Hon. Jeffrey S. White.

Patent at issue:

- 5,886,274 — System and method for generating, distributing, storing and performing musical work files

Services Provided: **Testifying expert:** music composition systems, MIDI, networking. **Deposition** taken. Developed and presented **Markman tutorial** presented before Judge White.

Disposition: Settled.

Date: 2004.

Contact: Jared Bobrow: 650.802.3034, Perry Clark: 415-439-1938

Expert Engagement:

Type of Matter: Patent litigation

Law Firm: Orrick, Herrington, Sutcliffe

Case Name: Aureal Semiconductor, Inc. v. Creative Technology Ltd., et al., Northern Dist. of Cal, Civil Action No. C98-4550 MHP

Patent at issue:

Services Provided: **Testifying expert:** regarding a means of rendering 3D digital audio.

Disposition: Dismissed.

Date: 1999 – 2000.

Contact: Lisa-Marie Schull (State Bar 196132)

Expert Engagement:

Type of Matter: Trademark infringement

Law Firm: Buchalter Nemer Fields & Younger

Case Name: Industrial Indemnity Co. v. Apple Computer, Inc.

Services Provided: **Testifying expert:** digital audio and music technology
Deposition taken; **testified at trial.** Presented several demonstrations of Apple

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Computer music and audio technology to the jury.
Three days of jury testimony under oath.
Disposition: Won on appeal.
Date: 1994 – 1995.
Contact: Stephen Sommerhalter: ssommerhalter@buchalter.com (retired)



Consulting Engagement:

Client: Buchla & Assoc.
Services Provided: Developed software architecture and implemented all software for the Buchla 259e Programmable Complex Waveform Generator. Features include: dual digital oscillators (modulating and carrier) with various waveforms, FM, AM, waveshaping, soft and hard sync, MIDI control, presets, control panel, knobs, switches and control voltages. (See <http://www.buchla.com> and search for 200e and 259e). C/C++

Consulting Engagement:

Client: Chromatic Research (bought by ATI Technologies)
Services Provided: Algorithm development for audio synthesis and processing on MPACT1 DSP.

Consulting Engagement:

Client: Frox, Inc.
Services Provided: Architected, developed, debugged, implemented, and shipped an ambitious multi-DSP digital home entertainment system

Consulting Engagement:

Client: Philips Semiconductor
Services Provided: Developed and licensed a custom C++ MSDEV application software to Philips that documented a large instruction set for a 64-bit media processor from the machine description sources. Developed a separate program to verify the correctness of the pseudocode implementation of all instructions

Consulting Engagement:

Client: Equator Technologies
Services Provided: Extended their C/C++ compiler to automatically document Equator's Application Programming Interface (API) source code for their DSP, written in C

Consulting Engagement:

Client: Raza Microelectronics
Services Provided: Wrote the XLR Programmer's Reference Manual for the XLR family of Threaded Processors

Consulting Engagement:

Client: Pixim, Inc.
Services Provided: Created Developer's Guide documenting features, architecture, theory of operation, hardware, software and firmware for advanced wide dynamic range video camera sensor technology

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Consulting Engagement:

Client: Philips Semiconductor
Services Provided: Wrote Ethernet MAC chapter for new TriMedia processor architecture document

Consulting Engagement:

Client: Cradle Technologies
Services Provided: Developed design kit guide for their Hammerhead videoconferencing system including development system setup, chip architecture, software APIs, software development tools, and debugging

Consulting Engagement:

Client: Siemens Microelectronics
Services Provided: Data book for the TriCore TC10 embedded processor. User guides for TriCore simulators

Consulting Engagement:

Client: Infineon Technologies
Services Provided: Data book for Infineon MPSystem, a single-core 32-bit microcontroller DSP architecture for real-time embedded systems

Consulting Engagement:

Client: Zoran Corporation
Services Provided: User guide for Vaddis ZR36730 Integrated DVD Decoder chip

Consulting Engagement:

Client: Dolby Laboratories
Services Provided: Market evaluation for consumer application of AC3 encoding

Consulting Engagement:

Client: Sony, Inc.
Services Provided: User Guide for the Sonoma Digital Audio Workstation

Consulting Engagement:

Client: Malleable Technologies
Services Provided: Architecture documents and data sheets for VoIP DSP core

Consulting Engagement:

Client: C-Cube Microsystems
Services Provided: Ziva-Kit DVD decoder architecture documents, and white papers on DVD decoding algorithms

Consulting Engagement:

Client: TriMedia Technologies, Inc.
Services Provided: Several chapters of the TM1100 and TM1300 Data Books, including the audio and video I/O subsystems, memory management system, and instruction compression

Consulting Engagement:

Client: BOPS, Inc. ("Billions of Operations Per Second, Inc.")
Services Provided: C/C++ optimizing compiler for their scalable multi-DSP processor system

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Consulting Engagement:

Client: SeaSound, LLP
Services Provided: User Guide for the SeaSound Solo digital audio processing system

Consulting Engagement:

Client: Palm, Inc.
Services Provided: C++ Generic Conduit Guide

- Member, Association of Computing Machinery (ACM)
- Member, Institute of Electrical and Electronics Engineers (IEEE)
- Member, International Computer Music Association (ICMA)
- Member, Audio Engineering Society (AES)
- Management Incentive Award, UCSD (1988)
- Fellow, Deutscher Akademischer Austauschdienst (DAAD), Berliner Künstlerprogramm, Berlin (1986)
- Bourges Prize, Digital Electroacoustic Music category (1981)
- National Endowment for the Arts grant recipient (1981)

1. Loy, Gareth, “Life and Times of the Samson Box”, *Computer Music Journal*, Fall 2013, 37(3), Pages 26-48.
2. Loy, Gareth, “The Systems Concepts Digital Synthesizer: An Architectural Retrospective”, *Computer Music Journal*, Fall 2013, 37(3), Pages 49–67.
3. Loy, Gareth, “Mars in 3D”, *Computer Music Journal*, Fall 2013, 37(3), Pages 101–103.
4. Loy, Gareth, [*Musimathics — The Mathematical Foundations of Music, Vol. 2*](#), Cambridge: MIT Press. 2007. Reprinted with corrections 2013.
5. Loy, Gareth, [*Musimathics — The Mathematical Foundations of Music, Vol. 1*](#), Cambridge: MIT Press. 2006. Reprinted with corrections 2011.
6. Loy, Gareth and John Snell, “[Stephen Travis Pope: Ritual and Memory](#)”, *Computer Music Journal* 34(3), Fall 2010. Record review.
7. Loy, Gareth, “[The CARL System: Premises, History, and Fate](#),” *Computer Music Journal* 26(4), Winter 2002.
8. Eric Lyon, Max Mathews, James McCartney, David Zicarelli, Barry Vercoe, Gareth Loy and Miller Puckette, “[Dartmouth Symposium on the Future of Computer Music Software: A Panel Discussion](#)”, *Computer Music Journal*, 26(4), Winter, 2002.
9. Loy, Gareth, “The Frox Digital Audio System,” *Proceedings of the International Computer Music Conference* (San Jose), San Francisco: International Computer Music Association, 1992.
10. Todd, P. and Loy, Gareth, eds., [*Music and Connectionism*](#), Cambridge: MIT Press, 1991.
11. Loy, Gareth, “[Connectionism and Musiconomy](#)”, *Music and Connectionism*, P. Todd and G. Loy, eds., Cambridge: MIT Press, 1991.
12. Loy, Gareth, “[Composing with computers — a survey of some compositional formalisms and](#)

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- [programming languages for music](#),” *Current Directions in Computer Music*, Max Mathews, John Pierce, eds., Cambridge: MIT Press, 1990.
13. Loy, Gareth, “Second Special Issue on Parallel Distributed Processing and Neural Networks”, *Computer Music Journal*, 13(4), Winter 1989.
 14. Loy, Gareth, “Special Issue on Parallel Distributed Processing and Neural Networks”, *Computer Music Journal*, 13(3), Fall 1989.
 15. Loy, Gareth, “On the scheduling of parallel processors executing synchronously,” *Proceedings of the International Computer Music Conference*, San Francisco: International Computer Music Association, 1987.
 16. Loy, Gareth, “[Whither MIDI](#),” *Computer Music Journal*, 11(1): 9-12, 1987.
 17. Loy, Gareth, “Designing a computer music workstation from musical imperatives,” *Proceedings of the International Computer Music Conference*, San Francisco: International Computer Music Association, 1986.
 18. Loy, Gareth, “Player — Tutorial Introduction,” Technical Memorandum, UCSD: Center for Music Experiment, 1986.
 19. Loy, Gareth, “Player — an experimental music composition language with real-time capabilities” *Proceedings of the International Computer Music Conference (Rochester)*, Computer Music Association, San Francisco, 1983.
 20. Loy, Gareth and Abbott, Curtis, “[Programming languages for computer music synthesis, performance, and composition](#),” *ACM Computing Surveys*, 17(2), June, 1985. Also published in Japanese by the *ACM Computing Surveys in Bit*.
 21. Loy, Gareth, “[About AUDIUM: an interview with Stanley Shaff](#),” *Computer Music Journal*, 9(2): 41–48, 1985. Interview.
 22. Loy, Gareth, “[Musicians make a standard: the MIDI phenomenon](#),” *Computer Music Journal*, 9(4): 8–26, 1985.
 23. Loy, Gareth, “[Curtis Roads and John Strawn, editors: Foundations of computer music](#),” *Computer Music Journal*, 9(3): 80–81, 1985. Book review.
 24. Loy, Gareth, “Designing an operating environment for a real-time performance processing system,” *Proceedings of the International Computer Music Conference (Vancouver)*, San Francisco: International Computer Music Association, 1985.
 25. Loy, Gareth, “MIDI: a critical overview,” Acoustical Society of America, Invited paper for Musical Acoustics III: Real-Time Music Synthesizers, Abst.: *JASA Suppl.* 77(1): S74, 1985.
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 27. Loy, Gareth, “Player — extensions to the C programming language for parallel processing run-time music synthesis control,” *Proceedings, MIDISOFT*, San Francisco, 1984.
 28. Loy, Gareth, “[Allen Strange: Electronic music — systems, techniques, and controls, 2nd edition](#),” *Computer Music Journal*, 7(4): 60–61, 1983. Book review.
 29. Loy, Gareth, “Applications of digital signal processing in computer music,” Acoustical Society of America, Invited paper, Special Plenary Session: “Applications of Signal Processing in Acoustics”, Abst., *JASA Suppl.*, 74(1): S36, 1983.
 30. Loy, Gareth, “[The composer seduced into programming](#),” *Perspectives of New Music*, 19(1): 184–198, 1982.
 31. Loy, Gareth, “A sound file system for UNIX,” *Proceedings of the International Computer Music Conference (Venice, Italy)*, San Francisco: International Computer Music Association, 1982.
 32. Loy, Gareth, “System design for computer music at the Computer Audio Research Laboratory,

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- UCSD,” IEEE 1982 Region VI Conference, Invited paper for the session on Computer Systems and Applications, San Diego, 1982.
33. Loy, Gareth, “[Notes on the implementation of MUSBOX, a compiler for the Systems Concepts Digital Synthesizer](#),” *Computer Music Journal*, 5(1): 13–33, 1981.
 34. Loy, Gareth, [Nekyia](#), Ann Arbor, Michigan: University Microfilms, 1980. Stanford University Department of Music DMA thesis.
 35. Loy, Gareth, “Systems Concepts Digital Synthesizer operations manual and tutorial,” Stanford University Report STAN-M-6, Stanford University: Department of Music, 1980.
 36. Loy, Gareth, “[Sonic landscapes, electronic and computer music by Barry Truax, and Studies for trumpet and computer by Dexter Morrill](#),” *Computer Music Journal*, 2(1): 60–61, 1978. Record review.
 37. Loy, Gareth, “[New directions in music — Significant contemporary works for the computer](#),” *Computer Music Journal*, 2(4): 6–8, 1978. Record review.
 38. Loy, Gareth, “The Dartmouth digital synthesizer, electronic music by Jon Appleton, Lars-Gunnar Bodin, Russell Pinkston & William Brunson,” *Computer Music Journal*, 1(2): 61, 1977. [Table of Contents](#).
 39. Loy, Gareth, “Studio report, CCRMA, Stanford University,” *Proceedings of the International Computer Music Conference* (UCSD), San Francisco: International Computer Music Association, 1977.
 40. Loy, Gareth, “The all-digital recording studio at Stanford University,” *Proceedings of the International Computer Music Conference* (MIT), San Francisco: International Computer Music Association, 1976.

-
- 2011 “Music, Expectation, and Information Theory”, lecture delivered to the American Association for the Advancement of Science (AAAS) conference, San Diego, CA, June 14, 2011.
 - 2011 “Software Discovery — Best Practices”, lecture delivered with Tom Gafford to the IEEE CNSV, Sunnyvale, CA, May, 2011.
 - 2009 “Introduction to the Mathematics of Music” Private lecture, Fairfax, CA, February 2009.
 - 2007 “A Brief History of Musical Scales.” Lecture presented to the Ear Club, Psychology Dept., University of California, Berkeley, February, 2007.
 - 2007 “Musical Scale Builders — the First Psychoacousticians.” Lecture presented to the Hearing Seminar, Center for Computer Research in Music and Acoustics (CCRMA), Stanford University, Stanford, CA, May, 2007.
 - 2007 “Music, Expectation, and Information Theory.” Lecture presented to the Music and Human Behavior conference, Stanford Graduate Summer Institute 2007 (SGSI07) held at CCRMA, Stanford University, Stanford, CA, facilitated by Vinod Menon and Jonathan Berger, September 2007.
 - 2007 “Information Theory and Expectation in Music.” Lecture presented to the NSF Integrative Graduate Education and Research Traineeship Program (IGERT) seminar series at UCSB, November 30th, 2007, facilitated by Stephen Travis Pope and Curtis Roads.
 - 2006 “The Grand Story of Musical Scales.” Tutorial presented to the Audio Engineering Society 121st Convention, San Francisco, August, 2006.

EXHIBIT B
MATERIALS CONSIDERED

1. U.S. Patent 8,214,873 (Ex. 1001) and its file history
2. U.S. Patent Application to Bi US 2002/0087996 A1 (Ex. 1012)
3. U.S. Patent to Erikson US 6,622,018 B1 (Ex. 1013)
4. U.S. Patent to Janik US 2003/0045955 A1 (Ex. 1011)
5. Declaration by V. Michael Bove dated 9/19/2013 (Ex. 1002)
6. Deposition transcript of V. Michael Bove, dated 5/29/2014 (Ex. 2012)
7. Yamaha's Petition IPR2013-00598
8. Patentee's Preliminary Response in IPR2013-00598
9. Institution Decision (Paper 19)
10. Microsoft Media Player 9 Series, © 2000-2002 Microsoft Corporation (Ex. C, hereto)
11. Getting started with Windows Media Player - Windows Help.pdf (Ex. D, hereto)
12. A Brief History of iPod.pdf (Ex. E, hereto)
13. P | Broadcast Dictionary.pdf (Ex. F, hereto)
14. IR Remote Control Primer - Phidgets Support.pdf (Ex. G, hereto)
15. HowStuffWorks Inside a TV Remote Control.pdf (Ex. H, hereto)
16. Welcome to IrDA.pdf (Ex. I, hereto)
17. Infrared Data Association - Wikipedia, the free encyclopedia.pdf (Ex. J, hereto)
18. Pocket PC 2002 - Wikipedia, the free encyclopedia.pdf (Ex. K, hereto)
19. Smartphone - Wikipedia, the free encyclopedia.pdf (Ex. L, hereto)

20. A&M Records, Inc. v. Napster, Inc. - Wikipedia, the free encyclopedia.pdf (Ex. M, hereto)
21. Thin client - Wikipedia, the free encyclopedia.pdf (Ex. N, hereto)

EXHIBIT C

Windows Media Player

Hide

Back

Forward

Print

Options

Contents

Index

Search

Type in the word(s) to search for:

rip

List Topics

Display


Select topic: Found: 4

Title	Location	Rank
To copy tracks from...	Windows ...	1
Using CDs	Windows ...	2
Copying music from ...	Windows ...	3
Using the Player	Windows ...	4

☐ Search previous results

☒ Match similar words

☐ Search titles only



Copying music from CDs

Copying ([ripping](#)) tracks from CDs to **Media Library** is easy, and you can even listen to your CD while you are copying. The type of CD you are trying to copy and the speed of your CD-ROM drive can affect the quality of the copy. Although copying information from a CD, you may not get an exact copy. For example, you may notice some minor flaws in the tracks in the audio. This is normal and is caused by the method your CD-ROM drive uses to read information from the disc. Attempts to correct this if the [error correction](#) check box is selected, but you may still notice very minor flaws.

If the **Copy protect music** check box is selected when you copy the tracks, the tracks that you copy from a CD are protected. You are required to play these tracks. The license allows you to play back copied tracks on the computer, copy tracks to a [portable device](#), and copy tracks to a CD.

Note that you should back up your licenses to a floppy disk periodically. If you reinstall or upgrade the operating system, your protected files, your licenses might be lost.

If you want to listen to a CD while you are copying its tracks, you must configure the Player to use digital copy protection. If the player is configured, there is still a chance you will not be able to listen to your CD while you are copying tracks to your speakers.

Notes

- The Player adds volume leveling values to tracks when you copy them.
- Your hardware (CD-ROM drive and speakers) determines whether you can copy and listen to tracks by using digital copy protection settings that work best with your hardware.

This section covers:

- [To copy tracks from an audio CD](#)
- [To copy CDs in succession](#)
- [To change the folder where your audio files are stored](#)
- [To turn off content protection when copying CDs](#)
- [To use digital copying](#)
- [To specify the information that appears in a track file name](#)
- [Compressing copies of CD tracks to use less disk space](#)

Related topics

- [Using CDs](#)
- [Using volume leveling](#)
- [Setting options for copying CDs](#)
- [Understanding licensed files](#)
- [To change CD recorder drive settings](#)

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EXHIBIT D

Player Library

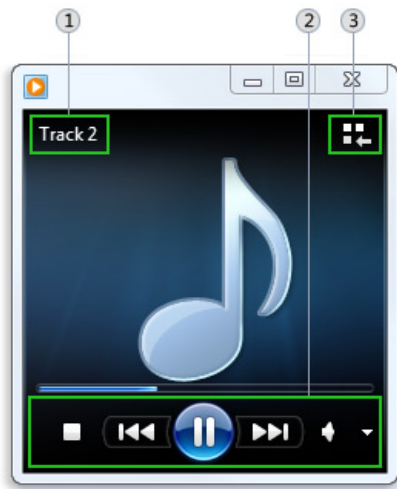
In the Player Library, you can access and organize your digital media collection. Within the navigation pane, you can choose a category, such as Music, Pictures, or Videos, to view in the details pane. For example, to see all of your music organized by genre, double-click **Music**, and then click **Genre**. Then, drag items from the details pane to the list pane to create playlists, burn CDs or DVDs, or sync to devices, such as portable music players.

As you move between the various views in the Player Library, you can use the Back and Forward buttons in the upper-left corner of the Player to retrace your steps.



Back and Forward buttons

In Now Playing mode, you can view DVDs and videos or see what music is currently playing. You can decide to view only the currently playing item, or you can right-click the Player, and then click **Show list** to view a selection of available items.



- ① Media information
- ② Playback controls area
- ③ Switch to Library button

Now Playing mode

To find out more about the tasks you can perform in the Player Library and in Now Playing mode, click the links under the following sections:

Player Library

Use the Player Library to do any of the following:

-
-
-
-
-
-

Now Playing

Use Now Playing mode to do any of the following:

-
-
-

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Play from the taskbar

You can also control the Player when it's minimized. You can play or pause the current item, advance to the next item, and go back to the previous item using the controls in the thumbnail preview. The thumbnail preview appears when you point to the Windows Media Player icon on the taskbar.

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Build a media library

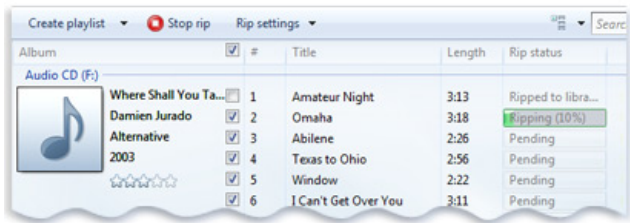
Windows Media Player looks for files in specific Windows libraries on your computer to add to the Player Library: Music, Videos, Pictures, and Recorded TV.

To build your media library, you can include folders in the libraries from other locations on your computer or external devices, such as a portable hard drive. For more information about adding files to the Player Library, see [Add items to the Windows Media Player Library](#).

