EXHIBIT A
(Redacted Cromarty Declaration)
(Part 1)

PUBLIC VERSION

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

CASE NO.: 11-CIV-20427-WILLIAMS/TURNOFF

DISNEY ENTERPRISES, INC., TWENTIETH CENTURY FOX FILM CORPORATION, UNIVERSAL CITY STUDIOS PRODUCTIONS LLLP, COLUMBIA PICTURES INDUSTRIES, INC., and WARNER BROS. ENTERTAINMENT INC.,

Plaintiffs,

v.

HOTFILE CORP., ANTON TITOV, and DOES 1-10.

Defendants.

_____/

HOTFILE CORP.,

Counterclaimant,

v.

WARNER BROS. ENTERTAINMENT INC.,

Counterdefendant.

_____/

DECLARATION OF DR. ANDREW CROMARTY IN SUPPORT OF DEFENDANTS' MOTION FOR SUMMARY JUDGMENT

[REDACTED]

I, Andrew Cromarty, hereby declare as follows:

A. Introduction and Background

1. I have been retained by Defendants Hotfile Corp. ("Hotfile") and Anton Titov (collectively, "Defendants") as an expert, opining on technical and business questions bearing on alleged secondary infringement of Plaintiffs' copyrights by Hotfile Corp. and Anton Titov as asserted by Plaintiffs in their Complaint. My expertise extends to these areas of the alleged copyright infringement by virtue of, at minimum, my extensive training in computer science and commercial experience as set forth below. I will not offer opinions of law, as I am not an attorney.

2. I have been engaged by Defendants through Distributed Systems Technology LLC, a company of which I am an owner, through Berg Software Designs. Berg Software Designs bills $600 per hour for my time working on this matter plus reasonable expenses, of which I receive a lesser indeterminate amount computed after business operations expenses of Berg Software Designs and Distributed Systems Technology LLC. My compensation is in no way related to the outcome of this litigation.

3. A list of the materials I considered is attached as Appendix A. My curriculum vitae and a full list of publications is attached as Appendix B. Attached hereto in Appendix C as Exhibit R is a true and correct copy of my November 18, 2011 expert report ("Cromarty Expert Report") including the exhibits to that expert report that, I understand by mutual agreement among counsel, were produced to Plaintiffs' counsel on November 20, 2011. I hereby affirm, under penalty of perjury, that the statements in that report were true and correct. Other documents or information cited or relied upon appear in Appendix D as Exhibit X.

4. In formulating my opinion, I have relied on the Court's orders of which I am aware, and other applicable information pertaining to this matter. A summary of that understanding as of the time of issuance of my Expert Report appears in Exhibit R.

5. I have not testified at trial in the previous ten years. I have testified as an expert witness in depositions on four dates in 2011.

6. If called as a witness at trial, I would testify as to the statements and opinions contained in this declaration.

7. I provide in this declaration a description of the Defendants' system and methods. I understand that Hotfile operates the website www.hotfile.com. Basic operations of Internet and the World Wide Web and the systems and methods used by Hotfile and/or visitors to www.hotfile.com are described *infra* with extensive additional tutorial detail in Appendix H of Exhibit R. Major sections of this declaration are as follows: Introduction and Background; Qualifications; Overview of Opinions; History: A Half-Century of File Sharing; Summary of www.Hotfile.com Operations, Pricing and Consumer Use; Expert Analyses, Findings and Opinions.

B. Qualifications

8. I have received academic honors, awards, appointments, and recognition and held senior technical and executive positions as noted in the accompanying CV and Expert Report. *Cromarty Expert Report at 4ff. and Exhibit B.* During my professional career I have held senior technical positions at several corporations, including the highest management-awarded corporate scientist hiring rank positions at Advanced Decision Systems, Digital Equipment Corporation, and Compaq Computer Corporation, for a combined total of approximately a decade. My relevant technical experience also includes mathematical analysis, software development, technique development, scientific investigation, and publication in technical areas that arise the present matter.

9. I have held numerous senior corporate executive and technical management positions during my career, including Chief Technology Officer (CTO) and Chief Information Officer (CIO) of Union Square Advisors, a San Francisco technology mergers & acquisition investment bank; CIO and CTO of DAX Solutions, Inc., a primary provider of Internet-based digital asset services to the Hollywood TV and movie industry, with international operations; CTO of SoftNet Systems, Inc., a billion-dollar NASDAQ-traded Internet services and telecommunications company; Chairman of the Board of Freewire Networks, Inc., a wireless broadband service, content, and e-commerce business; CTO of ISP Channel, then the third-largest cable Internet provider in the United States; CTO of Aerzone Corp., a $100 million wireless broadband service joint venture; and Board of Directors member of additional firms including Intelligent Communications Inc., an international satellite service provider, and SoftNet Ventures, a

corporate venture investment fund. Presently I am a Partner at Minerva Consulting, and the President and CEO of Distributed Systems Technology LLC.

10. I earned a Ph.D. in Computer and Information Science from the University of Massachusetts at Amherst, awarded in 1988, writing my doctoral dissertation on "Programming Constructs for Real-Time Distributed Knowledge-Based Systems." While there I also wrote a second doctoral dissertation on mathematical modeling and computer simulation of brain structure and function. I earned a Master of Science in Computer and Information Science from the University of Massachusetts at Amherst in 1980. I earned a Bachelor of Arts double degree in Biology and Psychology, and simultaneously a Bachelor of Arts degree in Music, from Wesleyan University in 1978.

11. Since obtaining my Ph.D., I have worked in numerous technical management positions and overseen dozens of successful projects developing software, hardware, and services. I also have worked as a computing professional by developing software and teaching programming in over 30 languages and have personally authored on the order of one million lines of software code.

12. I am credited with a number of worldwide historic multimedia, Internet and technology firsts, including first to stream 1,000,000 live videos on the Internet for an event, world's first demonstration of Java-based distributed Internet games, world's first live wireless webcasts, world's first streaming video live from an international film festival, and the first high-definition "set-top box" networked screening product and system for the movie industry.

13. My specific relevant experience with networking, internetworking, and multimedia content sharing or delivery over the Internet is described in the accompanying Exhibits. *Cromarty Expert Report at 10ff.* It includes decades of research, development and executive

corporate oversight over Internet multimedia content delivery, business model development and analysis, venture investment, due diligence investigation of a wide range of Internet and entertainment businesses, and the development, curatorship, and monetization of intellectual property. My business experience includes extensive development and evaluation of new, alternative, and competitive business models. I have evaluated well in excess of sixty investment and merger & acquisition opportunities, including their business operations and business models.

14. During 2005-2007, I was CTO/CIO of DAX Solutions Inc., the film and TV industry's primary provider of Digital Asset Exchange asset management and workflow services over the Internet (some details of which may be subject to commercial nondisclosure obligations). In that capacity I oversaw technical development and line-managed the firm's operations and field service teams, providing digital dailies and workflow services to many of the largest entertainment firms in Hollywood and throughout much of the world. My specific responsibilities included managing the development, deployment, and operation of DAX's state-of-the-art proprietary digital asset watermarking/fingerprinting technology and intellectual property and associated digital rights management systems and software. At DAX we operated the largest known Internet-based system in the world for securely managing film and TV industry digital assets, with over 3,000 industry accountholders. My responsibilities also included oversight and management of security for these copyrighted entertainment assets, and required working with, educating, and advising many of the largest entertainment firms in the world as to security technology and policy for their own copyrighted multimedia film and TV digital asset content, much of which they entrusted me to hold and manage for them on my servers in Los Angeles, in their own facilities, and throughout the world.

C. Overview of Opinions

15. Non-factual and erroneous opinion on technical and business matters has been presented as if fact in the Plaintiffs' Motion for Summary Judgment ("Plaintiffs' MSJ"), in my expert opinion. I am materially in disagreement with methods, analyses, representations, conclusions, and putative "facts" of Plaintiffs' declarants in this matter. I believe methodological errors and bias in their analyses cause them to reach incorrect conclusions. I find in my analysis that their opinions and asserted "facts" are in error.

16. Defendants use a common business model employed by many of the most respected retailers and service providers on and off the Internet—including the Plaintiffs' own business partners and licensed Internet distributor channels. Salient components of this business model include "affiliate marketing" relationships and tiered/"freemium" pricing. This business model is conventional, and not designed to induce any form of improper customer behavior. Rather, it simply serves to encourage development of a business partnering ecosystem that better reaches a diverse international audience and provides customer "upsell" incentives (increased purchasing).

17. It is my expert opinion that Hotfile's "premium" service is structured to allow customers to obtain better service performance. I find nothing in Defendants' service offering that provides any incentive to make illicit (*vs.* licit) use of the service.

18. Proprietary trade-secret so-called "digital fingerprinting" (DFP) technology and systems, such as Vobile's or Audible Magic's products, which are marketed and sold to the entertainment industry and Internet service companies, purport to "identify infringement" but in fact simply

compare two files and compute a number, relying on secretive proprietary unpublished opinions or ideas of the company's product engineers. Commercial acceptance (i.e. vendor sales revenue) for commercial "fingerprinting" products is irrelevant as to the products' technical effectiveness or scientific reliability. These vendors' use of trade secret to obscure the basis in their products and services for computing alleged "infringements" thwarts proper scientific confirmation—for example by impeding both scientific disprovability and proper fulsome scientific third-party independent peer review of their methodology—and is counter to established requirements of scientific reliability. Claims as to the effectiveness of these "fingerprinting" or "infringement"-determining products do not meet the standards for either science or fact.

19. Further, infringement is not a technical computation. These commercial products necessarily lack sufficient information to make a legal determination of infringement, leaving unresolved and unsettled substantive technical, business, and legal questions as to identity of works, rightsholder identity, license assignment, licensee rights, non-infringement due to user rights established in statute or case law, and more. Such techniques fail to incorporate or consider the full range of information essential to proper infringement analysis, and necessarily lack any technical means to do so. They cannot and do not "identify infringement."

20. It should be regarded as entirely unsurprising if Defendants did not make an early purchase of enormously expensive, unreliable, untestable, business-irrelevant "digital fingerprinting" software marketed towards helping Hollywood corporations with their movies when Defendants were starting a company offering the very different service of consumer Internet file storage and sharing. Incurring such an expense would not have been rational behavior for technical and business reasons, and if erroneously considered during Hotfile's startup period, likely would have been properly forbidden by Hotfile's investors.

21. Filenames and other file metadata are a technically inappropriate and non-fact-based means of establishing infringement. Their use for this purpose is technically erroneous and does not produce reliable facts as to infringement.

22. Peer-to-peer ("P2P") technology, systems and services differ profoundly and materially in essential business and technical aspects from technology, systems and services of Defendants. In my expert opinion, P2P systems and any matters, actions, or conclusions concerning them are not relevant to the present case.

23. Multiple takedown notices per "user" (website account) or per file are not inherently determinative or indicative of infringement. Proper common lawful uses of a file sharing service by innocent users may trigger issuance of repeated erroneous takedown notices. The staggeringly high percentage of false takedown notices reported for Internet file sharing sites like Hotfile—as many as half of total notices—may be explained in part by rightsholders erroneously relying on non-scientific and technically faulty "identification" systems and filename metadata criteria, as well as issuer negligence or misbehavior.

24. Counting file downloads is a technically specious and biased means of assessing potential infringements. There is not a one-to-one relationship between computer files and copyrighted works, and such a metric creates a substanial and material bias that falsely increases the apparent frequency of infringements, in the case of movie content overstating the infringement rate by perhaps a factor of ten. Assertions regarding infringement occurences based on this metric are non-scientific, technically improper, and lead to false "facts."

25. In my opinion, the Defendants' systems offer a specific substantial non-infringing use and benefit to normal law-abiding Internet users, one occupying an important market niche neglected by most of Defendants' business competitors. There is a substantial legitimate business

case for the existence and market success of a business such as that of the Defendants. *Cromarty Expert Report, Exhibit R at 154-173.* Also, it would be inappropriate to Hotfile's product mix and detrimental to their business model and to their users if Hotfile were to implement a search capability over links or filenames, as this would violate the privacy of those links and drive away proper lawful customers and business.