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Rip CDs to create digital music files

You can add music to the Player Library by using your computer's CD drive to copy CDs and store them on your computer as digital files. This process is known as **ripping**.



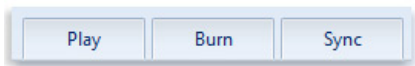
Ripping a music CD

For more about ripping CDs, see [Rip music from a CD](#).

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Use tabs to complete key tasks

The tabs at the top right of the Player open the list pane in the Player Library, making it easier for you to focus on specific tasks, such as creating playlists of your favorite songs, burning custom song lists to a recordable CD, or syncing playlists in your media library to a portable media player.



Play, Burn, and Sync tabs

To get started, click the tab that corresponds to the task you want to perform in the Player Library. To hide the list pane, click the tab that is currently open.

To find out what you can do on each tab, click the links under the following sections:

Play

The list below the Play tab reflects the items currently playing and the items you've selected to play in the Player Library. For example, if you selected a specific album to play, the entire album will appear in the Play tab.

You can also use the Play tab to create and save custom playlists. For more information about creating playlists, see [Create or change a regular playlist in Windows Media Player](#).

Burn

If you want to listen to a mix of music while you're away from your computer, you can burn CDs containing any combination of music. For example, you can burn audio CDs with the Player and play them in any standard CD player. Use the Burn tab to do any of the following:

-
-



Burning a CD


Sync

You can use the Player to sync music, videos, and pictures to a wide range of portable devices, including portable media players, storage cards, and some mobile phones. To do this, just connect a supported device to your computer and the Player will select the sync method (automatic or manual) that is best for your device. Then, you can sync files and playlists in your Player Library to your device. Use this tab to do any of the following:

-
-

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If you're having trouble using Windows Media Player, you can try using the Windows Media Player Settings troubleshooter to automatically find and fix some common problems.

Open the Windows Media Player Settings troubleshooter by clicking the **Start** button , and then clicking Control Panel. In the search box, type **troubleshooter**, and then click **Troubleshooting**. Click **View all**, and then click **Windows Media Player Settings**.

Need more help?

See all support pages for [music, photos, & video](#).

Ask a question in the [community forums](#).

Hello from Seattle. United States of America

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EXHIBIT E



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Instant Expert: A Brief History of iPod

BY DENNIS LLOYD • SATURDAY, JUNE 26, 2004



[2001](#) | [2002](#) | [2003](#) | [2004](#) | [What's Changed](#) | [iPod Sales](#) | [Global iPod Availability](#) | [iPod Trivia](#)

As the pace and importance of iPod announcements have accelerated in recent days, iLounge has taken this opportunity to assemble an "instant expert" guide to the history of Apple's popular device. **For an updated version of this article, please [Download the iLounge 2007 iPod Buyers' Guide](#).**

Key Milestones in the Life of the iPod

2001

January 9, 2001 Apple introduces iTunes for the Macintosh, a program that converts audio CDs into compressed digital audio files, organizes digital music collections, and plays Internet radio.

October 23, 2001 Apple unexpectedly announces the first iPod (codename Dulcimer) at a price of \$399. Unlike most (but not all) competing digital audio players available at the time, Apple relies on a hard disk for storage instead of flash memory or interchangeable CD-ROMs, and uniquely focuses on promoting the small size, power, and ease of use of its device. The first iPod has a 5 GB storage capacity - enough for over 1,000 songs - and works only on

Macs, using iTunes as a music organization and CD-to-iPod conversion tool. Did Apple release iTunes with the iPod in mind? According to an official Apple timeline, development of the iPod began only six months earlier. **November 10, 2001** Apple ships the first iPod. **Mid-November, 2001** Third-party developers begin to write workaround software that lets the iPod work with PCs. While first demo versions of the software are available in January of 2002, final versions won't emerge until June of 2002. **December 31, 2001** By the end of 2001, Apple has sold a total of 125,000 iPods.



2002

March 20, 2002 Apple announces a 10GB / 2,000 song update to the iPod for \$499. Taking a cue from crafty third-party developers, Apple ships new iPods with the ability to display business card-like contact information, a feature that makes some wonder about future PDA-like expansion of the iPod's abilities. As of this date, the iPod is still a Mac-only product, though workaround programs for PCs are circulating and largely functional.

July 17, 2002 Apple makes four major announcements. First, PC versions of the iPods are unveiled, including MusicMatch software instead of iTunes. Second, a 20GB iPod is introduced. Third, 10GB and 20GB models now sport a new touch-sensitive Scroll Wheel instead of an actual moving wheel, which was easier to damage. And finally, iPod prices are lowered: 5GB drops to \$299, 10GB drops to \$399, and the 20GB model sits at \$499. However, all iPods at this point still require users to have computers with FireWire connectivity ports, which are faster than competing USB ports but far less common on PCs.

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October, 2002 By this point, retailers Best Buy, Dell, and Target have all started to sell iPods. Sensing the appeal of high-capacity music players, Creative releases the Nomad Zen Jukebox as a cheaper but larger competitor to the iPod. **December, 2002** Apple unveils its first and only limited edition iPods, with either Madonna's, Tony Hawk's, or Beck's signature engraved on the back for an additional \$49. (Another iPod featured the engraved logo of rock band No Doubt.) At a total price of \$548, these limited edition iPods were the most expensive ever sold by Apple.

2003

March, 2003 Microsoft announces Media2Go portable video and audio players, originally targeted for a holiday 2003 release. The players will eventually be renamed Windows Portable Media Centers, deemed Microsoft's "iPod killer," and delayed until late 2004. **April, 2003** Dell, which has been offering aggressive discounts on the iPod, temporarily stops selling the device after failing to renew its reseller agreement with Apple, but then renews.

April 28, 2003 Big news: Apple unveils the updated "third-generation" iPod and the iTunes Music Store for Mac users. The new iPods are thinner and smaller than before, feature a bottom Dock Connector port rather than a top-mounted FireWire port, and have entirely touch sensitive controls. Each new iPod has a higher capacity than the previous generation model it replaces by price point: new 10GB / 2,000 song (\$299), 15GB / 3,700 song (\$399) and 30GB / 7,500 song (\$499) models are available. All third-generation iPods now work on either Macs or PCs. Apple's iTunes Music Store launches with 99 cent per track / \$9.99 per album pricing and a library of 200,000 songs, but isn't yet available for PC users.



May 1-4, 2003 Retailers begin to sell third-generation iPods, and one week after launching the Mac iTunes Music Store, Apple has sold 1,000,000 songs. **June 19, 2003** Taking advantage of the iPods' proprietary (and FireWire/USB agnostic) Dock Connector port, Apple releases Dock Connector-to-USB 2.0 cables and drivers for third-generation iPods, expanding the range of PCs that can connect to the devices. **June 23, 2003** Apple sells the one millionth iPod, more than a year and a half after the release of the device. **September 8, 2003** Apple refreshes the middle and top of the third-generation iPod line with higher storage capacities at familiar pricing. A 20GB / 5,000 song (\$399) model replaces the 15GB version, and a 40GB / 10,000 song (\$499) model replaces the 30GB version introduced in April. Apple also announces that it has sold 10,000,000 songs through the iTunes Music Store since launch. **October 16, 2003** Apple releases both iTunes and the iTunes Music Store for U.S.-based PC users, phasing out support for MusicMatch PC software in the process. Belkin and Apple jointly announce voice recording and digital photo storage peripherals for the iPod, further and more tangibly expanding the unit's capabilities past music playback. Apple also announces total sales of 13,000,000 songs via iTunes since launch.



October 27, 2003 Running a month behind its expected launch date, Dell announces the Digital Jukebox (DJ) as a cheaper competitor to the iPod, and partners with MusicMatch to offer a music downloading service. (By December, Dell will announce that it has permanently stopped reselling iPods to focus on the DJ.) **November, 2003** Complaints about iPod battery problems reach a fever pitch as the 'iPod's Dirty Little Secret' video spreads across the Internet. Apple subsequently publicizes a cheaper battery replacement alternative for existing users.

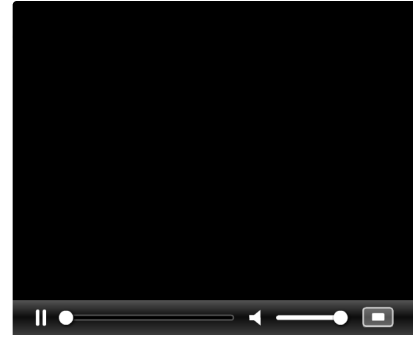
2004



○ ○ ○ ○ ○



January 6, 2004 Apple debuts the iPod mini, a diminutive 4GB version of the iPod available in five colors at \$249. Despite an impressive simplifying redesign of the iPod's control scheme and casing, critical opinion of the device is initially mixed because of price and capacity concerns. Apple simultaneously replaces the \$299 10GB entry-level iPod with a 15GB model, and retailers almost immediately discount the discontinued 10GB model to \$249, further clouding the value equation.



January 6, 2004 Apple announces the sale of the two millionth iPod, less than six months after hitting the one million mark. **January 8, 2004** In an entirely unexpected move, personal computer heavyweight Hewlett-Packard announces at the Las Vegas Consumer Electronics Show that it will license the iPod from Apple rather than develop a competing product. HP CEO Carly Fiorina promises to release and sell a "HP blue"-colored iPod by Summer, and agrees to market iTunes to its PC customers almost immediately. **February 17-20, 2004** Apple ships its first iPod minis starting on Tuesday, and long lines form at stores for its official Friday on-sale date. Sell-outs and near-sell-outs are reported nationwide, and critical opinion quickly turns in the device's favor. **March 25, 2004** Apple pushes back the international release of the iPod mini from April to July, citing "much stronger than expected demand" from U.S. customers. Analysts report shortages of the miniature hard drives required by Apple. **May 5, 2004** Apple announces the sale of the three millionth iPod, only four months after hitting the two million mark. Analysts widely acknowledge the iPod as the digital audio market's dominant hardware format, and begin to de-emphasize references to cheaper competitors. **June 15, 2004** Apple releases the iTunes Music Store in three European markets: France, Germany, and the United Kingdom. One week later, 800,000 songs have been sold to European customers, 450,000 in the UK alone. **July 11-12, 2004** The iTunes Music Store sells its 100,000,000th downloaded song at approximately 1:25AM Eastern Standard Time, July 12 (or 10:25PM Pacific Standard Time, July 11), the first legal music download service to hit that milestone. Thanks to an Apple contest offering a 17" PowerBook laptop computer, 40GB iPod and iTunes gift certificate for 10,000 songs (total estimated value: \$13,200) to the person who purchased the 100,000,000th song, approximately 40,000 songs (total estimated value: \$39,600) were sold in just the ten minutes before the milestone was reached. **July 17, 2004** Leaked by Newsweek magazine two days before Apple's expected official announcement, the first photograph of the fourth-generation iPod appears on the Internet, depicting a hybrid of the third-generation iPod's white casing with the Click Wheel controls from the iPod mini. **July 19-20, 2004** Officially announced by Apple on July 19, the fourth-generation iPod is physically thinner than the third-generation iPod but remains larger than the iPod mini, boasts improved battery life (12 hours), iPod mini-style Click Wheel controls, and small software tweaks such as a main menu randomized (shuffle) playback feature. Called lower-cost iPods, prices for the new low-end (20GB, \$299) and mid-range (40GB, \$399) units look like \$100 drops from prior models until consumers discover that \$100 worth of pack-ins (Docks, remote controls, and cases) have been stripped from their packages. The fourth-generation iPods also lack some widely rumored features, including a 60GB version and a color screen to display digital photographs. Buzz remains significant and first units begin to appear by the 20th. **July 21, 2004** Apple adds three top European independent labels to the iTunes catalog, placating the few remaining critics of iTunes. **July 24, 2004** Apple releases the iPod mini worldwide, behind schedule but still early enough to excite people around the world. Sell-outs are reported in several countries, including Japan. **July 26, 2004** Motorola announces that its next generation of cellular phones will be iTunes-compatible. In response to Apple's earlier public rebuffing, RealNetworks releases a music technology called Harmony, enabling songs sold by Real through its own music store to be played back on iPods (and other devices) without Apple's permission. **August 5, 2004** Apple announces total sales of 3.7 million iPods. **August 10, 2004** The iTunes Music Store library hits 1,000,000 songs. **August 25, 2004** Apple quietly begins to search for wireless and video experts to join its iPod division. **August 27, 2004** Hewlett-Packard announces the "Apple iPod from HP" (or "iPod+hp"), a repackaged version of the 4G iPod with new manuals and HP-supplied technical support. Promising availability by September 15, HP begins to ship units almost immediately, and announces an iPod-compatible printer and "printable tattoos" to cover iPods. **August 31, 2004** Apple announces that it has 58% market share of the U.S. digital music player business, and plans a pan-European iTunes for October. **September 1, 2004** iTunes hits 125 million downloaded songs. Apple releases the iMac G5, which is now being marketed as a computer "from the creators of iPod." **September 7 - October 4, 2004** Microsoft's unofficial anti-iPod public relations offensive starts. Chairman Bill Gates says in an interview that the iPod would have been easy for Microsoft to make. Next, while Internet-based viruses plague Windows PCs, Microsoft announces that the next Windows version will prevent iPods from unleashing viruses on PCs, though no such iPod attack has been reported. Finally, CEO Steve Ballmer publicly calls iPod users music thieves, claiming that Microsoft offers better copy protection. He later apologizes. **October 12-14, 2004** Analysts report that iPod sales are 82% of all digital music players and 92% of all hard-drive based players; nearest hard drive competitor Creative has 3.7%. Over 2,000,000 iPods were shipped in the prior 3 months alone, and iTunes downloads hit 150,000,000, a rate of 4 million downloads per week. **October 26, 2004** Apple debuts the iPod photo, a new version of the fourth-generation iPod that's capable of displaying digital photographs and album art on its built-in color screen. Sold in 40GB (\$499) and 60GB (\$599) capacities, the iPod photo is physically identical to the fourth-generation iPod, only slightly thicker, and includes most of the pack-ins (Dock and case) that disappeared from iPod boxes in July. It also includes a "photo Dock" and AV cable for displaying digital photos on a television, as well as an evolved, colorized interface for using the iPod's music playback features. On the same day, and following considerable Apple co-promotion of a U2 song called Vertigo, Apple introduces the U2 iPod Special Edition (\$349), a 20GB fourth-generation iPod with a shiny black front casing, red Click Wheel, and U2-engraved rear metal casing. The U2 iPod includes a \$50 coupon towards the purchase of a \$149 Apple-innovated "digital box set" called The Complete U2, but not a copy of U2's latest album as was widely rumored before the product's launch. Apple notes sales of nearly 6 million iPods to date.

How Have iPods Changed?

Obvious differences in size, thickness, and materials aside, the iPod has gone through a number of changes since its debut in 2001. While the first-generation (1G) and second-generation (2G) iPods featured a FireWire data port up top next to the headphone port and hold switch, this data port was removed from the top of third-generation (3G) iPods, fourth-generation (4G) iPods, iPod minis and iPod photos in favor of a bottom-mounted Dock Connector port.

Placement of the four Menu/Play/Forward/Reverse buttons also changed; the original collection of four curved buttons surrounded the 1G and 2G iPods' Scroll Wheels, but were transformed into circular buttons above the Scroll Wheel for the 3G iPod, and then integrated into the Click Wheel of the iPod mini, 4G iPod, and iPod photo, beginning with the iPod mini.

Finally, the wheel mechanism itself has changed: while the 1G iPod used a wheel that physically moved, each subsequent iPod has used a touch-sensitive circle that emulates the movement of a wheel - a subtle,

yet unquestionably superior design.



iPod Boxes and Pack-ins

Though the prices and capacities of iPods are their most often touted differences, each generation of iPods has featured different pack-ins that can add extra value for the dollar. On the hardware side, Apple's decision to include remote controls, carrying cases, and eventually Docks with premium-priced iPods initially offset those higher prices, though changes to the iPod line-up in mid-2004 muddled this equation somewhat. On the software side, the replacement of PC-ready MusicMatch with the Windows version of iTunes makes newer iPods even easier to enjoy.



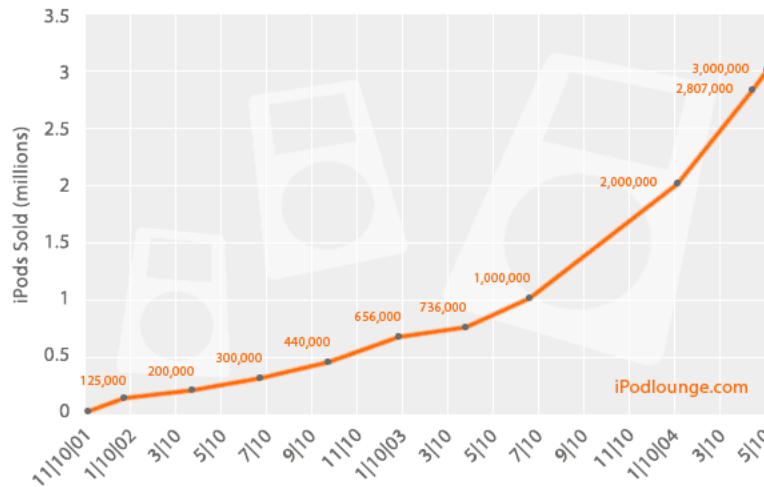
(left to right, boxes for the 1G iPod, 2G iPod, 3G iPod,

and iPod Mini) **Original (1G) iPod** Included headphones, FireWire cable, iTunes software, AC adapter. **Second-Generation (2G) iPod 5GB Mac Version** Same as above. PC Version included 4-pin to 6-pin FireWire adapter, MusicMatch software instead of iTunes. **10GB/20GB Versions** Same as above plus iPod Remote control and iPod Carrying Case. PC versions included 4-pin to 6-pin FireWire adapter, MusicMatch software instead of iTunes. **Third-Generation (3G) iPod 10GB (\$299) Version** Slightly new headphones, AC adapter, Dock Connector to FireWire cable, 4-pin to 6-pin FireWire adapter, iTunes software for Mac and MusicMatch software for PC*. **Initial 15GB (\$399)/30GB (\$499) Versions** Same as above plus Dock, new Remote control, and new Carrying Case. * Refreshed 15GB / 20GB / 40GB iPods include iTunes for both Mac and PC users, refreshed 15GB (\$299, M9460LL/A) iPod does not include Dock, Remote control or Carrying Case. **iPod mini** Headphones, plastic Belt Clip, AC adapter, Dock Connector to FireWire cable, Dock Connector to USB cable, iTunes software for Mac and PC users. **Fourth-Generation (4G) iPod** Headphones, AC adapter, Dock Connector to FireWire cable, Dock Connector to USB cable, iTunes software for Mac and PC users. 40GB iPod includes a Dock, but neither iPod includes a Remote or Carrying Case, or the older FireWire adapter. **iPod photo** Headphones, AC adapter, Dock Connector to FireWire cable, Dock Connector to USB cable, iPod photo Dock, AV cable, Carrying Case, iTunes software for Mac and PC users, Apple stickers. **iPod U2 Special Edition** Headphones, AC adapter, Dock Connector to FireWire cable, Dock Connector to USB cable, iTunes software for Mac and PC users, \$50 Coupon for The Complete U2 digital box set.

Historical Growth of iPod and iTunes Sales

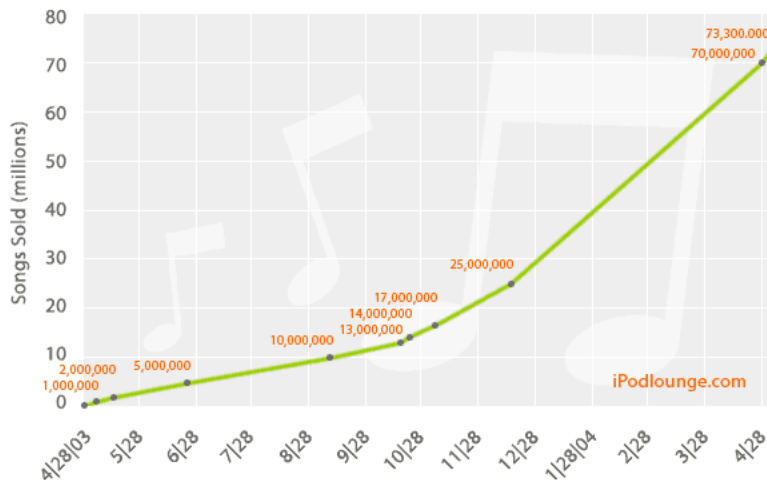
iPod Sales iPod sales were good but not fantastic until around the May 2003 release of the third-generation iPod, which marked a turning point in the sales history of the device. Prior to that release, Apple's sales were directed initially towards a relatively small audience of Macintosh users, and even when a PC version of the iPod was released, its FireWire-only design limited its appeal to mainstream PC users.