D. History: A Half-Century of file Sharing

26. File sharing over computer networks, including the Internet and its precursor networks, already was common and well-specified more than forty years ago. File transfer protocols, notably including today's File Transfer Protocol, were developed just for this purpose. For example, in 1971 the Internet specification publication RFC114, "A File Transfer Protocol," detailed many of the benefits of remote content sharing using an "extended file transfer protocol":

> Indirect usage … does not require that you explicitly log into a remote system or even know how to "use" the remote system. An intermediate process makes most of the differences in commands and conventions invisible to you. For example, you need only know a standard set of network file transfer commands for your local system in order to utilize remote file system. This assumes the existence of a network file transfer process at each host cooperating via a common protocol. Indirect use is not limited to file transfers. It may include execution of programs in remote hosts and the transfer of core images. The extended file transfer protocol would facilitate the exchange of programs and data between computers, the use of storage and file handling capabilities of other computers (possibly including the trillion-bit store data computer), and have programs in remote hosts operate on your input and return an output. *RFC114 at 1.*

27. Subsequently, the modern Internet File Transfer Protocol was further specified in 1980, published as RFC959 "File Transfer Protocol" in 1985, and has continued in use through the present day.

28. Importantly, these file transfer methods were developed without the contemporaneous ability, or objective, of transferring modern copyrighted entertainment or other multimedia files. At the time these file sharing techniques were conceived and developed, substantially all such content was in non-digital form.

29. For example, the now-common "MP3" digital music format did not emerge until the late 1990's. And at the time the File Transfer Protocol was specified, high-definition digital formats, CDs, and DVDs had not yet been invented and brought to market.

30. As networking developed, from its earliest days, free file-sharing services arose to provide the many legitimate and needed benefits of file sharing to the networked community.

31. For example, over a third of a century ago, the SIMTEL Archive file sharing system was created and made publicly available to all users on the ARPANET (i.e., the Internet), first at the Massachusetts Institute of Technology and then moved to and maintained at the White Sands Missile Base, a U.S. Government facility, throughout most of the 1980's. The primary use of the Archive was file sharing of free software among Internet users, under the U.S. Government's *de facto* financial and administrative sponsorship.

32. Another very widely used file sharing system, "gatekeeper.dec.com," was established in the late 1980's as an Internet-wide file sharing site established by Digital Equipment Corporation, the first computer company in the world to create a corporate Internet gateway:

> History
>
> The FTP archive on gatekeeper.dec.com, later to become gatekeeper.research.compaq.com, first went on-line in the late 1980's. … In its heyday, gatekeeper was a prominent Internet FTP site. Just about any public domain software package you wanted or needed could be found on gatekeeper. One of gatekeepers' primary functions was to give Digital software developers, living on the DECNET based internal corporate network, access to public domain software available from the Internet. (The Digital internal DECNET host, DECPA::, mounted the gatekeeper FTP archive via NFS.) Gatekeeper was also used by Digital product groups to provide software updates and patches to Internet customers. "*What happened to gatekeeper.dec.com?" at 1.*

33. There were many other such file sharing sites across the Internet throughout the past forty or more years. File sharing sites are a historical commonplace, and a long-standing necessity for routine use of computer networks.

34. Today there is a vibrant marketplace of firms offering a range of file sharing services under a variety of different terms or business models.

35. An important characteristic of modern file sharing and file storage services is provision of a fungible, apparently infinite, ubiquitous store for one's own digital data. These services serve as a geographic and virtual extension of the native file capacity available in the user's personal computing environment.

36. For example, Amazon.com rents file space to anyone with a credit card at inexpensive rates in essentially unlimited capacity through its Simple Storage Service ("S3"). Amazon S3 implements a "freemium" pricing model, that is, some file storage services are offered free, with

more services and improved performance available if the customer pays for them (called an "upsell").

37. Dropbox, a firm that offers Internet file storage from one's personal computer or PDA cell phone under a "freemium" model, is backed by first-tier venture capital investors including Sequoia Capital, Greylock, Accel Partners, and Goldman Sachs. *SecondMarket's Q3 2011 Private Company Report* Dropbox was recently reported by BusinessInsider as one of SecondMarket's Top Ten Most-Watched venture-backed firms. Market analysis firms SecondMarket and Crunchbase describe Dropbox as using file sharing to solve existing problems in Internet email, device interoperability, and mobile access to personal data: "Dropbox was founded in 2007 by Drew Houston and Arash Ferdowsi. Frustrated by working from multiple computers, Drew was inspired to create a service that would let people bring all their files anywhere, with no need to email around attachments. … Guiding their decisions was a relentless focus on crafting a simple and reliable experience across every computer and phone." *SecondMarket Overview of Dropbox; Crunchbase Overview of Dropbox.*

38. Commercial file sharing sites have become the single most important medium through which open source software is distributed today. For example, the well-known open source repository Sourceforge presently contains "software in over 260,000 projects" serving "2.7 million developers" and "46 million consumers." This file sharing service specializing in source code sharing is owned and operated by a NASDAQ-traded public corporation with a market capitalization well in excess of $100,000,000. *About Sourceforge.* Other well-known open source file sharing services include Launchpad and Github. The use of such file sharing services for distribution of open source software is well understood in the IT profession and by expert practitioners as central to the operations and essential to the viability of the open source software

industry.

39. File sharing services offer increasing value to legitimate users as multimedia technology advances. For example, it is now common for cell phones such as a Blackberry or iPhone to take high-resolution photographs and shoot high-definition movies. The resulting collection of digital assets quickly becomes very large, and for technical reasons email is a very poor choice for sharing them. File sharing services are a far better solution to sharing such assets. Indeed, Apple recently released its iCloud service to address this need for its own customers. Users of other brands of devices, however, continue to need a third-party commercial file sharing service to obtain these communications benefits.

40. Firms such as Picasa (a Google subsidiary) and Flickr (a Yahoo subsidiary) provide file sharing services to the consumer visual multimedia file sharing market, employing a freemium pricing model with upsells. *About Picasa; Flickr FAQ; Flickr Upgrades.*

41. Defendants' system and service, Hotfile, is a *de facto* market competitor of these established modern firms. For example, customers of these other services can choose to use Hotfile as an alternative service provider, or *vice versa.*

42. Some file sharing services focus on particular markets, business opportunities, or "use cases" (styles of customer use). Such market specialization may present both benefits and limitations to the customer.