Sales of iPods



It took over a year and a half for Apple to hit the one million mark for iPods sold, but then the third-generation iPod was unveiled in Tokyo. Only six months later, the company had sold its second million iPods. Four months later, aided by the release of the iPod mini, they'd sold another million units of iPod hardware. By late October, aided by the release of the fourth-generation iPod, Apple was up to almost 6 million total units, and an additional 2-4 million units were predicted to be sold by the end of 2004. Importantly, Apple's sales milestones were achieved despite the continued introduction of cheaper alternatives by Creative, Dell, and iRiver, amongst others. None of these companies' products appears to have significantly impacted the iPod's sales growth or undermined its perception as king of the digital

Sales of iTunes Songs



music hill.

iTunes Music Store Sales Though the history of the iTunes Music Store dates back only a year, there have been two important positive changes in its sales trends. The first was in October of 2003, starting with the release of the PC version of the Music Store. In December 2003, following a flurry of holiday season iPod purchases and media mentions, the second upward tilt began, dramatically accelerating the pace of iTunes Music sales. Apple hit the 100 million song mark in July, 2004, ahead of some expectations (but later than initial Apple predictions), and 150 million by October, 2004, a dramatically increased pace.

Which Countries Have the iPod, iPod mini, and iTunes Music Store?

iPod Available worldwide from Apple, Apple authorized retailers, and unauthorized retailers. **iPod mini** Nearly worldwide. As of July, 2004, Apple released the product into almost every geographic region of the world. While several countries have not received the product officially, supplies may be available from importers. **iTunes Music Store** The service was first available (2003) within the United States, then expanded in June 2004 to the United Kingdom, France and Germany, and then on October 26, 2004 added Austria, Belgium, Finland, Greece, Italy, Luxembourg, The Netherlands, Portugal and Spain. On December 1, 2004, Canada was added to the list. Negotiations for Australia, New Zealand, Japan and other countries remain underway.

iPod Trivia

Q: What's the most expensive official iPod Apple has ever sold to consumers? **A:** Prior to the release of the iPod photo, the answer was limited edition iPods laser-engraved with the buyer's choice of four alternatives: the signatures of musicians Beck or Madonna, the logo of band No Doubt, or the signature of pro skateboarder Tony Hawk. Asking price: \$49 over the retail price of each iPod, or \$548 for the then top-priced 20 GB iPod. The new premium iPod is the 60GB iPod photo, sold for \$599.



Q: Has the iPod ever sparked a legal controversy outside of the United States? **A:** Yes, at least three times. The iPod was briefly taken off the market in France in September 2002 when French authorities notified Apple that the device violated a law limiting the sound output of portable devices to 100 decibels. Apple quickly updated the iPod's software to remedy the problem, and subsequently implemented a volume cap on all iPods shipped to Europe, much to the consternation of users in other countries. In December 2003, the iPod became a lightning rod for controversy after Canadian authorities imposed an additional governmental levy (charge) of CDN\$25 per player to compensate artists whose copyrights were being infringed. The \$25 charge was substantially lower than earlier proposals of \$21 per GB, which would have equaled a \$315-\$840 additional charge per 15-40 GB iPod - more in some cases than the cost of the iPod itself. Finally, Apple Computer has been sued in the United Kingdom by Apple Corps, holder of The Beatles rights, allegedly for violating an earlier trademark-related agreement whereby Apple Computer agreed not to enter the music business. **Q: What's the most unusual iPod ever sold on eBay?** **A:** A German seller auctioned an iPod that had been 24-karat gold-plated after purchase. Additionally, eBay sellers have auctioned off "pink" iPod minis that Apple accidentally delivered in a shade closer to magenta. **Q: Is it true that Oprah spent almost \$140,000 on iPods and gave them away?** **A:** In Spring 2003, Oprah named the iPod one of "Oprah's Favorite Things" as part of her series of product giveaway shows, and gave 15GB (\$399) iPods to each member of her 350-person studio audience. If you're worried that billionaire Oprah had to drop nearly \$140,000 of her own cash for the iPods, don't be: Apple donated them, and Oprah didn't even know how to use one when it was featured on the show. (When you're a billionaire, you can afford to hire someone else to program your playlists.) **Q: What are the biggest iPod-related giveaways to date?** **A:** The biggest iPod and iTunes giveaways to date have been offered by Pepsi, which offered a two-month "100 million free songs" giveaway (where only 5 million songs were actually given away), and an Australia-only "Win an iPod every hour" campaign with 1,018 15GB iPods available to be won. **Q: What musicians have been associated with the iPod?** **A:** Too many to count. After releasing the 10GB iPod, Apple briefly introduced a series of iPod boxes featuring the images of famous musicians: Jimi Hendrix and Miles Davis were featured on 10GB iPod boxes, while Bob Marley and Billie Holiday appeared on 5GB iPod boxes. The company has also included the previously mentioned musicians Beck, Madonna and No Doubt in a limited edition engraved iPod campaign, and has included performers such as Alicia Keys in product and service unveilings. Most notably, U2 released a special edition black version of the iPod in partnership with Apple in November, 2004 (announced in late October, 2004). The company plans



partnerships with other musicians in the near future.

Q: Do the British really love the iPod more than Americans? **A:** It's possible. Two early 2004 news stories suggested that British judges, law enforcement officials, and criminals are taking more than a passive interest in Apple's music players. In February, the Beatles versus Apple case (Apple Corps versus Apple Computer) came before a High Court judge in London, who wondered aloud whether he would need to be disqualified from the bench because he was an iPod owner. In March, England's second largest police force, the West Midlands Police, warned iPod users to hide their iPods and stop wearing Apple's packed-in white headphones because of muggings by iPod-hungry street thieves. In both cases, representatives of Apple Computer publicly expressed delight at the iPod's growing popularity. **Q: Can the iPod run anything other than Apple's own operating system?** **A:** Yes, but not that well. Apple has intentionally prevented outside developers from experimenting with or changing the device's operating system. In an effort to expand the iPod's support for music formats other than MP3, AAC, WAV and unprotected WMA, **several hackers** have used reverse engineering to make the iPod run a stripped down version of Linux, which features limited functionality and as yet no ability to properly play back audio in other formats. Their most visible achievement has been getting the iPod's title screen to display the face of Tux the Linux penguin. **Q: How much media exposure has the iPod received since launch?** **A:** An incredible amount. The iPod has been prominently featured in music videos, television shows, and massive product giveaways, say nothing of thousands of newspaper and magazine articles, and a number of books. Apple's partnership with the rock band U2 increased both the band's and the iPod's profile almost exponentially around the world. **Q: How have PC hardware and software competitors responded to Apple's success with the iPod?** **A:** The responses have been surprisingly mixed, and not entirely negative. Though Creative Labs, Dell, and iRiver have continued to develop and sell competing devices, industry heavyweight Hewlett-Packard in January 2004 halted development of an iPod alternative and opted to license and resell Apple's product itself. In March 2004, the CEO of RealNetworks (developer of RealAudio and RealVideo standards) made an awkward public plea that Apple introduce iPod support for Real's standards and competing Music Store, combined with a threat to join Microsoft if Apple didn't act. Apple declined. Real responded in late July by releasing Harmony, software technology to permit songs sold by Real to play on the iPod. Apple threatened to block Harmony songs from playing on iPods, and accomplished the feat in mid-November, 2004. **Q: What's Apple's iPod track record with automobile manufacturers?** **A:** To date, Apple has publicly partnered with two European car manufacturers to cross-promote iPods and vehicles. In July of 2003, Volkswagen announced a "Pods Unite" campaign for the 2003 New Beetle, whereby New Beetle purchasers received a custom-engraved (VW logo) iPod and a "VW Connectivity Kit" with free music, an Audible audio book, a coupon, a window sticker, a "VW Music-zine" and what later became known as Belkin's TuneDok cupholder iPod mount. In June of 2004, BMW announced the "iPod Your BMW" campaign, whereby owners of select BMW vehicles can add a \$149 iPod control and power charging system called the BMW iPod Adapter to their cars. Apple promises further vehicle-related announcements in the near future.

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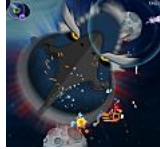
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- 1 WOW!! great story!!
Posted by **Yarin** on June 26, 2004 at 11:53 AM (PDT)
- 2 not a whole lot to say other than cool and interesting.
Posted by **stefan** on June 26, 2004 at 11:58 AM (PDT)
- 3 Nice! 😊
Posted by **josh** on June 26, 2004 at 12:16 PM (PDT)
- 4 WOW a great insight into the history of this fabulos gadget.
Posted by **-i2l-** on June 26, 2004 at 12:16 PM (PDT)
- 5 Cool History Article of one of the best MP3 Portable to date.
Posted by **Oliver** on June 26, 2004 at 1:23 PM (PDT)
- 6 Pretty good story but too biased, should of pointed some of the downfalls too.
Posted by **michael** on June 26, 2004 at 1:30 PM (PDT)
- 7 Makes me love mine even more! Great story!
Posted by **Eric** on June 26, 2004 at 2:44 PM (PDT)
- 8 Great article, very informative and much needed. Excellent job.

Audrey
iPodlounge Mod

Posted by **honeybee1236** on June 26, 2004 at 3:22 PM (PDT)
- 9 really nice story

Posted by **esra in PA** on June 26, 2004 at 3:49 PM (PDT)
- 10 great article guys. keep up the good work!

Posted by **Phillip** on June 26, 2004 at 4:11 PM (PDT)

11 Great article, just one error:

September 8, 2003

Apple refreshes the third-generation iPod line with higher storage capacities at familiar pricing. The 15GB / 3,700 song (\$299) iPod becomes the company's cheapest, with 20GB / 5,000 song (\$399) and 40GB / 10,000 song (\$499) versions replacing the smaller units introduced in April. Apple also announces that it has sold 10,000,000 songs through the iTunes Music Store since launch.

Apple didn't update the 10GB model to 15GB until Steve made his keynote speech at the 2004 conference. Only the 15/30 were upgraded to 20/40 GB models respectively.

Posted by **DarkJC** on June 26, 2004 at 4:52 PM (PDT)

12 they should make an ipod with a rumble pack—u kno, like in the xbox controllers. it would be totally useless, waste battery, but come on people, IT WOULD RUMBLE WEN LOW BASS COMES ON! lol

Posted by **laxman2211 in us** on June 26, 2004 at 7:19 PM (PDT)

13 LAXMAN!!! THAT WOULD BE AWESOME!!! LOL!!!!!! NIIIICCEEE!!! :cool:

Posted by **Chris** on June 26, 2004 at 8:01 PM (PDT)

14 that was an AWESOME article. i was just wondering when the 1G and 2G ipods came out and how they changed through the generations. the number of ipods sold the past 3 years is amazing!

Posted by **Vicky** on June 26, 2004 at 10:05 PM (PDT)

15 Nicely written article, with heaps of interesting facts.

That Pepsi competetion in Australia is pretty annoying though; I've sent in about 40 labels in the last three weeks, with 18 being sent at 2am in the morning. Nothing. Then a schoolmate wins an iPod on his twelvth label. Bastard.

Posted by **Elithrar in Perth, Australia** on June 26, 2004 at 10:34 PM (PDT)

16 tru elithrar, but da best time i herd is like 7am sunday mornings - ur gonna hav 2 wate till next week tho 😊

how many weeks left til it finishes?

Posted by **Snowy in Australia** on June 26, 2004 at 10:57 PM (PDT)

17 DarkJC: You're entirely correct, and we've fixed the error. Thanks for reminding us - ironically we were quite worked up back then because 10GB models started to sell for \$249 (sometimes less), the same price as the announced-but-as-yet-unreleased 4GB mini. Amazing how even recent memories can fade. Thanks again, and thanks to everyone else for your comments.

Posted by **Jeremy Horwitz** on June 27, 2004 at 12:02 AM (PDT)

18 Great info-article about the history of the iPod, although the Linux-on-iPod project has done more that should be respected here, such as the almost realtime playback of Ogg Vorbis files. Also, as Apple really started pushing its advertising campaign from the time of the 3G iPods, it's surprising how many people don't know about the 1G and 2G models... I'm a highschool iPod owher with a 2G I got in January 2003, and although now basically everyone at school knows about the iPod, they aren't aware of the earlier ones...hence I sometimes get the comment of "That's a fake, isn't it?" and stuff... X_x

"The reward for conformity was that everyone liked you...except yourself."

Posted by **elynnia** on June 27, 2004 at 3:52 AM (PDT)

- 19 I think that the iPod has changed so much over the years. We have went from a down Apple company to a upbeat Apple company doing great. Steve Jobs did a miracle by making the third generation iPods compabitable with iTunes for Windows. I have had so much sucess with this mixture. The syncing with IEEE 1394 is great. The second generation iPod was also a hit starting to lean toward PDA features. I am still waiting for an iPod with Wireless Internet (Wi-Fi). The PDA features are my second great miracle Steve Jobs brought to iPod. I consider the iPod to just get better and better in history!

Posted by **Joese** on June 27, 2004 at 4:49 AM (PDT)

- 20 Pepsi comp. finishes on the 11th of July. I'm going to buy one pretty soon anyway (like, next week), but it would've been nice to win one.

Posted by **Elithrar in Perth, Australia** on June 27, 2004 at 5:38 AM (PDT)

- 21 this is sick mate totally awesome

Posted by **suck my wiing wang hoho** on June 27, 2004 at 6:30 AM (PDT)

- 22 "October, 2002 - Sensing the appeal of high-capacity music players, Creative releases the Nomad Zen Jukebox as a cheaper but larger competitor to the iPod."

Not quite...

The first high-capacity drives weren't from Apple.

1999-10-29

Compaq in Palo Alto releases the PJB, or Personal Juke Box. Some of the people involved in the Compaq project are later involved with PortalPlayer, which designs the iPod's chipset. The PJB comes in 20 or 6 GB versions.

<http://rockbox.haxx.se/playerhistory/pjb100.jpg>

<http://research.compaq.com/SRC/pjb/>

The PJB-100 is licensed to Korean company HanGo Electronics and sold in the US by Remote Solutions.

<http://www.pjbox.com/10-26.htm>

Specifications:

CPU/DSP: Motorola 56309 DSP

Display: 128x64 b/w lcd

Disk: 6.5 GByte, 2.5"

Ram: 12 MByte

Size: 150x80x26 mm, 280 gram

Interface: USB 1.1

2000-01-05

Creative releases Nomad Jukebox.

<http://us.creative.com/corporate/pressroom/releases/welcome.asp?pid=6193>

<http://rockbox.haxx.se/playerhistory/nomad.jpg>

Specifications:

CPU/DSP: ?

Display: 132x64 b/w lcd

Disk: 6 GByte, 2.5"

Ram: 8 MByte

Size: 127x127x38 mm, 397 gram

Interface: USB 1.1

2001-06-29

Archos releases Jukebox 6000

<http://www.3dsoundsurge.com/press/pr1088.html>

<http://rockbox.haxx.se/playerhistory/archos6000.jpg>

Specifications:

CPU/DSP: ?

Display: 132x64 b/w lcd

Disk: 6 GByte, 2.5"

Ram: 8 MByte

Size: 127x127x38 mm, 397 gram

Interface: USB 1.1

2001-11-12

Apple releases iPod - first player with 1.8" drives.

<http://www.apple.com/pr/library/2001/oct/23ipod.html><http://rockbox.haxx.se/playerhistory/ipod.jpg>

Specifications:

CPU/DSP: Texas Instruments TMS320DSC21, Micronas MAS 3587F

Display: 237x234 colour lcd

Disk: 10 GByte, 2.5"

Ram: 16 MByte

Size: 110x78x28 mm, 290 gram

Interface: USB 1.1 (USB 2.0 & Firewire optional)

It's interesting to note that the first HD player, the PJB way back in 1999, had a long thin form factor, essentially similar to today's iPod Mini. It fitted nicely into pockets.

You could argue that Creative fumbled badly by releasing the Nomad in a "CD Discman"-like form factor. Not so easy for pockets!

Posted by **trailblazers** on June 27, 2004 at 7:52 AM (PDT)

- 23 trailblazers, most of your specs on the ipod are wrong... last i checked the first ipod wasn't color, 10gb, 2.5", 16mb ram, USB interface, any of that really. your size #s are all wrong on the others too.

the article never said ipod was the first to have high capacity... and wtf cares about hango and archos players? the compaq looks as much like ipod mini as a compaq PC looks like a powermac G5 😊

Posted by **captain accurate** on June 27, 2004 at 12:40 PM (PDT)

- 24 To the guy who posted the hard drive absed players two posts above me, the iPod does not have a "237x234 colour lcd". It is monochrome in al variations as of yet.

Posted by **Dragon** on June 27, 2004 at 4:50 PM (PDT)

- 25 Nobody ever said iPod was the first HD player—it was among the first. From the article's 2nd paragraph:

"Unlike most (but not all) competing digital audio players available at the time, Apple relies on a hard disk for storage"

The success of the iPod (like iTunes in Europe) is in being best, not first. Including ease of use that has never been matched.

(And yes, those specs posted by trailblazer are wrong.)

Historical note... Compaq now sells computers with iTunes, and parent-company HP will be selling iPods 😊

Posted by **Nagromme** on June 27, 2004 at 6:01 PM (PDT)

- 26 ...well it didn't take long for the flame war to start!

good article btw.

Posted by **illa** on June 27, 2004 at 7:51 PM (PDT)

- 27 "Compaq now sells computers with iTunes, and parent-company HP will be selling iPods"

Nobody ever accused HP under Carly of anything approaching intelligence or innovation.

HP: Uninvent!

Posted by **Carly** on June 27, 2004 at 9:23 PM (PDT)

- 28 "and wtf cares about hango and archos players"

If you don't know your past then you can never control your future.

Posted by **history repeating** on June 27, 2004 at 9:25 PM (PDT)

- 29 The main issue was the article's listed release date for the Creative Nomad, which was way too late.

Yes, I copied and pasted the specs wrong, They should be as below. You try to do a good turn and all you get is abuse - you people need to lighten up!

2001-10-23

Apple iPod released - first to use 1.8" hard drive.

Specifications:

CPU/DSP: Portalplayer (Dual ARM7 SMP)

Display: 160x128 b/w lcd

Disk: 5 GByte, 1.8"

Ram: 32 MByte

Size: 102x62x20 mm, 184 gram

Interface: Firewire

2001-11-12

Archos Multimedia released. First to use full-color playback and recording of audio *and* video.

CPU/DSP: Texas Instruments TMS320DSC21, Micronas MAS 3587F

Display: 237x234 colour lcd

Disk: 10 GByte, 2.5"

Ram: 16 MByte

Size: 110x78x28 mm, 290 gram

Interface: USB 1.1 (USB 2.0 & Firewire optional)

Posted by **specs** on June 27, 2004 at 9:31 PM (PDT)

- 30 cool.... dude!!!

Posted by **beplua** on June 27, 2004 at 11:36 PM (PDT)

- 31 Very informative! Excellent story!

Jun

Global Source PDA

<http://www.gblsrc.com>

Posted by **Jun** on June 28, 2004 at 3:07 AM (PDT)

- 32 the date that was listed was accurate for the nomad zen, which was the one creative released as a direct competitor to ipod.

Posted by **reader** on June 28, 2004 at 6:19 AM (PDT)

- 33 Correction:

Actually, the second edition of the 3rd generation 15 GB iPod does NOT have a remote nor does it have a docking station or a carrying bag. What it does come with is iPod earphones,

FireWire cable, 6-pin-to-4-pin FireWire adapter, AC adapter and CD with iTunes software for Mac and Windows.

Posted by **Polkster13** on June 28, 2004 at 6:32 AM (PDT)

- 34 Polkster13: Fair catch - it was actually an omission in the piece, and the article has been amended to add that detail. The first "15 / 30 GB" iPods did include those items, but when Apple refreshed the 10 GB version with the replacement 15, that changed. Thanks, and thanks again to everyone else for your comments!

Posted by **Jeremy Horwitz** on June 28, 2004 at 7:02 AM (PDT)

- 35 Very nice, congrats!

Posted by **James Wong** on June 28, 2004 at 8:13 AM (PDT)

- 36 excellent story but i really need the dates for the ipod mini when it comes into the uk

Posted by **adam** on June 28, 2004 at 9:05 AM (PDT)

- 37 I like the history bits. Looking at the iPod and its ancestors is a way of seeing how and why the iPod does what it does so well. I read the EE Times to follow the key people in Compaq (no more!), Portalplayer, Apple, and SonicBlue (no more!) to see which designers and engineers go where. It's unsurprising to see how people carry their same great ideas from one company to another, especially when Silicon Valley is such a damn small place!

Here's a little bit of history. Way back in 1999/2000 SonicBlue released the Rio PMP 300 - an otherwise unremarkable little mp3 player. It had only 32MB built-in, which even then was a joke. Although it had expansion slots, flash RAM was insanely expensive back then so it was pretty much useless. Also, SonicBlue's implosion due to litigation stemming from their ReplayTV product meant they lost focus.

But the PMP 300 did have one very clever innovation: a jog dial with radial click buttons and an intuitive UI that was miles ahead of most others then. The PMP 300 died in the market but its innovation lived on as the engineers implemented the scroll wheel and then click wheel, along with the same basic song selection UI, for Apple's iPod.

<http://images.amazon.com/images/P/B00000JBAT.01.MZZZZZZZ.jpg>
<http://images.amazon.com/images/P/B00000JBAT.01.PT01.TZZZZZZZ.jpg>

The PMP 300 is the Cro-Magnon to the iPod's Home Sapiens.

I guess that makes the iPod Mini the Homo Superior then? Cue Magneto!

Posted by **archeology** on June 28, 2004 at 9:38 AM (PDT)

- 38 Hey that Rio is ugly, but it is black! I wish there was a limited edition black iPod...

[Amazon says you can still buy this Rio for \\$35](#). Not sure if it's even worth that, but I do like collecting useless gadgets...

Posted by **Ugly Rio** on June 28, 2004 at 3:41 PM (PDT)

- 39 did the rio actually have a jog dial? wasn't that just a four-way button?

Posted by **reader** on June 28, 2004 at 4:10 PM (PDT)

- 40 Did you mention the black ipod?

<http://thextype.com/>

Posted by **Richard Wingfield** on June 28, 2004 at 10:34 PM (PDT)

- 41 I won an Ipod in the Pepsi competition on the first week. I am still waiting for the thing to arrive :(Come on Pepsi, you run a competition and tell winners it will be delivered way within 4 weeks, where is it? I can't wait to get it.

Posted by **Jason** on June 29, 2004 at 6:25 AM (PDT)

- 42 About iPods and cars, what about Smart i-Move limited edition???? Is missing everywhere! Best iPod intregation seen on a car, and it isn't mentioned within this fabulous article.

!!??

Posted by **caramelo** on June 29, 2004 at 6:58 AM (PDT)

- 43 I like cheese

Posted by **Beoooooooo** on June 29, 2004 at 7:21 AM (PDT)

- 44 The [Dashboard Confessional's Custom Honda Civic](#) has an iPod hooked up to Alpine's head unit via their [iPod Ready Interface Kit](#) (announced Jan 2004.)

Guess BMW was more sexy than Honda, although the interface seems more functional on the Civic than on the BMWs.

Posted by **woebeme** on June 29, 2004 at 11:11 PM (PDT)

- 45 HP cancelled plans to design their own digital music player, and instead gained a license from Apple to produce their own version of the iPod, in return for marketing iTunes with hp PC's.

Factoid:

The CEO behind Realplayer asked (actually, more like begged) Apple to include support for the RealAudio format with the iPod, threatening to join with Microsoft if Apple didn't oblige.

Apple rejected the offer.

Posted by **Elithrar in Perth, Australia** on June 30, 2004 at 4:31 AM (PDT)

- 46 Looks like someone didn't read the whole piece before posting their factoids

Posted by **reader** on June 30, 2004 at 5:06 PM (PDT)

- 47 The black iPod is probably just a Colorware painted iPod, as such, it's really not that neat, and most importantly, it isn't a limited edition model from Apple. If you want a colored iPod, black or otherwise, just go to [\[url=http://www.colorwarepc.com\]](http://www.colorwarepc.com)<http://www.colorwarepc.com>[\[url\]](http://www.colorwarepc.com). They also do computers and for relatively short money they do create a very unique product.

Posted by **rsacer** on July 1, 2004 at 2:52 AM (PDT)

- 48 iPodlounge, please update the sales of iTunes songs, it is up to 95 million as of today (June 2)

Posted by **DG** on July 1, 2004 at 7:41 PM (PDT)

- 49 Nice article about the history of the i-pod. It was very informative, and I enjoyed the photos and graphs. The article should have, however, pointed out the negative for those of us who use the windows based version, like unexpected crashes, or freeze ups for no reason. All in all, the pluses outweigh the negatives.

Posted by **capricorn** on July 2, 2004 at 2:54 AM (PDT)

- 50 gay angle? I really don't see how anyone could have started relating ipods to homosexuality. its like relating love with toasters. they are completely different

Posted by **finig** on July 5, 2004 at 5:57 PM (PDT)

- 51 brilliant article. and too right the uk has to wait till the 24 of july to get its ipod minis so i'm gettin mine from the US 🤔 its coming saturday. nyway. the only other integration of ipod and car is that of P.Diddy's signature Sean John Escalade which comes whith an ipod that is connected to the music cystem through a dock.

Posted by **jax** on July 8, 2004 at 1:32 AM (PDT)

- 52 cool article, like the pix

Posted by **sofran** on July 8, 2004 at 3:23 PM (PDT)

- 53 I have a 3G and I-tunes crashes my computer regularly that shoulb be noted more thoroughly in this site. Please don't punish PC users because we use inferior (but cheaper) computers!

Posted by **Scott-Bee** on July 9, 2004 at 2:03 PM (PDT)

- 54 99 million now.

Great article.

And to think I used to frequently visit ipoding.com

This site is the ultimate iPod site. Fantastic design, loads and loads of great content and easy to navigate.

iPodlounge! I salute you!

Posted by **Jake** on July 10, 2004 at 9:32 AM (PDT)

- 55 Very cool! i thought the article was interesting. i got my ipod for Christmas and I just love it! It's awesome!

Posted by **Lynne** on July 11, 2004 at 11:22 AM (PDT)

- 56 Very cool! i thought the article was interesting. i got my ipod for Christmas and I just love it! It's awesome!

Posted by **Lynne** on July 11, 2004 at 11:22 AM (PDT)

- 57 You forgot about that VERY limited black iPod that Jaguar(i think- had for new owners.) I remember reading it somewhere about those really limited iPods. If it is not Jaguar, it is some other luxury car manufacturer

Posted by **kELVINLeFabuleux** on July 27, 2004 at 9:24 AM (PDT)

- 58 cool! wish they wud bring out a blak iPod, or even betta (well i tink) a iPod dats all white - no silver, just pure white

Posted by **reiss** on July 29, 2004 at 9:44 AM (PDT)

- 59 The most expensive iPod was not the artist engraved version, it was the 2G iPod with custom laser engraving it was \$49 extra and the 10G iPod was \$499. I slight mistake byt still worth noting. (I can show you my receipt)

Posted by **Josh Morrison** on August 1, 2004 at 8:44 AM (PDT)

- 60 Do you think ipod's should have color screens? So they can play vids and pics, and games, or do you like the ipod as solely as a music player?

Posted by **ipodfreak** on August 2, 2004 at 6:56 PM (PDT)

- 61 I didn't even know there were previous, or shall I say archaic, versions of the iPod. This article was extremely informational, especially since I know the historical background of my newest best-friend, the 4th generation 20GB iPod.

Posted by **starjtr** on August 3, 2004 at 10:42 PM (PDT)

- 62 Sick story guys, keep up the good work. Can't wait to get my 20gb ipod soon.

Posted by **ANDREW!** on August 4, 2004 at 12:48 AM (PDT)

- 63 Sick story fellas. kepp up the good work. Cant wait to get my 20GB ipod soon

Posted by **ANDREW** on August 4, 2004 at 12:56 AM (PDT)

- 64 my f'n ipod died after one month of uses
what more can I say!

Posted by **normal man** on August 10, 2004 at 10:25 PM (PDT)

- 65 thank you so much for the history of the ipod. I had been searching frantically for it after purchasing my own 3G 20G Model and was ecstatic after I found this page.

Posted by **anonymous** on August 13, 2004 at 3:20 PM (PDT)

- 66 "In an effort to expand the iPod's support for music formats other than MP3, AAC, WAV and unprotected WMA, several hackers have used reverse engineering to make the iPod run a stripped down version of Linux, which features limited functionality and as yet no ability to properly play back audio in other formats."

First, they're not hackers in the illegal sense, don't portray them as such. And yes, now it does have audio play back.

"Their most visible achievement has been getting the iPod's title screen to display the face of Tux the Linux penguin."

If you know how cool linux is, you would know just how awesome it would be to have even a 'stripped down' version on your iPod.

Posted by **nighthawk** on August 16, 2004 at 3:41 PM (PDT)

- 67 HELLO IPODERS!
xxxxxxxxxxxxxxxxxxxxxxxx
I need your expert help. I am doing my university thesis on the ipod. And i need to get my hands on some good books to help me. So far i can only find information on websites. But this article mentioned that the ipod was feautred, "in a number of book..." But where are they?!! Does anyone know of good books?
I am talking about the ipod as a fashion accessorie, and how it has achieved its iconic status.. any ideas or research help would be greatly appreciated.
xxxxxxxxxxxxxxxxxxxxxxxx

Posted by **jicky** on August 17, 2004 at 7:14 AM (PDT)

- 68 i saw a page on the internet about using WinniePod Updater to change a first gen ipod (mac) to PC version. Is this still possible? My friend just gave me her old mac ipod and i have a PC. What do i need to buy to connect it to my PC laptop to do the conversion?

Posted by **eriq** on August 29, 2004 at 7:39 PM (PDT)

- 69 i saw a page on the internet about using WinniePod Updater to change a first gen ipod (mac) to PC version. Is this still possible? My friend just gave me her old mac ipod and i have a PC. What do i need to buy to connect it to my PC laptop to do the conversion?

Posted by **eriq** on August 29, 2004 at 7:41 PM (PDT)

- 70 Just to saying that the article is very informative :D. Kudos. But should have talked about the bad things too(IF there is any*shrugs*).

Posted by **Huan in MSIA** on September 4, 2004 at 9:33 PM (PDT)

- 71 Should I buy iPod if I hate Windows and always have to format? Also I really like talking about penis but do NOT take it up the ###. I am straight. At least that's what my boyfriend tells me.

Posted by **Edward** on September 9, 2004 at 6:47 AM (PDT)

- 72 i wanna ipod!

Posted by **foolio** on September 9, 2004 at 11:24 PM (PDT)

- 73 ipod are cool i have a great 80 gb one and a sony fish head

Posted by **anus** on October 1, 2004 at 1:22 PM (PDT)

- 74 ipod are cool go to skool i have a limited addition 100 gb ipod and it purple

Posted by **fat pig** on October 1, 2004 at 1:24 PM (PDT)

- 75 no idea, but ipodz rule. THis guides great, only one thats worth it online

Posted by **ibookah** on October 6, 2004 at 8:16 AM (PDT)

- 76 that was crap, i wanted info on the ipod and its creator, John Ives... I didn't need to know about a billionaire giving away \$140000 worth of ipods!!! what do i care about that???

Posted by **mark johnson** on October 26, 2004 at 5:08 AM (PDT)

- 77 Thanks for this great job.
But i need a little bit shorter essay on this topic, does any one have?

Posted by **Alver** on December 4, 2004 at 11:27 AM (PDT)

- 78 Now why, oh why, are we all so fussed over the HISTORY of the ipod. Yes the article was interesting, but next time, can there be an article on the FUTURE of the ipod.

I personally would like to see things such as bluetooth connectivity for headphones and synching, and even crazier third-party accessories for our white little wonders...

Posted by **>nATHAN in UK** on January 1, 2005 at 1:34 PM (PDT)

- 79 it would be great if this was kept current and brought up to date

Posted by **Aaron Pauley** on March 18, 2005 at 12:57 AM (PDT)

80 why isn't there a linux itunes out there and then you can use ur ipod on the most offordable O/S out there. I had to buy a goddamn Win XP before i got the best mp3 player out there. I'm also surprised a hacked version of itunes labled lintunes or tuxtunes hasn't come out on the download sites.

Posted by **afterburner** on June 25, 2005 at 6:20 PM (PDT)

81 LOVE THIS ARTICLE!!!!!!! great for me to finish my report on iPods on! =] THANK YOU SO MUCH!!!! I'll be sure i'll get an A+! THXS AGAIN!

Though i think you should make ipod mini's with more colors: like purple and orange

Posted by **Jennifer T** on October 31, 2005 at 8:50 PM (PDT)

82 guess what? time to update 😊

Posted by **revmonkey** on January 2, 2006 at 8:28 PM (PDT)

83 Ya, especially in the iPodLinux area. Now the iPod has more functionality when running Linux than when running Apple's "iPodOS".

Posted by **clith** on January 5, 2006 at 3:25 PM (PDT)

84 P.S. Your registration code is broken. A "+" is* a valid character to the left of an "@" in an email address.

Posted by **clith** on January 5, 2006 at 3:25 PM (PDT)

85 Okay, lets get real people.

A few points to consider,

1) Whilst it isn't bad, the sound quality on the iPod is far from range-topping.

2) What in gods name is the point of having 10,000 songs, when the battery life is between 8~12 hours (confirmed by no less than 8 users).

3) Design-wise apple hit a winner with the iPod, but it has been a victim of its' own success, now it looks '4 years ago'. Changes like the nano are good, but go against the principle of HD players.

4) Soon, solid-state hard-drives are to be easily available, with far higher capacity than before, quicker loading, and access times than ANY HDD, and also far lower power consumption. Could the 'original' iPods' days be numbered?

5) Whilst you may consider Sonys' MiniDisc to be a flop, you should know first, that it has a much, much higher level of sound quality than any flash/HD-based portable player, due to the ATRAC3 Type-R encoding.

It is also capable of reaching well over 10x the 'quoted' playback time of 12 hours for the iPod, and whilst it may not be able to hold anywhere near as much music as one, you can take multiple discs with you, and it is not a chore to change them over. Not only this, it is smaller and lighter than any iPod save for the nano, and has remotes supplied with any model coming close to the price of an iPod, mostly with backlit lcd displays.

It can record from ANY source, in ANY place, at ANY time, and is FULLY editable on the move, with higher sound quality, and in some cases, volume too.(useful for linking it to Hi-Fi systems.)

6)The iPod is no longer king, it has actually been surpassed technologically by things like this:
<http://www.audioholics.com/news/pressreleases/DigitalMindDMC8270MP3.php>

or the monolith mx-7000 here:

<http://www.monolith-europe.com/>

or even this:

http://www.archos.com/products/music/gmini_xs_202S/tech_specs.html?country=global&lang=en

and this too;

<http://www.creative.com/products/product.asp?category=213&subcategory=214&product=12985&nav=0>

7) Basically, there are other alternatives to iPod, which are actually better, but it seems that people are more interested in having an iPod for its image. How many times have you looked around a train, a bus, or whatever, and seen people fiddling with their iPods for no reason than to just make it visible?

It just seems tragic, in the same way that people with the latest phones, or PDA's or Laptops inherently do the same. This is tantamount to a return to the 'yuppie culture' of the 1980's.

How are the consumer sheep of today any better than the 'friends' comparing business cards in 'American Psycho'?

In fact they are not, its the same all over, if no-one bothers to consider alternatives to iPod, then eventually no serious alternatives WILL exist. The reason Apple have stayed on top this long, is the fact that other firms have nipped at their heels, (and in some cases the jugular!) and forced them to progress fast.

The shock that Apple caused to ALL the competition, by not only releasing the iPod, but the fact it was the best leap forward in available portable audio (since funnily enough, MiniDisc!), made EVERYONE sit up and take notes, notice and leaves from Apples' book.

If you believe that Apple produce a superior product (the iPod) in every respect, to those that industry giants with far more audio/electronic expertise, produce, you are sorely mistaken, and a victim of a fantastic media machine!

However, well done Apple! Because whilst the days of iPod supremacy might be numbered, you did succeed in creating not just an amazing design (as usual), not even just a competitive one, but producing an inately usable, and practical device for the masses, and then marketing it fantastically well too!!

The bottom line?

Dont buy one because your friend/family member/work colleague/partner has one, buy one because you appreciate the achievement it signifies. I you don't or you strive for another form of excellence, then look elsewhere, and see what you have been missing from the competition.

Happy Listening,

Adam Abbey-Ryah

"Free-Thinker of the Masses"

Posted by **krazyeebyker** on February 8, 2006 at 7:21 AM (PDT)

86 Any idea what Apple spent to develop the original iPod?

Posted by **rboling** on March 28, 2006 at 1:18 PM (PDT)

87 Well I'm not a great storyteller xD. Guess I'll add a bit to this although I don't have exact dates.

After the 4th Gen photo, we have the 5th Gen Video and also the iPod Shuffles. Then Apple releases the Nano line.

The first shuffles resemble a pack of sugared gum while the iPod Video did not change much in size from the photo.

For lack of a better description, the First nano would be considered an "iPod mini on a diet". Soon thereafter, new shuffles that resemble small pedometers with clips start appearing.

The release of the iPhone was a precursor to the iPod touch. With the touch came the 6th Generation iPod classic with a matte finish and slightly curved edges. The iPod shuffle 3rd gen is released although there really isn't much difference between 2nd and 3rd gen. The iPod Nano

3rd gen is released with a similar matte finish of the iPod Classic but is shorter, stubbier, and smaller. The Nano now plays video.

News update in 1st quarter 2008- The iTunes outsells Walmart's music store.

Posted by **Quick additions** on May 9, 2008 at 7:42 AM (PDT)

88 Thankyou so much for this, it will be helpful for my school project ^_____^

Posted by **Beck** on May 13, 2008 at 5:11 PM (PDT)

89 Hi!!It's a wonderful idea to write this but it will be better if you put other things of the ipod such as how it is done why who when you know so please!!
bye

Posted by **josefa** on June 27, 2008 at 3:01 PM (PDT)

90 That was BRIEF????
lol, it was nice though....

Posted by **Hafsa** on September 4, 2008 at 8:39 PM (PDT)

91 i purchased a first gen ipod mini in 01 or 02 (I know definitively that it was prior to my 2003 college graduation), so there is no way it was first released in 04.

Posted by **kristen** on December 3, 2008 at 11:09 AM (PDT)

92 No, the mini definitely arrived in 2004 - we picked one up in Boston in August 2004 only a few months after they were launched.
The 1st gen iPod was launched in 2001 - the mini was some way off in the future then!!

Posted by **Bob Levens in UK** on December 3, 2008 at 11:44 AM (PDT)

93 nice timeline

Posted by **carmen george** on February 20, 2009 at 6:22 AM (PDT)

94 Hi Dennis - This is great. Do you have an updated version that you can share? Including changed through 2008/2009.

Thanks.

Posted by **Hem** on August 16, 2009 at 11:05 PM (PDT)

95 Nice Article I think I like the ipod because of the musicians.

Posted by **Paul Lubianker** on November 12, 2009 at 9:43 PM (PDT)

96 wow good timeline but i'm sittin here thinkin where's my ipod nd where's tha touch but thn i noticed he published this in 2004.

Posted by **akire** on January 3, 2010 at 3:22 PM (PDT)

97 this is long!

Posted by **brianna** on January 13, 2010 at 7:03 AM (PDT)

98 This is really helpful! I had an assesment due and this is my lifesaver, literally

Posted by **jess_97** on May 29, 2010 at 5:22 PM (PDT)

99

@krazeebyker,

Not to be an internet troll, but your comment was filled with hate and ill-concealed malice towards the iPod. It made me reflect on why a human being would spend so much effort and time writing a slander post about one of the top companies in the world on a remote website just to prove a point to no one in particular. Dude.. no offense but... GET A LIFE.

Posted by **CAFE_KID** on June 3, 2010 at 11:04 PM (PDT)

100

@CAFE_KID

Some points for you, if you ever read this again, lol.

1) the post was more than 4 years old by the time you commented on it!

2)My comment was not 'filled with hate and ill-concealed malice towards the iPod', my frustration was towards the blind buying doctrine of those who follow the glowing fruit blindly, with no consideration for anything else.

3)Your post is a result of you either not being able to read complete posts, having a lack of comprehension skills, or just being a plain fanboy, in trolls clothing.

4)That is the exact same kind of vociferous defence that all fans of the fruit blurt out. 'You're just a hater!' -In basic terms.