43. Overall, however, with respect to the kind of content that may be stored or accessed and the degree of service provider *vs.* customer control that is possible, these services are generally indistinguishable both technically and in the market. All provide file storage as a service; all promote their storage services as part of their business model; all permit users to store files without the service provider's knowledge of or regard for the internal contents of the files, which

may in fact be opaque to the service provider for technical or privacy reasons; all require their users to accept responsibility for obtaining, and representing they do have, any rights required to upload content as a condition of use; and all continue the nearly half-century-old technical and business practice of providing remote storage for files of arbitrary type and content for remote use and access.

44. Thus the technology for sharing files among distant networked users is not a new invention designed for sharing copyrighted digital works owned by others or as a specific mechanism for infringing copyright.

45. Quite to the contrary, file sharing has been in perpetual use, starting decades before it became technically feasible to move commercial entertainment media over computer networks. Network file sharing predates substantially all modern digital entertainment content, and it has a decades-long history of substantial non-infringing use.

46. Existing Internet file sharing services are a direct technical and business continuation of this nearly half-century-old unbroken practice of sharing content over computer networks, among university, business, personal, and government file sharing sites.

47. Common uses of commercial file sharing services today include:

- allowing an individual to gain access to personal data across many devices, such as between a PC and a PDA/cell phone, or between work and home computers;
- sharing data securely with business colleagues, such as between attorneys and their client or experts;
- sharing computer source code and related data, such as through Sourceforge;
- sharing self-authored multimedia works such as pictures, music performances, and movies among members of a group, such as within a family, a Boy Scout

troop, a music band, or a commercial entertainment production company; or

- moving files from one location to another, such as a student writing an essay written on a shared computer in a school computer lab, then depositing it at a file sharing site for later pickup from a home personal computer.

48. Sharing content and services between computers and between computer users is what networked computers are meant to do, and why computer networks exist.

49. Consequently, as file sharing is a long-lived technology, in widespread use for a large and varied number of individual purposes, the mere presence, availability, investment in, commercial promotion of, or use of file sharing technology or services offers no technical foundation upon which to ascribe any specific intent to either individual users or service providers—other than to store and retrieve some data.

E. Summary of www.hotfile.com operations, pricing, and consumer use

50. Hotfile operates a collection of Internet-connected web servers in a data center facility in Texas. Such web servers typically comprise a computer, large amounts of data storage space, and software to support the file storage and retrieval operations described herein as well as basic computer management functions to support housekeeping functions and permit remote administration (startup, shutdown, software upgrades, etc). The data storage space often is organized as one large pool of storage shared by the server computers.

51. When individuals anywhere in the world wish to store a file on the Internet for later retrieval and use, one choice they have is to store it on a www.hotfile.com server.

52. An individual may choose to do this for many reasons. He may wish to offload his storage onto a willing third party, for example because his computer is low on space. He may wish to put his data in a public server location from which he later can retrieve a copy using another Internet-connected device or from a different location, e.g. while traveling with his phone or PDA or when using a laptop computer in a cafe. He may wish to share the resource with others, such as a group of business colleagues, friends, customers, or family members.

53. The reasons a file is stored on a server—the motives of the storer—are inherently unknowable by the server owner-administrator. Internet technology generally does not provide any means for the client or its user to represent or provide this information, and any such information that could be captured or inferred by the server or its administrator is inherently unreliable.

54. Like many or most websites, www.hotfile.com provides services to users whether or not they have a paid account. However, all users uploading to www.hotfile.com, whether registered paying users or not, must take specific action to agree to abide by Hotfile's policies. Before uploading a file to Hotfile servers, they must actively signify that they "have read the HotFile Terms of Service, Intellectual Property Policy, and Privacy Policy, and … agree to be bound by them." *Hotfile website.*

55. I understand Hotfile imposes a size limit of 400 megabytes (400 MB) on uploaded files. Splitting a large file into smaller pieces to upload is permissible. An important effect of this upload policy is a reduction in the security and business risk to Hotfile due to intentional or accidental "denial of service" events, in which Hotfile's Internet communications and server resources are persistently tied up in long-lasting transfers that fail before they complete. The probability of a file transfer failing due to exogenous factors such as an Internet communications failure increases with file size, making file size limitations a rational business policy. Limiting file size also enhances the utility and effectiveness of other throttling measures available to Hotfile to balance load among users and provide fair service to all Hotfile's customers. Fairness of service delivery is a core technical concern in distributed computing and an important business concern on the Internet.

56. When a user has accepted Hotfile's policy, he may choose and upload a file from his client (personal) computer with a few mouse clicks. The transfer of a copy of the file from his client computer to a Hotfile server then proceeds automatically. When the transfer is complete, the user is presented with a "link" or URL ("Uniform Resource Locator," a text string comprising a Web address) pointing to the uploaded file's location on the Hotfile servers. For example, uploading a file named "pictureofmydog.gif" may result in a URL being created and

displayed such as "http://hotfile.com/dl/135394112/220ead1/pictureofmydog.gif.html". Importantly, the filename component of the URL (e.g., "pictureofmydog") is chosen by the uploading user, not the server or its owner-administrator. This feature permits users to give meaningful—or arbitary—names to the digital assets they wish to share with colleagues, friends, customers, or family on the Internet.

57. The resulting URL may be kept private, for private use. If it is not revealed to others, its long name and numeric components make it unlikely anyone will guess the name, affording a degree of privacy or security.

58. Alternatively, the URL may be shared with others. Anyone who enters the URL into their Web browser, or who clicks on it when displayed as a link in a bookmark list or index web page, will have access to the uploaded resource. This is how sharing is accomplished on the Internet.

59. A non-registered Hotfile user who attempts to "visit" (use) the URL is presented with a Hotfile web page offering a business choice pursuant to Hotfile's "freemium" business model (cf. *supra)*. The downloading/viewing user may choose a free "Regular Download" at no cost, which provides limited download speeds, one download at a time, and a limit of two downloaded files per hour, with a brief delay before downloads start after they are requested. Alternatively, the downloading user may choose a premium (paid) High Speed Download, which offers unrestricted download speed, no initial service delay, and an unrestricted number of file downloads per hour, subject to available computing and communications resources to service received requests. Further user performance incentives to upgrade to a premium paid account include "Fast download even when servers are busy," support for download accelerators, and support for resuming downloads that fail midstream due to Internet communications errors (cf.

supra), and "Hot/Direct Linking," which offers accountholders the ability to share the performance benefits they have purchased for files they upload.

60. For example, if a parent with a premium account uploads family photographs and videos taken using a PDA or cell phone camera at her child's sporting event and then shares the resulting URL by email or SMS text message, other family members anywhere on the Internet immediately can view those photos and videos. In this case, the premium accountholder parent's paid-account performance benefits are shared by the entire family when obtaining and viewing these family digital assets.

61. Payment by Hotfile premium accountholders in the United States is accomplished through PayPal, an eBay subsidiary, and is charged on a recurring monthly basis. Presently offered premium service "tiers" are based on the amount of file transfer volume an accountholder wishes to rent, and for how long. For example, $9/month rents 100 gigabytes (100 GB) of Hotlink file transfer traffic.

62. This is typical pricing for Internet file storage and access. As one example, Amazon.com rents storage to anyone on the Internet through its "S3" Internet-based ("cloud"-based) storage service at prices in the range of $10 to $14 monthly per 100 GB. *Amazon S3 Pricing at 1.* Similarly, Amazon's Elastic Compute Cloud ("EC2"), "a web service that provides resizable compute capacity in the cloud" with the business goal to "to make web-scale computing easier for developers," similarly operates under a freemium model with free uploads and a marginal price for premium download service of approximately $12 per GB of file transfer traffic monthly. *Amazon EC2 at 2. Amazon EC2 Pricing at 3.* Amazon's services are very widely used

by companies across the Internet; as one example, the publicly-traded multi-billion-dollar entertainment movie streaming firm Netflix is a customer of Amazon's cloud services.

63. Pre-payment discounts are offered by Hotfile as part of their pricing mix. This is common in the Internet and Web hosting industry; for example, well-known major web hosting firms such as Bluehost and 1and1 offer pre-payment discounts for web hosting services.

64. Hotfile service pricing compares favorably and predictably with alternative commercial storage and data transfer costs. For example, raw storage purchased as hard disk equipment presently costs approximately $5 per 100 GB single-quantity capital cost, but any operating expense must be borne by the buyer and a raw hard disk is not inherently Internet-accessible or structured as a reliable ubiquitous service. Major phone carriers in the United States such as ATT presently offer data transfer (with no storage) in the general range of $10 per GB. Hotfile's pricing tiers are intermediate, falling between the cost of raw storage and the cost of mobile data transfers by carriers, as is to be expected: Hotfile's business operations can employ cheaper terrestrial communications, they offer (and must pass through costs for) added management and reliability services, and they can achieve economies of scale in their large storage arrays.

65. Hotfile also has a reseller program,. Under this program, in essence Hotfile is a wholesale provider of storage accounts, and its resellers are individual retailers around the Internet who market and resell its underlying services. Presently Hotfile lists over a dozen resellers who resell its services in the United States, approximately thirty payment systems (such as PayPal) worldwide that are accepted and used for payments, and over one hundred countries for which there are resellers. The wholesale discount on accounts through indirect channels is nominally

20% of the retail price for direct single-quantity sales by Hotfile.

66. Hotfile's published policy is that they "do not restrict any country - free downloads for everyone are guaranteed." For example, Hotfile downloads are permitted as a means for individuals to communicate in countries where totalitarian regimes may otherwise wish to control information flow to citizens, or where speech or information sharing may be restricted or repressed.

67. Hotfile has an "affiliate" marketing program. Under this program an affiliate may be paid for usage generated by the affiliate. As discussed *supra,* an affiliate marketing program allows a business to reach markets or cultures outside its own, particularly on the Internet, which is international in scope. Affiliates earn commissions according to a published Earnings Table. One business incentive metric for awarding affiliates is achieving a high download-to-upload ratio. Incentivizing increased user activity is a rational business decision because, under the freemium business model, increased traffic driven to a site will result in conversions at some fixed rate to premium (paying) users. In addition, Hotfile further directly incentivizes these conversion by employing a second published metric computed based on conversions to premium user accounts attributable to an affiliate. A third incentive rewards premium accounts sold through advertising on the affiliate's web site. Amazon.com offers a similar sell-through incentive for sales by its affiliates. Finally, affiliates receive a permanent commission on referred sales for uploaders who become registered Hotfile customers, in that a first Hotfile customer earns 20% of the net sales of a second uploader who registers under the first customer's referral link. Hotfile's marketing program is substantially similar to refer-a-friend and affiliate marketing programs employed by large successful Internet sales, web hosting and telecommunications service provider companies

such as Amazon.com, eBay, 1and1 and Ooma. *Amazon.com Associates Program Advertising Schedule. Ooma referral offer at 1. 1and1 referral offer. 1and1 Affiliate Marketing Overview. eBay Partner Network Overview.*

F. Expert analyses, findings, and opinions

68. Non-factual and erroneous opinion on technical and business matters has been presented as if fact in the Plaintiffs' Motion for Summary Judgment ("Plaintiffs' MSJ"), in my expert opinion. I am materially in disagreement with methods, analyses, representations, conclusions, and putative "facts" of Plaintiffs' declarants in this matter. I believe methodological errors and bias in their analyses cause them to reach incorrect conclusions. I find in my analysis that their opinions and asserted "facts" are in error.

69. I conclude from my analysis that Defendants use a common business model employed by many of the most respected retailers and service providers on and off the Internet—companies such as eBay, Wal-Mart, Amazon.com, Google, major web-hosting companies including Bluehost and 1and1, telecommunications firms including Sonic.net and Ooma, and Yahoo.

70. Salient components of this business model include "affiliate marketing" relationships and tiered/"freemium"[1] pricing. The use of affiliate marketing is so common on the Internet today that a robust secondary market or brokerage ecosystem has developed, with large-scale respected corporate players including Google Affiliate Network and ValueClick's Commission Junction.