5) I called for people to make a BALANCED judgement when making such purchases, even listing some of the iPods' benefits.

6)You will also note that almost ALL of the links I then posted, are now either defunct, or outdated.

7)You unfortunately do not know of whom you speak, nor of my own experience with technology, and LIFE.

8)I build professional 3d/Multimedia Workstations and Rendering machines, often costing upwards of 10,000GBP, and know a LOT about MacOS, iOS, Android, Linux, and Windows.

9)I also have an audiophile habit, and keep up to date with the latest tech and trends there too.

10)Did you know about the prevalence of solid-state hard drives, or for that matter (although not prior noted), the existence holographic storage, back in 2006?

11)Did you know that Apple set out to be a pioneer of making things free and open-source, like Linux, or Google, and now remain one of the most secretive, sanctimonious firms in the tech. industry?

I have a life, one which it seems, is more informed than most.

My clients/friends come to me for advice and action on these matters, because they know I will advise them toward, and then in some cases, build them, a product that will serve them best, not because I get a commission from it, but because I build my reputation upon it.

Wake Up!

Unless things change in some drastic manner, expect to see;

)More cores in cpu's rather than more clockspeed. - Because we are reaching the limits of what silicon is actually capable of.

)Google become a MAJOR player in the software market. - Because even I have lost track of all the pies they have their fingers in.

)and Apple, whom you must remember were bailed out to the tune of \$150,000,000, by MICROSOFT, no less, have made critical, almost mortal mistakes in the past, and are capable of doing so again.....

...just as are Samsung, Microsoft, Philips, Motorola, or any other firm.....

Get a life, PAH, if only you knew.

Posted by **Krazeebyker** on March 27, 2011 at 4:36 PM (PDT)

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EXHIBIT F

Broadcast Dictionary

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A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Archives

Packet

Fixed length block of data

or

Includes all the information needed to transport and file recovery

PAL

Phase Alternating Lines- analog television transmission standard in large parts of the world

Partial Restore

Return of only part of a clip from longterm storage back to central storage for editing

or

Used to save storage space and time when only part of a the content is needed

Pillarbox

Video picture with vertical black bars at the left and right of the screen that occurs when converting a 4:3 to a 16:9 signal

Pixel

- DTV Basics

Picture elements

Playlist

A list of clips to be played in order.

Playout

Playback of clips for newscasts or transmission

or

Generally controlled by an automation or playback system

Playout Server

- IT Basics

A video server used to play clips for newscasts or transmission

or

Generally controlled by an automation or playback system

PPV

- VOD

Pay Per View

Primary Events

The main content in a playlist, usually program segment or commercial

« *Older posts*

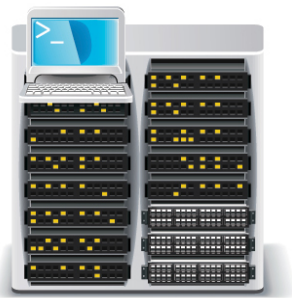
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EXHIBIT G



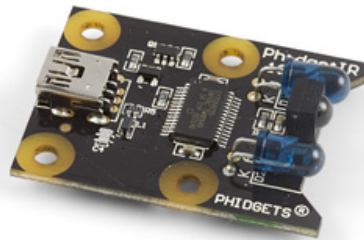
Products for USB Sensing and Control

IR Remote Control Primer

From Phidgets Support

Contents

- 1 Introduction
- 2 Data Encoding Properties
 - 2.1 Header
 - 2.2 Trail
 - 2.3 Repeat Code
 - 2.4 Bit Length
 - 2.5 Code Length
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 - 3.1 1. Pulse Distance Modulation (PDM) or Space Encoding
 - 3.2 2. Pulse Width Modulation (PWM) or Pulse Encoding
 - 3.3 3. Bi-Phase or Manchester Encoding
- 4 Receiving Data
- 5 Transmitting Data
- 6 Resources



Introduction

IR Remote Controls can send and receive data encoded in various fashions as pulses of infrared light. The various encoding methods that most IR remotes support are grouped under the general term '*Consumer IR*' or CIR.

CIR is generally used to control consumer products such as TVs, DVD players or game consoles with a wireless remote control, but in general can be used for any application that needs to transmit low speed data wirelessly. CIR is a *low speed protocol*. This means its commands generally contain no more than 32-bits of data with a maximum bit rate of 4000 bits/second (but usually much less). There is no concession for anti-collision, so only one code can be transmitting at any time. Transmission distance depends on the power of the transmitter, and the receiver typically needs to be within line of sight. However, the signal can still reach the receiver without line of sight by bouncing off of the walls and ceilings if the transmitter is strong enough. CIR data is transmitted using a modulated bit stream. Data is encoded in the length of the IR light pulses and the spaces between pulses. The pulses of IR light are themselves modulated at a much higher frequency (usually ~38kHz) in order for the receiver to distinguish CIR data from ambient room light.

Data Encoding Properties

CIR codes encode data using a specific encoding scheme. Apart from the actual data part of the bit stream, there are a number of other features to describe. These features can all be specified when transmitting a code using our API, and they are filled in when learning a code.

Header

A CIR code will often start with a header. This is a pulse and space that immediately precedes the data. Usually the pulse is quite long (several ms), and is used by the receiver to adjust its gain control for the strength of the signal.

Trail

The trail is a trailing pulse that follows the data stream but is not part of the data. This is only used in some encodings.

Repeat Code

The repeat code is a series of pulses and spaces that are sent at a specific amount of time after the data packet. This allows the receiver to know that the button is being held down. Not all encodings have a specific repeat packet, but all encodings support repetition (either with a repeat code, or simply by repeating the data over and over).

Bit Length

This is the number of bits in the data. Most codes are between 8 and 32 bits long.

Code Length

Codes can have either a constant length or a variable length. Constant length codes will have a specific amount of time within which the code can be sent, which includes the code itself followed by a gap time. The gap time plus the data time adds up to the constant code time, so that if the data takes a bit longer because there are lots of 1's then the gap will be shorter, and if the data time is short because a repeat code is being sent, then the gap time will be much longer. Variable length codes will have a varying data encoding time followed by a constant gap time.

Gap

Gap refers to the time between codes. This is a long (>20ms) space time between codes that helps the receiver see the beginning of the next code. If the code length is constant, this gap time refers to the entire code length - the data time plus the gap time. If the code length is variable, this gap time refers to the constant gap time only.

Minimum Repeat

Some encodings require a code to be repeated a number of times before it is recognized. This usually cannot be automatically detected.

Toggle Mask

CIR data is sometimes toggled for two reasons. In one case some of the data is toggled every time it is sent. This can help the receiver to recognize the data as valid, and is often combined with the Minimum Repeat feature. This can sometimes be detected automatically.

In a more common variant, one bit of data is toggled every time the button is released - in this way when a button is pressed and held down, you get the same code repeated over and over - once the button is released and pressed again, you get the same thing, but with one bit toggled. This helps the receiver to know when a code is being repeated. This 'toggle on repeat' cannot be detected automatically.

Carrier Frequency

The carrier frequency is the frequency used to modulate the IR pulses. IR receivers are tuned to a specific frequency so it's best to transmit on the frequency that they are tuned to receive. Most consumer IR devices use 38kHz, and this is usually set as the default. Others that are sometimes used include 56kHz, 40kHz, 36kHz or 39.2kHz. If you are unsure what frequency your receiver is tuned to, we recommend that you check the datasheet or documentation online.

Duty Cycle

Duty cycle is the period of the carrier frequency. This can be set from 1 to 50, but useful values are in the range 25-50. The default is 50. The duty cycle of an incoming data stream cannot be automatically determined.

Data Encodings

CIR device manufacturers use many different protocols to encode data using pulses of IR light. Few of these protocols have been standardized, and many are very similar but have different bit lengths, or different headers, etc. There are three major ways to encode data that are supported automatically by our devices, and these cover the encoding used by almost all CIR devices:

1. Pulse Distance Modulation (PDM) or Space Encoding

This is the most common encoding scheme. Here, data is encoded by modulating the duration of the space between pulses, while the pulse time remains constant. For example, a '1' could be encoded by a 500us pulse followed by a 1ms space, and a '0' encoded by a 500us pulse followed by a 500us space. The data stream will be terminated by a trailing pulse which lets us determine the length of the last space.

2. Pulse Width Modulation (PWM) or Pulse Encoding

This is like Space encoding, except that the data is encoded by modulation of the pulse width. For example, a pulse of 1.2ms followed by a space of 600us would encode a '1', while a pulse of 600us followed by a space of 600us would encode a '0'. There is no need for a trailing pulse because the space length is fixed, and the trailing space can be inferred. This protocol is used by Sony.

3. Bi-Phase or Manchester Encoding

This encoding breaks each bit in the data stream into a fixed length of time, where each time slice is half pulse and half space. For example, if the bit time is 800us, a '1' could be encoded by a 400us pulse followed by a 400us space, while a '0' would be encoded by a 400us space followed by a 400us pulse. The PhidgetIR supports two specific variations of Bi-Phase coding, called RC5 and RC6. There are protocols that have been somewhat standardized - with specific bit times and headers, and they can be automatically recognized and used for transmission. There are many other ways to encode data, but they are not covered here, and not supported automatically by our devices. They can be reproduced by capturing / retransmitting a RAW bit stream. One such protocol would be RCMM.

Also note that, with the exception of RC5 and RC6, there is no way of knowing how '1's and '0's were originally encoded by the manufacturer, and the automatic decoding logic used by our IR Remote Controls will simply guess. Therefore, a code returned by the device may be the complement of the same code published elsewhere. That being said, it will always consistently return the same code for a specific bit stream.

Receiving Data

An IR transceiver continuously receives IR data when it is not transmitting. There are three ways to intercept this data.

1. Code data: Use this method if you are wanting to act on specific codes (button presses) but don't care about reproducing them. The transceiver does its best to decode every code that comes in and displays it as a hexadecimal string (array of bytes). This string should be unique at least on one remote. Access this data using the Code event or the LastCode property.

2. Learn Code data: Use this method if you want to learn or retransmit a code, the transceiver will determine as much about a code as possible and pass the CodeInfo structure/object which contains the code semantics, along with the code string (byte array) itself. This can be used to retransmit the code as it was received. In order to learn a code the button must be held down longer (~1 second). Access this data using the Learn event or the LastLearnedCode property.

3. Raw data: Use this method if the transceiver cannot decode the data automatically, you can access the raw data stream directly. This is an integer array of data in micro-seconds. Each access to the Raw Data array will return an even number of array elements, with the first element always being a space and the last element always being a pulse. Access this data using the RawData event or the getRawData (readRaw) function.

Transmitting Data

Data can be transmitted in two ways. When data is being transmitted, reception is momentarily paused.

1. Code data: Use this method if you want to transmit a code that can be encoded automatically by the PhidgetIR. This will be almost any code. In order to send a code like this, you will need to fill in a CodeInfo structure. The easiest way to get all of these values is to learn the code from the original remote.

Note that the remote will probably use the same CodeInfo settings for every button, with only the actual code (data) changing. You can also fill in the CodeInfo structure manually using known data (for example, in the LIRC remote control database). Just be aware that their codes may not exactly match the codes you need to use because of a most/least significant bit first convention mismatch or the flipped bits methods mentioned above.

2. Raw data: If you can't represent your bit stream using a CodeInfo structure, you can send Raw data directly. This is just an array of pulses and spaces in microseconds. The array must start and end with a pulse. An optional gap can also be specified which serves to guarantee spacing before any more data is transmitted.

Resources

- Database of CIR codes (<http://www.lirc.org/>)

- General CIR reference with links (http://en.wikipedia.org/wiki/Consumer_IR)
- CIR protocols (<http://www.sbprojects.com/projects/ircontrol/ircontrol.htm>)

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EXHIBIT H

A Discovery Company

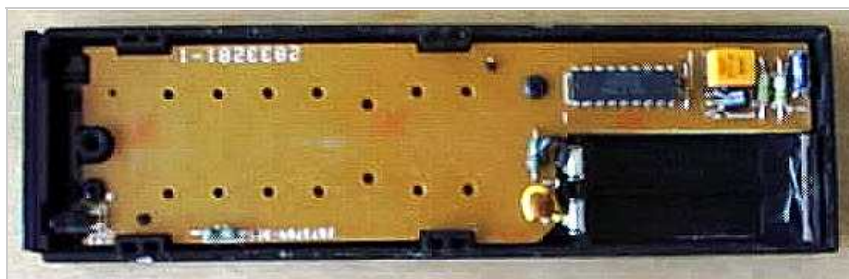
Inside a TV Remote Control

by Marshall Brain

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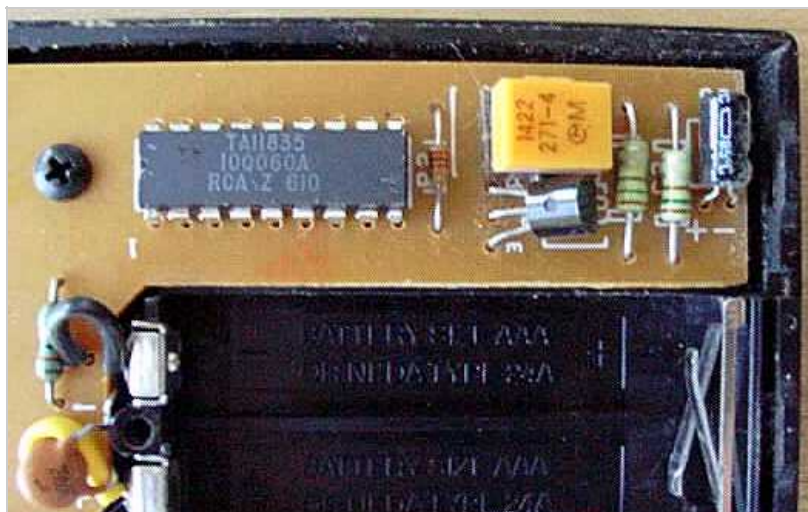


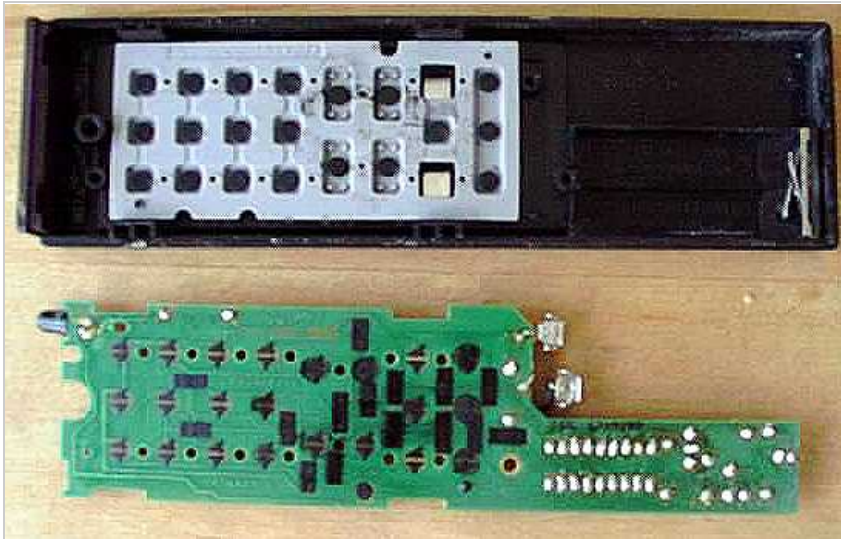
Introduction to Inside a TV Remote Control

If you are like most Americans, you probably pick up a TV remote control at least once or twice a day. Let's look inside and see how they work. Here is the remote we will be dissecting today:

The remote control's job is to wait for you to press a key, and then to translate that key-press into infrared (pronounced "infra-red") light signals that are received by the TV. When you take off the back cover of the control you can see that there is really just 1 part visible: a **printed circuit board** that contains the electronics and the battery contacts.

The components that you see here are typical for most remotes. You can see an **integrated circuit** (also known as a **chip**) labeled "TA11835". The chip is packaged in what is known as an **18 pin Dual Inline Package**, or a **DIP**. To the right of the chip you can see a diode, a transistor (black, with three leads), a resonator (yellow), two resistors (green) and a capacitor (dark blue). Next to the battery contacts there is a resistor (green) and a capacitor (tan disk). In this circuit, the chip can detect when a key is pressed. It then translates the key into a sequence something like morse code, with a different sequence for each different key. The chip sends that signal out to the transistor to amplify the signal and make it stronger.





LEARN MORE

- [RC Toys](#)
- [How Remote Controls Work](#)
- [Discovery.com: Remote Aircraft Guidance](#)

The Circuit Board

When you unscrew the circuit board and take it out, you can see that the circuit board is a thin piece of fiber glass that has thin copper "wires" etched onto its surface. Electronic parts are assembled on printed circuit boards because they are easy to mass produce and assemble. In the same way that it is relatively inexpensive to print ink onto a sheet of paper, it is inexpensive to "print" copper wires onto a sheet of fiber glass. It is also easy to have a machine drop the parts (the chips, transistors, etc.) onto the sheet of fiberglass and then solder them on to connect them to the copper wires.

When you look at the board, you can see a set of contact points for the buttons. The buttons themselves are made of a thin rubbery sheet. For each button there is a black conductive disk. When the disk touches the contacts on the printed circuit board, it connects them and the chip can sense that connection.

At the end of the circuit board there is an **infrared LED**, or **Light Emitting Diode**. You can think of an LED as a small light bulb. Many LEDs produce visible light, but a remote's LED produces infrared light that is invisible to the human eye. It is not invisible to all eyes, however. For example, if you have a camcorder it can see the infrared light. Point your remote at the camera and push a button. You will be able to see the infrared light flashing in the viewfinder.

The receptor in the TV is able to see infrared light as well.

So the basic operation of the remote goes like this: You press a button. When you do that you complete a specific connection. The chip senses that connection and knows what button you pressed. It produces a morse-code-like signal specific to that button. The transistors amplify the signal and send them to the LED, which translates the signal into infrared light. The sensor in the TV can see the infrared light and "seeing" the signal reacts appropriately.

Links General:

- [How Television Works](#)

Technical:

- [Decoding IR Remote Controls](#)
- [A Serial Infrared Remote Control](#)
- [IR remote control computer interfacing](#)
- [Remote Infrared Control](#)
- [Innotech Systems, Inc.](#) - manufacturer

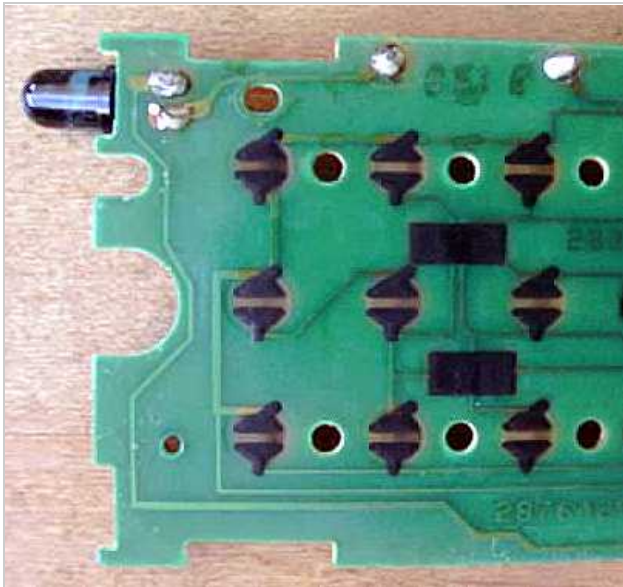


EXHIBIT I

[About IrDA](#)[Applications](#)[IrDA Products](#)[Newsroom](#)

Standards from the Infrared Data Association today permit tens of millions of users to easily beam items between handheld devices.

Professionals beam business cards from PDA to cell phone. School children wirelessly exchange games at recess. Shoppers make purchases at grocery stores by pointing a handheld device at point of sale terminal.

Today, IR protocols are used in applications like consumer electronics, computers, household appliances, medical devices, automotive technologies & commercial services.

Join the IrDA

Become a member of the community that creates and develops fast and reliable communication standards by using Infrared technology-- become an IrDA member!

[Learn More >](#)

Giga-IR and IrDA Classic

Recent innovative improvements to protocol layers and transceiver designs now allow IrDA technology to be more efficient, extend the distance up to 3m and enable much wider angles.

[Learn More >](#)

Featured Giga-IR Demo



IrDA in the News

[IrDA Creates 5 and 10 Gigabit Optical Wireless Communications Workgroup](#)
[IrSimple Certification Process Enhanced with Test Selection Capability](#)



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EXHIBIT J

Infrared Data Association

From Wikipedia, the free encyclopedia

The **Infrared Data Association (IrDA)** is an industry driven interest group that was founded in 1993 by around 50 companies. IrDA provides specifications for a complete set of protocols for wireless infrared communications and the name "IrDA" also refers to that set of protocols. The main reason for using IrDA had been wireless data transfer over the “last one meter” using point and shoot principles. Thus, it has been implemented in portable devices such as mobile phones, laptops, cameras, printers, medical devices and many more. Main characteristics of this kind of wireless optical communication is physically secure data transfer, Line-of-Sight (LOS) and very low bit error rate (BER) that makes it very efficient.

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- 1 Specifications
 - 1.1 IrPHY
 - 1.2 IrLAP
 - 1.3 IrLMP
 - 1.4 Tiny TP
 - 1.5 IrCOMM
 - 1.6 OBEX
 - 1.7 IrLAN
 - 1.8 IrSimple
 - 1.9 IrSimpleShot
- 2 Reception
- 3 See also
- 4 References
- 5 Further reading
- 6 External links
 - 6.1 Official
 - 6.2 Other



IrDA Logo



IrDA via USB

Specifications

IrPHY

The mandatory **IrPHY (Infrared Physical Layer Specification)** is the physical layer of the IrDA specifications. It comprises optical link definitions, modulation, coding, cyclic redundancy check (CRC) and the framer. Different data rates use different modulation/coding schemes:

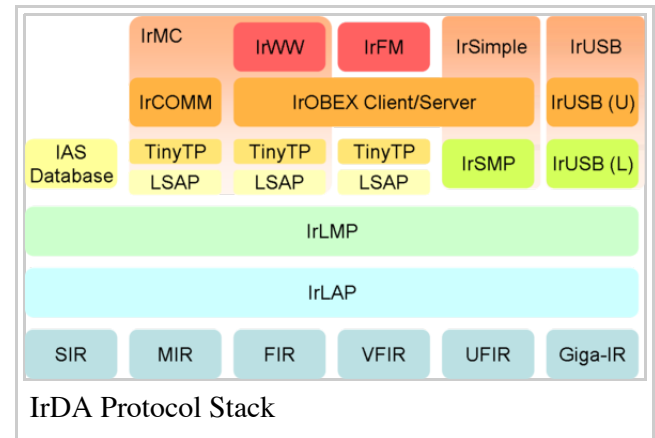
- SIR: 9.6-115.2 kbit/s, asynchronous, RZI, UART-like, 3/16 pulse
- MIR: 0.576-1.152 Mbit/s, RZI, 1/4 pulse, HDLC bit stuffing
- FIR: 4 Mbit/s, 4PPM
- VFIR: 16 Mbit/s, NRZ, HHH(1,13)
- UFIR: 96 Mbit/s, NRZI, 8B10B
- GigaIR: 512 Mbit/s – 1Gbit/s, NRZI, 2-ASK, 4-ASK, 8B10B
- 5/10GigaIR: seems to be a new IrPHY coming soon^[1]

Further characteristics are:

- Range: standard: 1 m; low power to low power: 0.2 m; standard to low power: 0.3 m, The 10 GigaIR also define new usage models that supports higher link distances up to several meters.
- Angle: minimum cone $\pm 15^\circ$
- Speed: 2.4 kbit/s to 1 Gbit/s
- Modulation: baseband, no carrier
- Infrared window
- Wavelength: 850-900 nm

The frame size depends on the data rate mostly and varies between 64 Byte and 64 kByte. Additionally bigger blocks of data can be transferred by sending multiple frames consecutively. This can be adjusted with a parameter called Window Size (1-127). Finally data blocks up to 8 MByte can be sent at once. Combined with a low bit error rate of generally $<10E-9$, that communication could be very efficient compared to other wireless solutions.

IrDA transceivers communicate with infrared pulses (samples) in a cone that extends minimum 15 degrees half angle off center. The IrDA physical specifications require that a minimum irradiance be maintained so that a signal is visible up to a meter away. Similarly, the specifications require that a maximum irradiance not be



exceeded so that a receiver is not overwhelmed with brightness when a device comes close. In practice, there are some devices on the market that do not reach one meter, while other devices may reach up to several meters. There are also devices that do not tolerate extreme closeness. The typical sweet spot for IrDA communications is from 5 to 60 cm (2.0 to 23.6 in) away from a transceiver, in the center of the cone. IrDA data communications operate in half-duplex mode because while transmitting, a device's receiver is blinded by the light of its own transmitter, and thus, full-duplex communication is not feasible. The two devices that communicate simulate full duplex communication by quickly turning the link around. The primary device controls the timing of the link, but both sides are bound to certain hard constraints and are encouraged to turn the link around as fast as possible.

IrLAP

The mandatory **IrLAP (Infrared Link Access Protocol)** is the second layer of the IrDA specifications. It lies on top of the IrPHY layer and below the IrLMP layer. It represents the Data Link Layer of the OSI model. The most important specifications are:

- Access control
- Discovery of potential communication partners
- Establishing of a reliable bidirectional connection
- Distribution of the Primary/Secondary device roles
- Negotiation of QoS Parameters

On the IrLAP layer the communicating devices are divided into a Primary Device and one or more Secondary Devices. The Primary Device controls the Secondary Devices. Only if the Primary Device requests a Secondary Device to send is it allowed to do so.

IrLMP

The mandatory **IrLMP (Infrared Link Management Protocol)** is the third layer of the IrDA specifications. It can be broken down into two parts. First, the LM-MUX (Link Management Multiplexer) which lies on top of the IrLAP layer. Its most important achievements are:

- Provides multiple logical channels
- Allows change of Primary/Secondary devices

Second, the LM-IAS (Link Management Information Access Service), which provides a list, where service providers can register their services so other devices can access these services via querying the LM-IAS.

Tiny TP

The optional **Tiny TP (Tiny Transport Protocol)** lies on top of the IrLMP layer. It provides:

- Transportation of large messages by SAR (Segmentation and Reassembly)

- Flow control by giving credits to every logical channel

IrCOMM

The optional **IrCOMM (Infrared Communications Protocol)** lets the infrared device act like either a serial or parallel port. It lies on top of the IrLMP layer.

OBEX

The optional **OBEX (Object Exchange)** provides the exchange of arbitrary data objects (e.g., vCard, vCalendar or even applications) between infrared devices. It lies on top of the Tiny TP protocol, so Tiny TP is mandatory for OBEX to work.

IrLAN

The optional **IrLAN (Infrared Local Area Network)** provides the possibility to connect an infrared device to a local area network. There are three possible methods:

- Access Point
- Peer to Peer
- Hosted

As IrLAN lies on top of the Tiny TP protocol, the Tiny TP protocol must be implemented for IrLAN to work.

IrSimple

IrSimple achieves at least 4 to 10 times faster data transmission speeds by improving the efficiency of the infrared IrDA protocol. A 500 KB normal picture from a cell phone can be transferred within 1 second.^[2]

IrSimpleShot

One of the primary targets of **IrSimpleShot (IrSS)** is to allow the millions of IrDA-enabled camera phones to wirelessly transfer pictures to printers, printer kiosks and flat panel TVs.

Reception

IrDA was popular on PDAs, laptops and some desktops during the late 90s through the early 2000s. However, it has been displaced by other wireless technologies such as WiFi and Bluetooth, favored because they don't need a direct line of sight, and can therefore support hardware such as mice and keyboards. It is still used in some environments where interference makes radio-based wireless technologies unusable.

IrDA popularity is making a comeback with its highly efficient IrSimple protocols by providing sub 1 second transfers of pictures between cell phones, printers, and display devices. IrDA hardware is still less expensive and doesn't share the same security problems encountered with wireless technologies such as Bluetooth.

In addition, some Pentax DSLRs (K-x, K-r) use IrSimple for image transfer and gaming.^[3]

See also

- Consumer IR
- Li-Fi
- List of device bandwidths
- RZI

References

- ↑ [1] (<http://irda.org/displaycommon.cfm?an=1&subarticlenbr=186>) 2011-12-15, IrDA Creates a New Working Group to Accomplish 5 and 10 Gigabit Optical Wireless Communications
- ↑ [2] (<http://irdajp.info/irsimple.html>) IrDA IrSimple Specifications (Infrared Data Association - irda.org)
- ↑ [3] (<http://www.pentaximaging.com/about-us.aspx?p=press&pid=PENTAXANNOUNCESK-rDIGITALSLRANDNEW35MMLENS20100908174223>) Pentax K-r

Further reading

- *IrDA Principles and Protocols*; Knutson and Brown; MCL Press; 214 pages; 2004; ISBN 978-0975389201.

External links

Official

- Official website (<http://www.irda.org>)
- List of official specifications (<http://irdajp.info/specifications.html>), physical layer specification is US\$100

Other

- Linux Infrared HOWTO (<http://www.tldp.org/HOWTO/Infrared-HOWTO/>)
- Linux Infrared Remote Control (<http://www.lirc.org>)

- Linux status of infrared devices (IrDA, ConsumerIR, Remote Control) (http://tuxmobil.org/ir_misc.html)
- Latest IRDA developments (<http://www.deviceforge.com/news/NS7351692307.html>) including IrSimple, VFIR and UFIR (2005)
- IrDA project of Universidad Nacional de Colombia SIE board (http://wiki.linuxenaja.net/wiki/Academico/Embebidos/IrDA_SIE)

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Categories: Standards organizations | Infrared Data Association

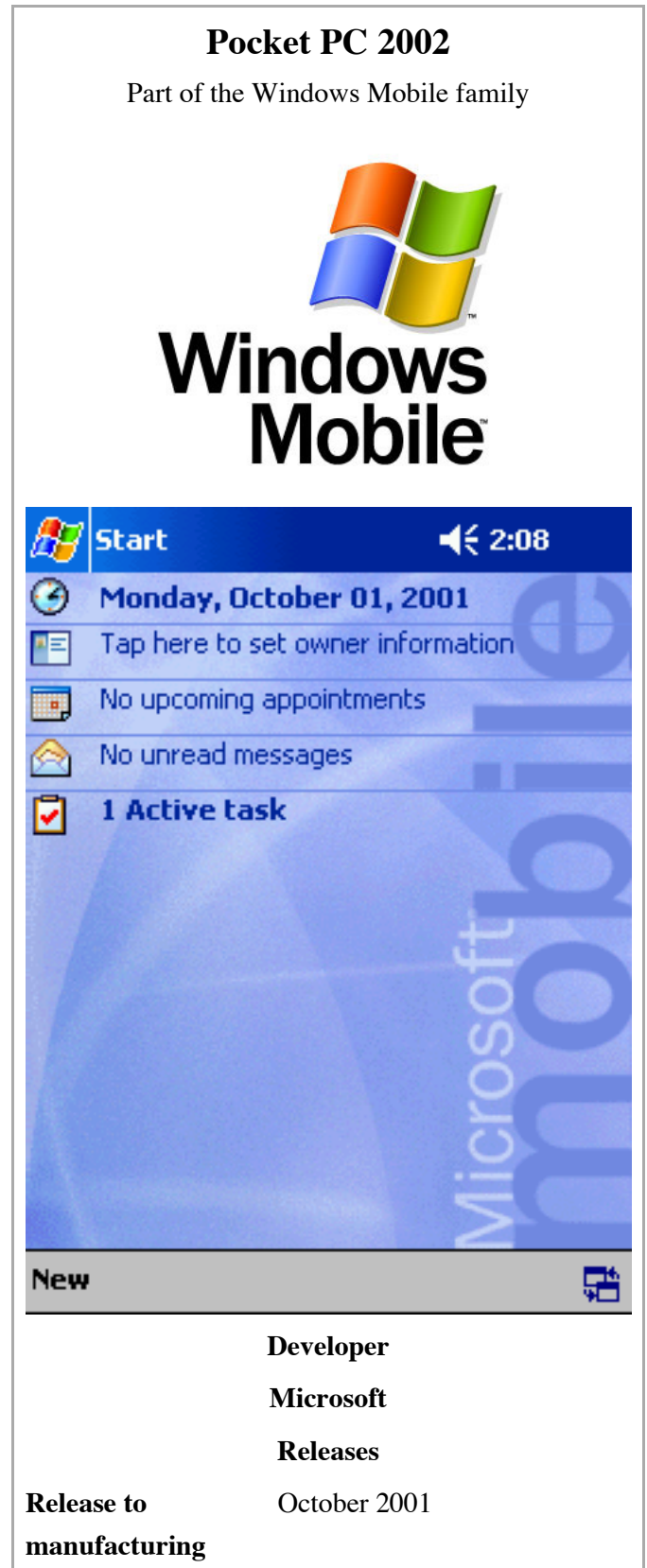
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EXHIBIT K

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Source model	Closed source
Preceded by	Pocket PC 2000
Succeeded by	Windows Mobile 2003
Support status	
Unsupported as of October 14, 2008	

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Categories: Windows CE | Windows Mobile

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EXHIBIT L

Smartphone

From Wikipedia, the free encyclopedia

A **smartphone** (or **smart phone**) is a mobile phone with more advanced computing capability and connectivity than basic feature phones.^{[1][2][3]}

Early smartphones typically combined the features of a mobile phone with those of another popular consumer device, such as a personal digital assistant (PDA), a media player, a digital camera, or a GPS navigation unit. Modern smartphones include all of those features plus the features of a touchscreen computer, including web browsing, Wi-Fi, and 3rd-party apps.

Currently, about 90% of handset sales worldwide are for devices driven by Google's Android and Apple's iOS mobile operating systems.^[4]

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History

Early years

Devices that combined telephony and computing were first conceptualized in 1973, and were offered for sale beginning in 1993. The term "smartphone" first appeared in 1997, when Ericsson described its GS 88

"Penelope" concept as a *Smart Phone*.^{[5][6][7][8][9]}

Forerunners

The first mobile phone to incorporate PDA features was an IBM prototype developed in 1992 and demonstrated that year at the COMDEX computer industry trade show. A refined version of the product was marketed to consumers in 1994 by BellSouth under the name Simon Personal Communicator. The Simon was the first device that can be properly referred to as a "smartphone", even though that term was not yet coined.^{[6][11]} In addition to its ability to make and receive cellular phone calls, Simon was also able to send and receive faxes and e-mails through its touch screen display.

PDAs

In the late 1990s, many mobile phone users carried a separate dedicated PDA device, running early versions of operating systems such as Palm OS, BlackBerry OS or Windows CE/Pocket PC.^[1] These operating systems would later evolve into mobile operating systems.

In 1996, Nokia released the Nokia 9000 which became their best-selling phone of that time. It was a palmtop computer-style phone combined with a PDA from HP. In early prototypes, the two devices were fixed together via a hinge in what became known as a clamshell design. When opened, the display was on the inside top surface and with a physical QWERTY keyboard on the bottom. Email and text-based web browsing was provided by the GEOS V3.0 operating system.

In June 1999, Qualcomm released a "CDMA Digital PCS Smartphone" with integrated Palm PDA and Internet connectivity, known as the "pdQ Smartphone".^[12]

In early 2000, the Ericsson R380 was released by Ericsson Mobile Communications,^[13] and was the first device marketed as a "smartphone".^[14] It combined the functions of a mobile phone and a personal digital assistant (PDA), supported limited web browsing with a resistive touchscreen utilizing a stylus.^[15]

In early 2001, Palm, Inc. introduced the Kyocera 6035, which combined a PDA with a mobile phone and operated on Verizon. It also supported limited web browsing.^{[16][17]}

Smartphones before Android, iOS, and Blackberry, typically ran on Symbian, which was originally developed by Psion. It was the world's most widely used smartphone operating system until Q4 2010.

Mass adoption

In 1999, the Japanese firm NTT Docomo released the first smartphones to achieve mass adoption within a country. These phones ran on i-mode, which provided data transmission speeds up to 9.6 kbit/s.^[18] Unlike future generations of wireless services, NTT Docomo's i-mode used cHTML, a language which restricted some aspects of traditional HTML in favor of increasing data speed for the devices. Limited functionality, small screens and limited bandwidth allowed for phones to maximize the slower data speeds available.^[19]

The rise of i-mode helped NTT Docomo accumulate an estimated 40 million subscribers by the end of 2001. It was also ranked first in market capitalization in Japan and second globally. This power would wane in the face of the rise of 3G and new phones with advanced wireless network capabilities.^[20]

Outside of Japan smartphones were still a rare feature, although throughout the mid-2000s, devices based on Microsoft's Windows Mobile started to gain high popularity among businessmen and businesswomen in the U.S. The BlackBerry later gained mass adoption in the U.S., which in 2006 popularized the term CrackBerry due to its addictive nature.^[21] The company first released its GSM BlackBerry 6210, BlackBerry 6220, & BlackBerry 6230 devices in 2003. Also released was the Blackberry 7730 which featured a color screen.^[22] In



IBM Simon and charging base (1993^[10])

2006 and 2007, both operating systems were in a large lead in the North American market, although while BlackBerry was popular among both business people and young people, Windows Mobile was only popular in the former.

These successive waves of phone technology allowed users to email, fax and make traditional calls, making it a useful tool for business travelers. As the BlackBerry gained customers, less sophisticated users were attracted to its many communication options.

In Europe, Windows Mobile was never a large player in the market, and BlackBerry didn't make a notable impact in the market until around 2008. Symbian was the most popular smartphone OS in Europe during the mid and late 2000s. This was largely led by Nokia, which has always been a popular brand outside of North America. Initially Nokia's Symbian devices were focused on business, the same way as Windows Mobile and BlackBerry devices at the time. From 2006 onwards, Nokia started to make entertainment-focused smartphones, which were popularized by the Nseries. The N95, for instance, had breakthrough multimedia features for its time, and marked the start of a broader market of smartphones within younger people, and not just business. In Asia (except Japan), the trend was similar to Europe's.

Another company that made a breakthrough was the Palm. Although originally PDAs, Palms later turned into business-focused smartphones, largely competing with BlackBerry and Windows Mobile in the U.S. market, and was less popular in Europe and Asia.

All leaders of the 2000s suffered following the release of the iPhone.

iPhone and later

In 2007, Apple Inc. introduced the iPhone, one of the first mobile phones to use a multi-touch interface. The iPhone was notable for its use of a large touchscreen for direct finger input as its main means of interaction, instead of a stylus, keyboard, or keypad typical for smartphones at the time.^[23] 2008 saw the release of the first phone to use Android called the HTC Dream (also known as the T-Mobile G1).^{[24][25]} Android is an open-source platform founded by Andy Rubin and backed by Google.^{[26][27]} Although Android's adoption was relatively slow at first, it started to gain widespread popularity in 2010.

Both of these operating systems led to the drop of the previous leading companies. Microsoft, for instance, started a new OS from scratch, in the form of Windows Phone, which is now the third largest OS. Nokia abandoned Symbian and partnered with Microsoft to use Windows Phone on its smartphones. Palm was bought by Hewlett-Packard, turned into webOS, and later demised. BlackBerry also made a new system from scratch, BlackBerry 10.

The future

In 2013, the Fairphone company launched its first "socially ethical" smartphone at the London Design Festival to address concerns regarding the sourcing of materials in the manufacturing.^[28] In late 2013, QSAAlpha commenced production of a smartphone designed entirely around security, encryption and identity

protection.^[29] In December 2013, the world's first curved-OLED technology smartphones were introduced to the retail market with the sale of the Samsung Galaxy Round and LG G Flex models.^[30]

Foldable OLED smartphones could be as much as a decade away because of the cost of producing them. There is a relatively high failure rate when producing these screens. As little as a speck of dust can ruin a screen during production. Creating a battery that can be folded is another hurdle.^[31] Samsung fully foldable phones are expected around 2016 to 2017.^[32]

A clear thin layer of crystal glass can be added to small screens like watches and smartphones that make them solar powered. Smartphones could gain 15% more battery life during a typical day. This first smartphones using this technology should arrive in 2015. This screen can also work to receive Li-Fi signals and so can the smartphone camera.^[33] The cost of these screens per smartphone is between \$2 and \$3, much cheaper than most new technology.^[34]

Near future smartphones might not have a traditional battery as their sole source of power. Instead, they may pull energy from radio, television, cellular or Wi-Fi signals.^[35]

In early 2014, smartphones are beginning to use Quad HD (2K) 2560x1440 on 6" screens with up to 490 ppi which is a significant improvement over Apple's retina display. Quad HD is used in advanced televisions and computer monitors, but with 110 ppi or less on such larger displays.^[36]

In 2014, Wi-Fi will continue to become the primary network for smartphones. As these devices do more and more with data and Wi-Fi becomes more prevalent and easier to connect to, Wi-Fi First smartphones service will start to take off.^{[37][38][39]}

In February 2014, some smartphones are dustproof and waterproof up to one-meter underwater depth such as Samsung Galaxy S5, Sony Xperia Z1S and Sony Xperia Z2.^[40]

Mobile operating systems

Android

Android is an open-source platform founded in October 2003 by Andy Rubin and backed by Google, along with major hardware and software developers (such as Intel, HTC, ARM, Motorola and Samsung) that form the Open Handset Alliance.^{[26][27]} In October 2008, HTC released the HTC Dream, the first phone to use Android.^{[24][25]} The software suite included on the phone consists of integration with Google's proprietary applications, such as Maps, Calendar, and Gmail, and a full HTML web browser. Android supports the execution of native applications and third-party apps which are available via Google Play, which launched in October 2008 as Android Market. By Q4 2010, Android became the best-selling smartphone platform.