71. This business model is conventional, and not designed to induce any form of improper customer behavior. Rather, it simply serves to encourage development of a business partnering

[1] "Freemium" is a portmanteau of "free" and "premium," the latter implying better or faster service for a fee. The business objective of "freemium" pricing is to introduce new customers to a service, with the hope of "converting" them to "premium" customers who pay for extra features and faster service.

ecosystem that better reaches a diverse international audience and provides customer "upsell" incentives (increased purchasing).

72. Even the Plaintiffs' own business partners and licensed distributor channels employ this business model—to distribute Plaintiffs' content under license. For example, Roku is a *de facto* retail sales channel for Plaintiffs and makes available Plaintiff content licensed to Hulu.com, Amazon.com and other TV and movie distributors via set-top boxes Roku manufactures and sells to the retail market. Roku's product and service distributes both free and paid movie and TV content (thus "freemium"), and Roku provides two different methods for individuals or businesses to sign up as Roku affiliates, through Google or Commission Junction. *Roku Affiliate Program Description, Exh. X.* Roku customers also may automatically participate and obtain certain affiliate benefits simply by "referring a friend": Roku sends to its customers unsolicited refer-a-friend affiliate advertisement emails reading,

> "For every player purchased, you get an Amazon Instant Video rental—on us. The more you share, the more you get. In fact, we think some of you may never pay for another movie rental again!" *Roku Refer-a-Friend Program Description, Exh. X.*

73. The objective and effect of the "affililiate" business model aspect is to expand the business's reach to and through additional geographic and categorical markets and develop an indirect sales channel cost-effectively. "Geographic" expansion includes growing in international markets where cultures and languages, consumer tastes and needs, and local monetization are difficult for the home company to predict or understand. "Categorical" expansion includes finding new ways of presenting the company's product or service offering that the home

company could not have anticipated, but affiliates will. "Indirect channel" selling refers to using other individuals or businesses to market and/or sell your company's product or service, rather than directly selling it to customers yourself. Indirect sales is similar to the distinction between "wholesale" and "retail" product sales common in the United States, and offers the additional advantage of eliminating the home company's cost of maintaining an employee sales force in return for paying a commission on actual sales produced. Affiliate marketing is a widespread, common, accepted, respected business model approach.

74. The objective of the common "freemium" business model aspect employed by Defendants is to expand the business's customer base and increase conventional sales, by providing entry-level products or services free and additional products or services for a fee. It is a tiered pricing structure with a zero-cost entry level offering, similar to the "try before you buy" sales approach (or even free taste samples in supermarkets) common throughout the United States.

75. Freemium pricing is common and widespread, especially for Internet service and software sales. Much, if not most, commercial open source software sales employs freemium pricing, giving a base-level product away free and hoping to "upsell" the customer (that is, to sell them additional features, performance, or services for a fee). For example Red Hat Software, a ten billion dollar New York Stock Exchange-traded open source software vendor, employs a freemium pricing structure for substantially all its sales. Yahoo offers freemium tiered email services, with a base-level account offered at no dollar cost to the consumer and a more featureful email account with restrictions removed upon payment of a periodic service fee. Most Internet Service Providers (ISPs) in the United States, including for example AT&T and Comcast, offer a tiered pricing structure where higher performance (e.g. faster transfer speed, or

special services such as static IP address assignments or throttling elimination) cost more than base-level service. Defendants apply precisely this ISP tiered-pricing structure to provide faster performance and other special services (such as throttling elimination), combining it with the "freemium" entry-level pricing. Tiered and freemium pricing are a widespread, common, accepted, respected business model approach.

76. It is my expert opinion that Hotfile's "premium" service is structured to allow customers to obtain better service performance. I find nothing in Defendants' service offering that provides any incentive to make illicit (*vs.* licit) use of the service.

77. Proprietary trade-secret so-called "digital fingerprinting" (DFP) technology and products such as Vobile's or Audible Magic's products, which are marketed and sold to the entertainment industry and Internet service companies, purport to "identify infringement" but in fact simply compare two files and compute a number purporting to describe computer file similarity, relying on secretive proprietary unpublished opinions or ideas of the company's product engineers.

78. "Fingerprinting" itself is a misnomer, and a marketing appellation, as a file has no natural "fingerprint." Instead, an engineer thinks up a method, generally in secret, for generating a number that he likes—that in his otherwise unvetted opinion signifies similarity. Different engineers at different companies differ widely in their opinion of what makes up a good computation and even which factors are important or useful in comparing files with underlying assets, and they keep their comparison techniques and product details trade secret.

79. Use of trade secret to obscure the basis for computing alleged "infringements" is counter to the requirements of science. If there were a substantive, mature, reliable scientific basis for such techniques, the science would by definition be public in all aspects, the utility of alternative techniques would be known and accepted by all participants in all affected industries, the vendor

companies could not compete based on differing file-comparison techniques, and the product vendors would not advertise a proprietary advantage based on trade-secret techniques.

80. Further, infringement is not a technical computation. These commercial products necessarily lack sufficient information to make a legal determination of infringement, leaving unresolved and unsettled substantive technical, business, and legal questions as to identity of works, rightsholder identity, licensee assignment, licensee rights, and infringement.

81. Such techniques fail to incorporate or consider the full range of information essential to proper infringement analysis, and necessarily lack any technical means to do so. They cannot and do not "identify infringement."

82. In a typical infringement involving entertainment assets, the infringer does not copy a digital asset precisely but rather creates his own unique file, which thus will not be identical to the rightsholder's original digital asset file. They differ. This means a straightforward exact file comparison cannot suffice to evaluate candidate infringements, and similarity of underlying *human-perceived phenomena or ideas* instead must be estimated by a computer.

83. Further, the vendors' products do not pretend to perform a complete comparison—instead they apply secret rules of thumb for comparing snippets of files, with the attendant unreliability such partial heuristic computations introduce.

84. No matter what their "secret sauce," at best all file comparison programs can do is, they compare files. Under the typical conditions described *supra,* computer file comparisons are inadequate for establishing infringement. Human review and comparison of content is necessary to infer possible infringement. As I have noted in my earlier deposition testimony, in documents produced during discovery the Plaintiffs' cognizant management appear to have agreed in their own internal communications—contrary to their asserted forensics—that even for the narrow

purpose of responsibly issuing takedown notices (TDNs) pursuant to the DMCA, human review and comparison of content is necessary to infer possible infringement.