Bada

The Bada operating system for smartphones was announced by Samsung in November 2009.^{[41][42]} The first Bada-based phone was the Samsung Wave S8500, released in June 2010.^{[43][44][45]} Samsung shipped 4.5 million phones running Bada in Q2 of 2011.^[46] In 2013, Bada merged with a similar platform called Tizen.

BlackBerry

In 1999, RIM released its first BlackBerry devices, providing secure real-time push-email communications on wireless devices. Services such as BlackBerry Messenger provide the integration of all communications into a single inbox. There are 80 million active BlackBerry service subscribers and the 200 millionth BlackBerry smartphone was shipped in September 2012.^[47] Most recently, RIM has undergone a platform transition, changing its name to BlackBerry and making new devices on a new platform named "BlackBerry 10."^[48]

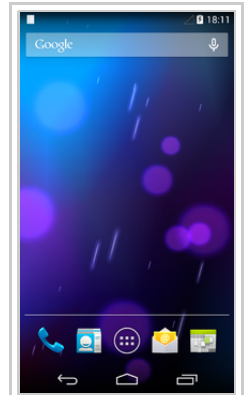
Firefox OS

Firefox OS (originally called the boot to gecko project) was demonstrated by Mozilla in February 2012. It was designed to have a complete community based alternative system for mobile devices, using open standards and HTML5 applications. The first commercially available Firefox OS phones were ZTE Open and Alcatel One Touch Fire. As of 2014 more companies have partnered with Mozilla including Panasonic (which is making a smart TV with Firefox OS) and Sony.^[49]

iOS

In 2007, Apple Inc. introduced the iPhone, one of the first mobile phones to use a multi-touch interface. The iPhone was notable for its use of a large touchscreen for direct finger input as its main means of interaction, instead of a stylus, keyboard, or keypad as typical for smartphones at the time.^[23] In July 2008, Apple introduced its second generation iPhone with a much lower list price and 3G support. Simultaneously, they introduced the App Store, which allowed any iPhone to install third-party native applications. Featuring over 500 applications at launch,^[50] the App Store eventually achieved 1 billion downloads in the first year, and 15 billion by 2011.^{[51][52]}

Palm OS



Android 4.4.2
home screen



BlackBerry
Curve 8900
(2008)



The original
iPhone (2007)

In late 2001, Handspring launched their own Springboard GSM phone module with limIn early 2002, Handspring released the Palm OS Treo smartphone with both a touch screen and a full keyboard. The Treo had wireless web browsing, email, calendar, a contact organizer and mobile third-party applications that could be downloaded or synced with a computer.^[53] Handspring was soon acquired by Palm, which released the Treo 600 and continued, though the series eventually took on Windows Mobile. After buying Palm, Inc, in 2011 Hewlett-Packard (HP) finally discontinued its smartphones and tablets production using webOS which is initial developed by Palm, Inc.^[54]

Sailfish OS

The Sailfish OS is based on the Linux kernel and Mer.^[55] Additionally Sailfish OS includes a partially or completely proprietary multi-tasking user interface programmed by Jolla. This user interface differentiate Jolla smartphones from others.^[56] Sailfish OS is intended to be a system made by many of the MeeGo team, which left Nokia to form Jolla, utilizing funding from Nokia's "Bridge" program which helps establish and support start-up companies formed by ex-Nokia employees.^{[57][58][59]}

Symbian

Symbian was originally developed by Psion as EPOC32. It was the world's most widely used smartphone operating system until Q4 2010, though the platform never gained popularity or widespread awareness in the U.S., as it did in Europe and Asia. The first Symbian phone, the touchscreen Ericsson R380 Smartphone, was released in 2000,^{[60][61]} and was the first device marketed as a "smartphone".^[62] It combined a PDA with a mobile phone.^[63] In February 2011, Nokia announced that it would replace Symbian with Windows Phone as the operating system on all of its future smartphones, with the platform getting abandoned throughout the following few years.^[64]

Windows Mobile

Windows Mobile was based on the Windows CE kernel and first appeared as the Pocket PC 2000 operating system. Throughout its lifespan, the operating system was available in both touchscreen and non-touchscreen formats. It was supplied with a suite of applications developed with the Microsoft Windows API and was designed to have features and appearance somewhat similar to desktop versions of Windows. Third parties could develop software for Windows Mobile with no restrictions imposed by Microsoft. Software applications were eventually purchasable from Windows Marketplace for Mobile during the service's brief lifespan.

Windows Phone



Palm Treo 650
(2004)



Nokia N8 (2010)



HTC Kaiser
(2009)

In February 2010, Microsoft unveiled Windows Phone 7 with a User Interface inspired by Microsoft's "Metro Design Language", to replace Windows Mobile. Windows Phone 7 integrates with Microsoft services such as Microsoft SkyDrive, Office, Xbox and Bing, as well as non-Microsoft services such as Facebook, Twitter and Google accounts. This software platform runs the Microsoft Mobile smartphones, and has received some positive reception from the technology press and been praised for its uniqueness and differentiation.^{[65][66][67]}

Application stores

The introduction of Apple's App Store for the iPhone and iPod Touch in July 2008 popularized manufacturer-hosted online distribution for third-party applications (software, computer programs) focused on a single platform. Up until that point, smartphone application distribution depended on third-party sources providing applications for multiple platforms, such as GetJar, Handango, Handmark, and PocketGear.

Store	2010 (millions U.S.) ^[68]
Apple App Store	\$1782
BlackBerry App World	\$165
Nokia Ovi Store	\$105
Google Play	\$102
Total	\$2155

Following the success of the App Store, other smartphone manufacturers launched application stores, such as Google's Android Market in October 2008 and RIM's BlackBerry App World in April 2009.

Market share

Smartphone usage

In the third quarter of 2012, one billion smartphones were in use worldwide.^[69] Global smartphone sales surpassed the sales figures for features phones in early 2013.^[70] As of 2013, 65 percent U.S. mobile consumers own smartphones.^[71] The European mobile device market as of 2013 is 860 million.^[72] In China, smartphones represented more than half of all handset shipments in the second quarter of 2012.^[73]

As of November 2011, 27% of all photographs were taken with camera-equipped smartphones.^[74] A study conducted in September 2012 concluded that 4 out of 5 smartphone owners use the device to shop.^[75] Another study conducted in June 2013 concluded that 56% of American adults now owned a smartphone of some kind. Android and iPhone owners account for half of the cell phone user population. Higher income adults and those under age 35 lead the way when it comes to smartphone ownership.^[76]

Worldwide shipments of smartphones topped 1 billion units in 2013 (up 38% from 2012's 725 million) while comprising a 55% share of the mobile phone market in 2013 (up from 42% in 2012).^[77]

By manufacturer

In 2013, Samsung had 31.3 percent shipment market share, a slight increase from 30.3 percent in 2012, while Apple was at 15.3 percent, a decrease from 18.7 percent in 2012. Huawei, LG and Lenovo were at about 5 percent each, significantly better than 2012 figures, while others had about 40 percent, the same as the previous years figure. Only Apple lost market share, although their shipment volume still increased by (small) 12.9 percent; the rest had significant increases in shipment volumes of 36 to 92 percent.^[78]

By operating system

The market has been dominated by the Android operating system since 2010. Android's market share (measured by units shipment) rose from 33.2% in Q4 2011 to 78.1% of the market in Q4 2013. Apple managed to oscillate their market share between 15% to 20.9% during the same period. BlackBerry's market share fell from 14.3% in Q4 2011 to 0.6% in Q4 2013. MS Windows Mobile market share rose from 1.5% to 3% during the same time frame.^[79]

As of the end of Q3 2013, Android was the most popular operating system, with a 81.9% market share, followed by iOS with 12.1%, Windows Phone with 3.6% and BlackBerry with 1.8%.^{[80][81]}

Historical sales figures (in millions of units)

Year	Android (Google)	BlackBerry (RIM)	iOS (Apple)	Linux (other than Android)	Palm/WebOS (Palm/HP)	Symbian (Nokia)	Asha Full Touch (Nokia)	Windows Mobile/Phone (Microsoft)	Bada (Samsung)	Other
2007 ^[82]		11.77	3.3	11.76	1.76	77.68		14.7		
2008 ^[82]		23.15	11.42	11.26	2.51	72.93		16.5		
2009 ^[83]	6.8	34.35	24.89	8.13	1.19	80.88		15.03		
2010 ^[84]	67.22	47.45	46.6			111.58		12.38		
2011 ^[85]	219.52	51.54	89.26			93.41		8.77		14.24
2012-Q1 ^[86]	81.07	9.94	33.12			12.47		2.71	3.84	1.24
2012-Q2 ^[87]	104.8	7.4	26.0	3.5		6.8		5.4		0.1
2012-Q3 ^[88]	122.5	9.0	23.6			4.4	6.5 ^[89]	4.1	5.1	0.7
2012-Q4 ^[90]	144.7	7.3	43.5			2.6	9.3 ^[91]	6.2	2.7	0.7
2013-Q1 ^[92]	162.1	6.3	37.4			—	--	7.0	--	--
2013-Q2 ^[93]	177.9	6.2	31.9			.631	--	7.4	.838	.471

Issues

Environmental

Obtaining the resources required to create smartphones involves the mining of minerals such as coltan, which are toxic to humans and wildlife.^[94] Other raw materials, such as oils, copper, plastics, and solvents, have the potential to contaminate both the soil and groundwater.^[94] Smartphones also contain toxic chemicals such as lead, bromine, chlorine, mercury, and cadmium.^[95]

The improper recycling of used smartphones damages the environment.^[96] Mobile phones can contain dangerous chemicals such as antimony, cadmium, copper, lead, arsenic, nickel and zinc,^[94] which can run off into surrounding water bodies or seep into soil contaminating wildlife and drinking water.^[97]

Worker conditions

The capacitors in electronics use minerals mined in developing countries. Mines in Rwanda, for example, have been associated with human rights and labor rights violations.^[98] Workers, including children, have been forced to work at gunpoint while mining for smartphone materials.^[98]

The electronics soldering in smartphones require tin, 30% of which comes from the Indonesian islands of Bangka and Belitung. The tin extraction process has been identified as environmentally destructive and, as of September 2013, children are employed in hazardous conditions to extract tin.^[99] Modern Westerners typically disapprove routine employment of people under 16 or so, imagining they have better options.

Social

A University of Southern California study found that the unprotected adolescent sexual activity was more common amongst owners of smartphones.^[100] A study conducted by the Rensselaer Polytechnic Institute's (RPI) Lighting Research Center (LRC) concluded that smartphones, or any backlit devices, can seriously affect sleep cycles.^[101]

Legal

A "patent war" between Samsung and Apple started when the latter claimed that the original Galaxy S Android phone copied the interface—and possibly the hardware—of Apple's iOS for the iPhone 3GS.

Security

Smartphone malware is more easily distributed through application stores that have minimal or no security mechanisms.^{[102][103]} Often malware is hidden in pirated versions of legitimate apps, which are then distributed through 3rd party app stores.^{[104][105]} Malware risk also comes from what's known as an "update attack", where a legitimate application is later changed to include a malware component, which users then install when they are notified that the app has been updated.^[106]

One out of three robberies involve the theft of a mobile phone. An online petition urging that smartphone makers to install kill switches in their devices is underway.^[107]

In order to minimize the chances of being a victim of theft of mobile devices, there have been several apps created to help those out that may be in a dangerous situation. There are now apps that may aid in personal security by providing immediate assistance.

Disturbing sleep

Using smartphones late at night can disturb sleep due to the bright screen light affecting melatonin levels and sleep cycles.^{[108][109][110][111]}

Other Terms

"phablet", a portmanteau of the words *phone* and *tablet* describes smartphones with larger screens.^{[112][113]}

"superphone" is also used by some companies to market phones with unusually large screens and other expensive features.^{[114][115]}

See also

- BlackBerry thumb
- Camera phone and videophone
- Comparison of smartphones
- List of digital distribution platforms for mobile devices
- Media Transfer Protocol
- Mobile broadband connectivity
- Mobile Internet device (MID) and personal digital assistant (PDA)
- Mobile operating system
- Mobile phone
- Second screen
- Screen protector

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Categories: Smartphones | Information appliances | Cloud clients

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EXHIBIT M

A&M Records, Inc. v. Napster, Inc.

From Wikipedia, the free encyclopedia

A&M Records, Inc. v. Napster, Inc., 239 F.3d 1004 (2001)^[1] was a landmark intellectual property case in which the United States Court of Appeals for the Ninth Circuit affirmed the ruling of the United States District Court for the Northern District of California, holding that defendant, peer-to-peer (P2P) file-sharing service Napster, could be held liable for contributory infringement and vicarious infringement of the plaintiffs' copyrights. This was the first major case to address the application of copyright laws to peer-to-peer file-sharing.

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Plaintiffs

A&M Records, Inc. v. Napster, Inc.



Court United States Court of Appeals for the Ninth Circuit

Full case name *A&M Records, Inc. v. Napster, Inc.*

Argued October 2 2000

Decided February 12 2001

Citation(s) 239 F.3d 1004

Holding

Napster could be held liable for contributory and vicarious copyright infringement, affirming the District Court holding.

Court membership

Judge(s) sitting Mary M. Schroeder, Richard Paez, Robert R. Beezer

Case opinions

Majority Robert R. Beezer

Laws applied

17 U.S.C. § 501, 17 U.S.C. §106

While the case is referred to as A&M Records, Inc. v. Napster, the full list of plaintiffs included a number of record companies, all members of the Recording Industry Association of America (RIAA).^[2] The plaintiffs in the District Court suit were:^[3]

- A&M Records, a subsidiary of Universal Music Group
- Geffen Records, a subsidiary of Universal Music Group
- Interscope Records, a subsidiary of Universal Music Group
- Sony Music Entertainment
- MCA Records, a subsidiary of Universal Music Group
- Atlantic Records, a subsidiary of Warner Music Group
- Island Records, a subsidiary of Universal Music Group
- Motown Records, a subsidiary of Universal Music Group
- Capitol Records, a subsidiary of EMI
- LaFace Records, a subsidiary of Sony Music Entertainment
- BMG Music d/b/a The RCA Records Label, subsidiaries of Sony Music Entertainment
- Universal Records, a subsidiary of Universal Music Group
- Elektra Entertainment Group, a subsidiary of Warner Music Group
- Arista Records, a subsidiary of Sony Music Entertainment
- Sire Records Group, a subsidiary of Warner Music Group
- Polygram Records, a subsidiary of Universal Music Group
- Virgin Records America, a subsidiary of EMI
- Warner Bros. Records, a subsidiary of Warner Music Group

Universal Music Group, Sony Music Entertainment, EMI, and Warner Music Group are known as the "big four" in the music industry.^[4] Of this list, only A&M, Geffen, Interscope, Sony, MCA, Atlantic, Island, and Motown are listed as plaintiffs on the appeal. Additionally, American songwriters and producers Jerry Leiber and Mike Stoller are included on the Circuit Court appeal, representing the interests of "all others similarly situated."^[1]

Defendant

Napster was started in 1999 by Shawn Fanning, then an 18-year-old freshman computer science student at Northeastern University.^[5] It provided a platform for users to access and download compressed digital music files, specifically MP3s, from other users' machines. Unlike many peer-to-peer services, however, Napster included a central server that indexed connected users and files available on their machines, creating a

searchable list of music available across Napster's network. Napster's ease of use compared to other peer-to-peer services quickly made it a popular service for music enthusiasts to find and download digital song files for free.^[6]

Procedural background

Plaintiffs alleged both contributory and vicarious copyright infringement by Napster, and soon filed a motion for a preliminary injunction in order to stop the exchange of plaintiffs' songs on the service immediately.

Judge Marilyn Hall Patel of the United States District Court for the Northern District of California granted the preliminary injunction, on the grounds that the plaintiffs demonstrated a reasonable likelihood of success.^[nb 1] She issued an injunction which preliminarily enjoined Napster

from engaging in, or facilitating others in copying, downloading, uploading, transmitting, or distributing plaintiffs' copyrighted musical compositions and sound recordings, protected by either federal or state law, without express permission of the rights owner.

Napster appealed to United States Court of Appeals for the Ninth Circuit.

Ninth Circuit appeal

On appeal, the Ninth Circuit ordered a stay of the District Court's injunction, pending resolution. The Ninth Circuit issued its opinion on February 12, 2001, affirming in part and reversing in part the District Court's decision.

Direct infringement

The Circuit Court agreed with the district court's threshold determination that Napster users were probably engaging in direct infringement of plaintiffs' copyrights.

Fair use defense

Turning to the question of fair use, the Circuit court agreed with the district court's "general analysis of Napster system uses" as well as with its analysis of the three "alleged fair uses identified by Napster" – which were "sampling, where users make temporary copies of a work before purchasing; space-shifting, where users access a sound recording through the Napster system that they already own in audio CD format; and permissive distribution of recordings by both new and established artists."

The court first considered these four factors on an abstract level of the system itself.

1. They agreed with the District Court's finding that downloading an MP3 is not transformative under the

purpose and character of use factor, and that even though Napster didn't directly benefit financially from users' downloads (i.e., charge for the service), "repeated and exploitative copying of copyrighted works, even if the copies are not offered for sale" could be considered a commercial use.

2. The court also affirmed the district court's finding that creative works, such as the songs in question, are "closer to the core" of intended copyright protection" than non-creative works, thus favoring the plaintiffs on the second factor.
3. They considered the potential that in some cases, wholesale copying of a work may be protected, noting time-shifting as an example.
4. Finally, the Ninth Circuit agreed with the district court's finding that widespread wholesale transfer of plaintiff's music negatively affected the market for CD sales and that it also jeopardizes the record industry's future in digital markets.^[1]

The court then turned to the three uses Napster identified as fair use in the conduct of its users:

1. *sampling*, where users make temporary copies of a work to sample it before purchase, which the District Court found to be a commercial use even if a user purchases the work at a later time. Sampling was deemed to not be a fair use, because the "samples" were in fact permanent and complete copies of the desired media.
2. *space-shifting*, where users access a sound recording through the Napster system that they already own in audio CD format; here the District Court found that neither of the shifting analyses used in the *Sony* or *RIAA v. Diamond Multimedia*^[9] cases applied in this case because the "shifting" in neither case included or enabled distribution. The space-shifting argument did not succeed because, while the shift to a digital format may have been a personal storage use, it was accompanied by making the file available to the rest of the system's users.
3. *permissive distribution* of recordings by both new and established artists who have authorized their music to be disseminated in the Napster system, which the District Court ruled was not an infringing use and could continue, along with chat rooms and other non-distributory features of Napster.

By contrast, the court found that the owners of Napster could control the infringing behavior of users, and therefore had a duty to do so. The Ninth Circuit affirmed this analysis, finding that the plaintiffs were likely to succeed in proving that Napster did not have a valid fair use defense.

Contributory infringement

In order to prove contributory infringement, a plaintiff must show that a defendant had knowledge of infringement (here, that Napster knew that its users were distributing copyrighted content without permission across its network) and that defendant supplied material support to that infringement.

Knowledge. The District Court ruled that the "law does not require knowledge of 'specific acts of infringement'"^[1] and rejected Napster's assertion that, because they could not distinguish between infringing and non-infringing files, they did not have knowledge of copyright infringement. The Ninth Circuit upheld this analysis, accepting that Napster had "knowledge, both actual and constructive, of direct infringement."

The Ninth Circuit also held that Napster was not protected under *Sony Corp. of America v. Universal City Studios, Inc.*, "the Betamax case", because of Napster's "actual, specific knowledge of direct infringement." "We are compelled to make a clear distinction between the architecture of the Napster system and Napster's conduct in relation to the operational capacity of the system."

- First, the Ninth Circuit acknowledged that it could not impute sufficient knowledge to Napster "merely because peer-to-peer file sharing technology may be used to infringe plaintiffs' copyrights." Paraphrased Sony into its own words, the Ninth Circuit explained that if a defendant "made and sold equipment capable of both infringing and substantial noninfringing uses," that fact alone—i.e., "evidence that such machines could be and were used to infringe plaintiffs' copyrighted television shows" – would not be sufficient grounds to impute constructive knowledge to defendants.
- The Court also assumed that Napster's software is "capable of commercially significant noninfringing uses." This analysis differed from the District Court's, which allowed "capable of" to be limited to the concrete uses that Napster alleged were actually underway.
- Nevertheless, the Ninth Circuit found that, "Regardless of the number of Napster's infringing versus noninfringing uses", the question could be resolved on the basis of whether "Napster knew or had reason to know of its users' infringement of plaintiffs' copyrights."
- Unlike Judge Patel, the Ninth Circuit accepted that *Religious Technology Center v. Netcom* might be relevant. Based on that case,

We agree that if a computer system operator learns of specific infringing material available on his system and fails to purge such material from the system, the operator knows of and contributes to direct infringement. ... Conversely, absent any specific information which identifies infringing activity, a computer system operator cannot be liable for contributory infringement merely because the structure of the system allows for the exchange of copyrighted material.

- Applying this rule, the Ninth Circuit nevertheless concluded—in agreement with the district court—

that Napster has *actual* knowledge that *specific* infringing material is available using its system, that it could block access to the system by suppliers of the infringing material, and that it failed to remove the material.

Material contribution. The Ninth Circuit briefly approved the district court's analysis of this element.

Thus, the court affirmed the District Court ruling that the plaintiffs were likely to succeed on a claim of contributory infringement.

Vicarious infringement

Addressing the vicarious infringement claim, the court then considered the necessary factors: whether Napster benefited financially from the infringement and whether they were capable of supervising and controlling infringing conduct. The Ninth Circuit sided with the District Court, who held that the infringing activity was a draw to potential users and that, since and Napster's future business model was predicated on expanding the number of users, Napster stood to benefit financially from the infringing activity. As for supervision, the Circuit court agreed in part with the District Court's finding that Napster had "the right and ability to supervise its users' conduct."^[1] However, the Ninth Circuit felt that Napster's ability to patrol and enforce infringing use was limited by the design of the system itself. The system was not designed to read the contents of MP3s or check for copyright ownership or permissions, only to index by name and ensure they are valid MP3 files. Despite this departure from the District Court's reasoning, they argued that these indices and infringing files were just as searchable by Napster as they were by the plaintiffs in locating infringing files for evidence in the case. Because of Napster's failure to police within its means combined with the financial interest factor, the Ninth Circuit affirmed the District Court's finding of vicarious infringement.^[1]

Other defenses

In its defense against the injunction, Napster also cited the Audio Home Recording Act (17 U.S.C. §§ 1001-10).^[10] and the Digital Millennium Copyright Act's safe harbor clause (17 U.S.C. § 512).^[11] The Ninth Circuit agreed with the District Court's finding that downloading MP3 files is not covered by the Audio Home Recording Act. The Ninth Circuit disagreed slightly with the District Court on the safe harbor issue, however, finding that the contributory infringement does not necessarily exclude a party from safe harbor protection. The court held that the safe harbor issue would be explored further at trial.^[1]

Napster also argued that the record companies waived their rights to copyright protection because they "hastened" the spread of MP3s on the web and had their own plans to get into the digital market. Rejecting this argument, Judge Patel wrote, "This limited evidence fails to convince the court that the record companies created the monster that is now devouring their intellectual property rights."^[3] The Ninth Circuit agreed, and also rejected Napster's claim that, by creating and providing digital files via the Internet, the plaintiffs had granted Napster an "implied license".^[1] Finally, Napster argued that the plaintiffs were using copyright to control online distribution, which Napster considered beyond the scope of the limited monopoly provided by the

Copyright Office. The court rejected this as well, finding that MP3s were the same works as those that appeared on CDs, just in a different format, thus the plaintiffs had every right to control their distribution of digital music files because they are the plaintiffs' copyrighted works.

Scope of the injunction

Napster contended that the injunction violated the company's First Amendment rights because it was overbroad. While the Ninth Circuit rejected this argument due to the lack of a fair use defense, they did order a stay of the injunction and agreed that the injunction was overbroad because "it places on Napster the entire burden of ensuring that no 'copying, downloading, uploading, transmitting, or distributing' of plaintiffs' works occur on the system."^[1] Recognizing that Napster's system simply indexed files with imperfect file names and did not automatically verify copyright ownership, the court found that it was the plaintiffs' burden to notify Napster of any infringing files on the system, which Napster would then remove. But the court also again noted that Napster must police the system within its means: "In crafting the injunction on remand, the district court should recognize that Napster's system does not currently appear to allow Napster access to users' MP3 files."^[1] The court also declined to adjust the bond amount and called imposition of a compulsory royalty scheme an "'easy out' for Napster" that would destroy the plaintiffs' ability to control their intellectual property.^[1]

Criticism and Impact

Among a number of amicus briefs filed on behalf of both sides of the dispute, one particularly critical brief filed by a consortium of eighteen copyright law professors at United States universities argued that the District Court misread *Sony* and took too narrow a view of fair use. They wrote:

Napster is the best-known example of a new technology deploying what has come to be called peer-to-peer networking, a system in which individuals can search for and share files that reside on the hard drives of other personal computers connected to the Internet. Peer-to-peer file sharing allows individuals to bypass central providers of content and to find and exchange material with one another. The decentralized model of peer-to-peer networking poses a significant challenge to sectors of the entertainment and information businesses that follow a model of centralized control over content distribution. However, this is not the sort of challenge that copyright law is designed to redress. The district court's ruling would ban a new technology in order to protect existing business models, and would invoke copyright to stifle innovation, not to promote it.^[12]

The professors further argued that the overbroad nature of the injunction threatened the development and deployment of any future peer-to-peer file-sharing network on the Internet because it insisted on a restructuring that defeated peer-to-peer technology itself. They also argued that the finding of contributory liability was

erroneous because of Napster's significant non-infringing uses and because not all unauthorized uses within the system were infringement. They concluded, "If Plaintiffs want copyright law extended to allow the suppression of new technologies, they must make their case to Congress."^[12]

Napster struggled to comply with the demands of the rewritten injunction, and in April 2001 Judge Patel called their policing efforts "disgraceful." The company turned to digital fingerprinting to try to identify infringing files.^[13] However, at a hearing on July 11, 2001, Judge Patel's dissatisfaction with Napster's 99.4% efficacy in removing infringing material prompted her to order the service shut down until it could be 100% effective.^[14] In September 2001, Napster settled with songwriters and music publishers, agreeing to pay \$26 million.^[15] Napster filed for Chapter 11 bankruptcy in May 2002, and when a judge blocked its sale to Bertelsmann in September 2002, the first incarnation of Napster was finished.^[16]

A number of file-sharing networks surfaced in Napster's wake, including Morpheus, Grokster, and KaZaA, many of which faced their own legal challenges over infringing material on the network.^[17] In 2005, a similar file-sharing service, Grokster, was sued by MGM. The case, *MGM Studios, Inc. v. Grokster, Ltd.*, went to the Supreme Court and is considered by many to be the sequel to the Napster case, another technology that "outpaced the law."^[18] Over the next few years, BitTorrent, another P2P technology, became the target of copyright scrutiny. Popular torrent trackers like the Pirate Bay faced long legal battles,^[19] but their opponents have had little success in shutting down these services permanently.

Notes

- [^] She noted that the usual standard for preliminary injunction in the Ninth Circuit is generally a "sliding scale which requires a greater degree of harm the lesser the probability of success,"^[7] but added that "In a copyright infringement case, demonstration of a reasonable likelihood of success on the merits creates a presumption of irreparable harm."^[8]

External Links

Text of *A&M Records, Inc. v. Napster, Inc.* is available from: CourtListener (<https://www.courtlistener.com/ca9/4Xv5/am-records-inc-v-napster-inc/>) Findlaw (<http://caselaw.findlaw.com/us-9th-circuit/1047162.html>) Justia (<https://law.justia.com/cases/federal/appellate-courts/F3/239/1004/636120/>) resource.org (<http://bulk.resource.org/courts.gov/c/F3/239/239.F3d.1004.00-16403.00-16401.html>)

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Further reading

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Categories: United States Court of Appeals for the Ninth Circuit cases | United States copyright case law | United States file sharing case law | 2001 in United States case law

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EXHIBIT N

Thin client

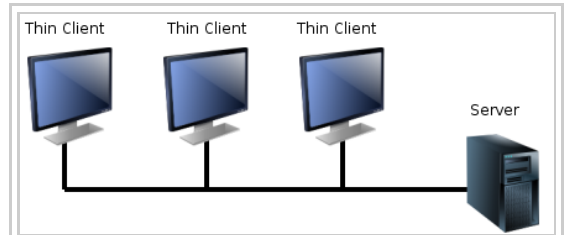
From Wikipedia, the free encyclopedia

A **thin client** (sometimes also called a **lean**, **zero** or **slim client**) is a computer or a computer program that depends heavily on some other computer (its *server*) to fulfill its computational roles. This is different from the traditional fat client, which is a computer designed to take on these roles by itself. The specific roles assumed by the server may vary, from providing data persistence (for example, for diskless nodes) to actual information processing on the client's behalf.

Thin clients occur as components of a broader computer infrastructure, where many clients share their computations with the same server. As such, thin client infrastructures can be viewed as providing some computing service via several user interfaces. This is desirable in contexts where individual fat clients have much more functionality or power than the infrastructure requires.

Thin-client computing is also a way of easily maintaining computational services at a reduced total cost of ownership.^[1]

The most common type of modern thin client is a low-end computer terminal which only provides a graphical user interface - or more recently, in some cases, a web browser - to the end user.



Thin clients connected to their server via a computer network



A public thin-client computer terminal inside a public library.

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An Aleutia E3 thin client, with flash memory

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History

Thin clients have their roots in multi-user systems, traditionally mainframes accessed by some sort of terminal computer. As computer graphics matured, these terminals transitioned from providing a command-line interface to a full graphical user interface, as is common on modern thin clients. The prototypical multiuser environment along these lines, Unix, began to support fully graphical X terminals, i.e., devices running display server software, from about 1984. X terminals remained relatively popular even after the arrival of other thin clients in the mid-late 1990s. Modern Unix derivatives like BSD and GNU/Linux continue the tradition of the multi-user, remote display/input session. Typically, X software is not made available on non-X-based thin clients, although no technical reason for this exclusion would prevent it.

Windows NT became capable of multi-user operations primarily through the efforts of Citrix Systems, which repackaged NT 3.5.1 as the multi-user operating system WinFrame in 1995. Microsoft licensed this technology back from Citrix and implemented it into Windows NT 4.0 Terminal Server Edition, under a project codenamed "Hydra". Windows NT then became the basis of Windows 2000 and Windows XP. As of 2011 Microsoft Windows systems support graphical terminals via the Remote Desktop Services component.

The term *thin client* was coined in 1993 by Tim Negriz, VP of Server Marketing at Oracle Corp., while working with company founder Larry Ellison on the launch of Oracle 7. At the time, Oracle wished to differentiate their server oriented software from Microsoft's desktop oriented products. Ellison subsequently popularized Negriz's buzzword with frequent use in his speeches and interviews about Oracle products.

The term stuck for several reasons. The earlier term "graphical terminal" had been chosen to distinguish such terminals from text-based terminals, and thus put the emphasis heavily on *graphics* - which became obsolete as a distinguishing characteristic in the 1990s as text-only physical terminals themselves became obsolete, and text-only computer systems (a few of which existed in the 1980s) were no longer manufactured. The term "thin client" also conveys better what was then viewed as the fundamental difference: thin clients can be designed with less expensive hardware, because they have reduced computational workloads.



A connected Samsung Chromebox as seen from above.

By the 2010s, however, thin clients were not the only desktop devices for general purpose computing that were "thin" - in the sense of having a small form factor and being relatively inexpensive. The Nettop form factor for desktop PCs was introduced, and nettops could run full feature Windows or Linux; tablets and tablet-laptop hybrids had also entered the market. However, while there was now little size difference, thin clients retained some key advantages over these competitors, such as not needing a local drive. However, "thin client" can be a misnomer for slim form factor computers using flash memory such as compactflash, SD card, or permanent flash memory as a hard disc substitute.

Characteristics of thin clients

Single point of failure

The server, in taking on the whole processing load of several clients, forms a single point of failure for those clients. This has both positive and negative aspects. On the one hand, the security threat model for the software becomes more focused on the servers. The clients do not run the software; therefore, only a small number of computers (the servers) need to be secured at a software level, rather than securing software installed on every single client computer (although client computers may still require physical security and strong authentication, to prevent unauthorised access, depending on requirements). On the other hand, any denial of service attack against the server will limit the access of many clients. The server software is typically written with virtual machine technology so every client is isolated and a client crash is easily handled and rebooted. The single point of failure can still exist, however. If the server crashes, data loss is possible.

For small networks, this single-point of failure property might be expanded. The hosting server can be integrated with file servers and print servers relevant to its clients. This can simplify the network and its maintenance, but might increase the risk against that server.

In practice, redundancy can be provided both in the form of additional connectivity from server to the network as well as in the servers themselves, using features like RAID, distributed servers (multiple networked servers appearing as one server to the users), clustered filesystems (which allow files to be accessed from multiple servers), VMWare High Availability and Fault Tolerance or Citrix XenApp's load balancing.

Cheap client hardware

While the server must be robust enough to handle several client sessions at once, the clients can be assembled from much cheaper hardware than that of a fat client. Many clients have minimal RAM, some do not even have a hard drive. This reduces the power consumption of those clients, and makes the system marginally scalable, i.e. it is relatively cheap to connect additional client terminals. The thin clients usually have a very low total cost



of ownership, but the need for a robust server infrastructure offsets some cost savings. Thin clients also generally use very low power and might not even require cooling fans, but the servers consume high power and almost always require an environmentally controlled air conditioned server room.

Client simplicity

Since the clients are made from low cost hardware with few moving parts, they can operate in more hostile environments than conventional computers. However, they inevitably need a network connection to their server, which must be isolated from such hostile environments. Since thin clients are cheap, they offer a low risk of theft in general, and are easy to replace if stolen or broken. Since they do not have any complicated boot images, the problem of boot image control is centralized to the server.

On the other hand, to achieve this simplicity, thin clients sometimes lag behind thick clients (PC Desktops) in terms of extensibility. For example, if a local software utility or set of device drivers are needed in order to support a locally attached peripheral device (e.g. printer, scanner, biometric security device), the thin client operating system may lack the resources needed to fully integrate the needed dependencies. Modern thin clients attempt to address this limitation via port mapping or USB redirection software. However, these methods cannot address all use case scenarios for the vast number of peripheral types being put to use today.



Gigabyte TA7
thin client

Slow bitmapped/animated graphics

Thin clients tend to be optimized for use with simple lines, curves, and text, which can be rapidly drawn by the client using predefined stored procedures and cached bitmap data. In this regard, thin clients work well for basic office applications such as spreadsheets, word processing, data entry, and so forth.

However, all thin clients suffer performance problems when large areas of the graphics display must be updated rapidly with high detail bitmap graphics, which may also need to be redrawn several times per second for animation purposes. In a few cases it may be possible to use a video stream that was already previously compressed such as MPEG or H.264 video, but many graphical programs such as photo editors, 3D drawing programs, and animation tools require high detail uncompressed bitmaps to be displayed in order for the software to be used effectively. Graphics rich 3D games can be completely unusable on a thin client unless the updated screen area is kept very small or the overall screen resolution is very low, to reduce the amount of data sent to the client.

In an attempt to reduce network bandwidth, the server may try to compress high detail bitmaps on the fly before sending the data to the client, but this adds latency to the client-server communications, and may reduce user interface responsiveness. Many thin clients offer options to turn off various graphics rich user interface effects in order to increase performance, such as not showing the contents of a window while dragging or not displaying a desktop background.

Thin client variants

Repurposing a PC as a thin client

The following options allow a PC to be used as a thin client - in some cases, even if it has no working hard drive:

- Linux Terminal Server Project
- Thinstation
- OpenThinClient
- AnywhereTS
- Remote desktop software



Ultra-thin client, Zero client, or Clientless

Traditionally, a thin client ran a full operating system for the purposes of connecting to other computers. Some thin clients, such as the Sun Ray, use a simpler protocol for communicating display updates, and these are sometimes called **ultra-thin clients** or a **zero clients**.^[2] Their tiny operating systems merely initialize the network, begin the networking protocol, handle display of the server's output, and transmit user input events. The full desktop is run remotely and the displayed graphics and text are compressed with either a remote display protocol such as PCoIP, or even just a video codec such as VP9 or Daala, and sent to the zero client. The client silicon is now much simpler and lower cost as all it requires is a video decoder and basic I/O.

RTE client

A Run Time Environment (RTE) client contains task specific applications (e.g. Mozilla Firefox for Internet browsing) and only the minimal (often customized) underlying and supporting code (BIOS, firmware, kernel, libraries, plug-ins, etc.) to run only those applications. It contains all and only the code needed to accomplish its specific task, thus it is more than a zero client but less than a typical thin client computer. The RTE client does not have a general purpose operating system - it usually lacks shells (terminal windows), is not designed to be patched (updated online), has minimal connectivity to external resources, and is often found in read-only media (e.g. tamper resistant ROM chips, CD-ROM, etc.). Attempts to inject or run any other applications/processes/threads results in crashing the kernel (system). Due to the need to physically update the device, RTE clients are mostly found in stable environments demanding high security.

Web thin client

Web thin clients only provide a web browser, and rely on web applications to provide general-purpose computing functionality. However, note that web applications may use web storage to store some data locally, e.g. for "offline mode", and they can perform significant processing tasks as well. Rich Internet Applications for instance may cross the boundary, and HTML5 Web Applications can leverage browsers as run-time environments through the use of a cache manifest or so called "packaged apps" (in Firefox OS and Chrome).

Examples of web thin clients include Chromebooks and Chromeboxes (which run Chrome OS) and phones running Firefox OS.

Chromebooks and Chromeboxes also have the capability of remote desktop using the free Chrome Remote Desktop browser extension, which means, other than being a web thin client, they can also be used as an ultra-thin client (see above) to access PC or Mac applications that do not run on the Chromebook directly. Indeed, they can be used as a web thin client and an ultra-thin-client simultaneously, with the user switching between web browser and PC or Mac application windows with a click.

Chromebooks are also able to store user documents locally - though, with the exception of media files (which have a dedicated player application to play them), all such files can only be opened and processed with web applications, since traditional desktop applications cannot be installed in Chrome OS.

Web thin clients are similar to RTE clients, but unlike first-generation RTE clients the operating system can typically be updated. Chrome OS, for example, automatically updates itself if its update servers (which are hosted by Google) are not blocked by a firewall - while still being tamper-resistant due to its use of Trusted Computing technologies.

Applications as thin clients

The notion of a thin client extends indirectly to any client–server architecture, in which case, a thin client application is simply one which relies on its server to process most or all of its business logic. This idiom is relatively common for computer security reasons. A client obviously cannot be trusted with the logic that determines how trustworthy they are, because an adversary can circumvent that logic.

However, in web development in particular, many client applications are becoming fatter. This is due to the adoption of heavily client-side technologies like Flash and Ajax, which are themselves strongly driven by the highly interactive nature of Web 2.0 applications.

List of protocols used by thin clients

This list is incomplete; you can help by expanding it (https://en.wikipedia.org/w/index.php?title=Thin_client&action=edit).

- Appliance Link Protocol
- Citrix ICA
- HP Remote Graphics Software (RGS)
- Linux Terminal Server Project
- NFS
- PCoIP
- various video codecs such as VP9
- Remote Desktop Protocol
- Secure Shell or SSH, an encrypted replacement for telnet.
- Virtual Network Computing

- X11, central to traditional Unix graphical windowing systems
- XML, HTML, or JSON over HTTP (Ajax)
- XDMCP

See also

- Blade PC
- Centralized computing
- Desktop Virtualization
- Dumb terminal
- Fat client
- Hybrid client
- Multiseat configuration
- Nettop
- Smart client
- Terminal services
- Time-sharing
- Univention Corporate Client (UCC), an Open Source solution for the central management of PCs, notebooks and thin clients
- Useful
- Windows PE
- X11, central to Unix windowing

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