85. Vendors' use of trade secret to obscure the basis in their products and services for computing alleged "infringements" thwarts proper scientific confirmation—for example by impeding both scientific disprovability and proper fulsome scientific third-party independent peer review of their methodology—and is counter to established requirements of scientific reliability.

86. It is in fact a tenet, and mathematical proof, of both computer science and mathematical system theory that without full knowledge of the details of these "fingerprinting" products, it cannot reliably be determined what the products are doing or whether they work as advertised or will produce a given result.

87. It also is my expert opinion that commercial acceptance (i.e. vendor sales revenue) for commercial "fingerprinting" products is irrelevant as to the products' technical effectiveness or scientific reliability. Such commercial sales signify market forces, not product competence at infringement determination or any other technical or legal task.

88. Just as sales data are not a shortcut to replace science as to reliability, neither is blurring the line between science and other disciplines. Engineering, for example—which consists in building things (such as proprietary products)—is not science. This established distinction remains true even if engineers use processes or mathematics to choose their product's features, or publish descriptions in engineering journals of what they built and how big/fast/pleasing they found it afterward. Neither is "technology" science; nor is mathematics. Core distinguishing principles of science include independent third-party peer review—*of methods as well as the results, and by other scientists;* scientific testability and "falsifiability"; an established error rate

that can be *independently* assessed, even by skeptics of a hypothesis; and methods that are accepted by the entire scientific community—including especially, accepted by those skeptical of hypothesized or predicted outcomes, and including the entire community, not only the hypothesis' supporters. By analogy: countless companies make consumer products and publish claims about them, even in engineering or trade journals; but it is the independent bodies such as Consumer's Union and *Consumer Reports* that provide independent, skeptical scientific testing. Conventional science sets an even higher bar. These principles are what makes science work, and without them, we are left only with product descriptions and advertising—and no scientific reliability, or fact.

89. "Digital fingerprinting" products today fail these tests, and the performance claims as to the effectiveness of these "fingerprinting" or "infringement"-determining products do not meet the standards for either science or fact. Such claims are technically opaque and come from inherently untrustworthy non-independent sources, such as Plaintiffs' own industry association or their commercial vendors, who secretly create the products, financially benefit from sales of such products and services, and do not reveal their structure, function, or testing methodology. Indeed, it is essential to the business model of those vendors to ensure that the technical workings of their systems *cannot* be properly scientifically studied and verified, because revealing such details would defeat their competitive advantage in the market.

90. Their performance analyses and claims thus will not be taken by a competent independent expert as reliable scientific fact. Rather, such performance claims are indistinguishable from engineers' and marketers' self-congratulation or industry cheerleading. Scientific discipline requires that efficacy claims for such products be fully studied by independent third parties or adversaries, and until that time, such claims must be regarded simply

as product advertising and as indistinguishable from unreliable "junk science."

91. Because "digital fingerprinting" products are non-scientific, proprietary, and expensive[2] sold products, it is difficult or impossible for an Internet service company such as a file-sharing or file-storage service to evaluate them for purchase.

92. Further, because of these limitations and because such products do not solve any organic technical or business problem of the service provider, it is not in the rational economic interest of an Internet service company such as Hotfile, or a reasonable business practice, to rush to purchase one, especially during the company's startup phase. Doing so would be as irrational as rushing to purchase an early 1900's patent medicine when one is not even sick.

93. Such a purchase also would be an unnatural business decision for a startup. It comprises allowing another industry's native costs of doing business to be laid off onto the startup. A rational economic actor would only make such a purchase under duress.

94. It thus should be regarded as entirely unsurprising if Defendants did not make an early purchase of enormously expensive, unreliable, untestable, business-irrelevant "digital fingerprinting" software marketed towards helping Hollywood corporations with their movies when Defendants were starting a company offering the very different service of consumer Internet file storage and sharing. This is exactly the kind of expense that professional investors instruct startups to avoid wasting their time and money on, in an effort to focus them on the

[redacted]

proper and legitimate activities of the business.

95. It appears early adoption of Vobile's DFP product would have offered Hotfile limited, and questionable, material infringement "control" capability, due to the Vobile product's technical immaturity and Plaintiffs' own non-production of technically-required computer files. First, Vobile's September 2011 press release for their new VCloud9 product admits that for DFP products prior to that date, "Copyrighted content contained within cloud-based cyberlockers [sic] is very difficult to find" and that "file compression "hides" the true content, which - until now - has made it impossible to identify." *Yangbin Wang Deposition Exhibit 2.* [redacted] I am unaware of any information indicating that a materially large or useful percentage of Universal's library has been "fingerprinted" and can be used by Defendants to seek possibly-infringing files.

96. It is important to understand that if rightsholders do not create and produce these "fingerprint" files for a particular work, then the "fingerprinting" software cannot function as to that work, and the rightsholder effectively will have prevented file sharing services from applying technical means to attempt to comply with DMCA safe harbor provisions or other obligations that may apply.

97. I additionally observe that www.hotfile.com requires every Hotfile uploader to explicitly agree to detailed contractual terms forbidding misuse of Hotfile's services, including copyright-

infringing acts. The technical mechanism for enforcing this agreement includes requiring every such Hotfile user to take specific, conscious, personal, physical action to accept these Terms of Service before he or she can begin to use the Hotfile service. That is, it is not possible to become a Hotfile uploader without first acknowledging copyright law, accepting full personal responsibility as to copyright of all assets the user stores on Hotfile servers, and contractually promising to Hotfile that there will be no attempt to infringe copyright using Hotfile's services. In my technical investigation I have seen no way that agreement can be circumvented.

98. Filenames and other such metadata are an unsuitable and unreliable means of determining infringement. ("Metadata" are "data about data"; file metadata are information a computer may contain about its files.) File metadata such as filenames, apparent file sizes, and filename "types" do not in any way determine or establish file content. For example, filename metadata cannot even reliably establish whether a file is a feature-length film *vs.* a poem. These factual limitations of filenames are well-known and accepted in computer science and the IT industry. File sizes similarly are easily manipulated—increased or decreased—using common tools. Filenames and similar metadata are simply a casual uncontrolled annotation, entirely malleable, under the control of and at the whim of any individual computer user or software program with access to the file. These metadata do not carry reliable inherent meaning as to actual file content, type, or provenance.

99. Moreover, computer filenames and similar metadata have no technical contribution to make as to actual infringement determination, because they cannot—and do not attempt to—provide reliable means of encoding essential information about rightsholders, licensees, contractual agreements, applicable law, fair use, computer backup and time-shifting rights, and countless other determinative factors.

100. Indeed, as was noted in my deposition testimony, there are specific economic reasons to expect that unscrupulous individuals on the Internet can profit best from a public filesharing service by maliciously choosing and publishing filenames that gratuitously suggest an infringement when there is none.

101. It can be concluded on purely technical and business grounds that filenames and file metadata are not trustworthy and can offer no reliable "facts" to establish infringement.

102. Uploading a file to Hotfile servers by Hotfile customers produces a "link" or URL ("Uniform Resource Locator", also sometimes called a "Web link") pointing to the uploaded file, which can be used later to retrieve it. More such links pointing to that same uploaded file may come to exist, for various technical or policy reasons. The uploaded file may be retrieved using any of these links.

103. When a takedown notice is received by a service provider under the DMCA, for technical and business reasons it is an error to disable or delete the underlying file rather than the accused link pointing to it. It similarly is an error to disable or delete all the file's links when only one link is accused. This is particularly true when storage-management techniques such as hash-based "de-duplication" of files are used on the server. The reason for this is simple, intuitive, and obvious. It is possible that different people may know a single file through different links, and one person may properly have access rights to the underlying asset while another does not. For example, one link might be licit and another illicit, or an individual's approval status may change as a matter of a licensing, permission, or other policy change. Under such circumstances, when a takedown notice is received accusing one link as improper or unauthorized, destroying or disabling the underlying file or other links pointing to it will also prevent legitimate authorized users from accessing the file using their own link to it, and may even result in inadvertent

destruction of a rightsholder's asset. This is not merely a theoretical concern. As noted in my deposition testimony, implementing this link-deletion policy correctly was a basis for file management efficiencies and permission control in the system through which my company provided commercial file sharing and production workflow management services to thousands of Hollywood-industry users, including Plaintiffs and/or their business partners.

104. Receiving multiple takedown notices per "user" (website account) or per file is not inherently determinative or indicative of infringement behavior, and without further confirmation does not provide a proper business basis for account termination. This is particularly true if the false takedown notice rate is high, or if faulty data such as file metadata are relied on to create TDNs without proper human review of the content (and, probably, discussion with the account holder).

105. Consider the example of the parent who makes a home movie of her child who is wearing a Harry Potter costume and trick-or-treating door-to-door on Halloween. She may name the family-produced video file on her computer "Harry Potter and the Chamber of Horrors." Next she will wish to share the home video with other family members. As is well-known, a large video file cannot be emailed under the technical constraints of most email accounts, but sharing the file using Hotfile's file-sharing website is feasible, affordable, and sensible. To do so, she uploads the file to Hotfile and emails the resulting "link" to distant grandparents to share her video. Now the takedown nightmare begins: the next day, the file has disappeared. Confused, she uploads her video again. It disappears again. She uploads it a third day. It disappears again. Unbeknownst to her, takedown notices were issued against her upload because of the filename she chose. She now has three "strikes" against her, and perhaps her Hotfile account is terminated, merely for choosing to name her video file according to the licensed retail costume her child

wore on Halloween. In the worst, case if she removed the file from her own computer thinking it was safely stored on Hotfile, the false takedown notice may have destroyed the only copy of her irreplaceable family video.

106. Reported false takedown notice rates are surprisingly high, and this realistic licit usage scenario, plus Plaintiffs' erroneous insistence that filename metadata "indicate infringement," may explain why. For example, Google states:

> A recent study undertaken in the United States reported on findings from takedown notices issued to Google under the Digital Millennium Copyright Act 1998 (US), concluding that over half (57%) of notices sent to Google for removal of material were sent by business targeting competitors and over one third (37%) of notices were not valid copyright claims. See J Urban & L Quilter, 'Efficient Process or "Chilling Effects"? Takedown Notices Under Section 512 of the Digital Millennium Copyright Act', http://mylaw.usc.edu/documents/512Rep-ExecSum_out.pdf. *Google Internet Service Provider Copyright Code of Practice – TCF Consultation Draft, March 6, 2009, at Footnote 3.*

107. Counting file downloads is a technically specious and biased means of assessing potential infringements. There is not a one-to-one relationshp between computer files and copyrighted works, and this erroneous files-downloaded metric creates a substanial and material bias that falsely inflates the apparent frequency of infringements.

108. High-quality (e.g. high-definition) television and movie content occupies very large digital files. For expository purposes, a helpful approximation is that one second of moderately

high quality video content may require a megabyte of file storage. Thus a feature film or hour-long television show would comprise many gigabytes (thousands of megabytes) of data. Correspondingly, a standard single-density DVD nominally holds approximately 5 gigabytes of data. This large file size obtains whether the video content is commercial entertainment content such as feature film or private "user-generated content" (UGC) such as a high-definition video shot with a Blackberry, iPhone, or typical family camera.

109. To the extent that Hotfile does not permit multigigabyte files to be uploaded, or users wish not to upload such files for technical reasons, large files may be uploaded by first splitting them into parts. Each such "part" is an independent file to be uploaded—and later, downloaded—that contains just a few minutes of the single underlying video work. That is, one work now corresponds to ten or twenty downloaded files.

110. In the case of movie content, this means that files downloaded as a percentage of total downloads does not accurately represent the percentage of works uploaded or downloaded. In general most computer files, and most digital works, are much smaller than a movie. Thus generously supposing every single accused asset corresponds to an infringed work, Plaintiffs' computations overstate the infringement rate by perhaps a factor of ten, possibly even twenty. And Plaintiffs' experts have provided no analysis of their significant overestimation of the rate of accused infringement due to this significant bias in their forensic technique.

111. As a result, assertions regarding infringement occurences based on the files-downloaded metric are non-scientific, technically improper, and lead to false "facts."

112. It is important to appreciate that Defendants do not run a "peer-to-peer" (P2P) service, and technical and business aspects specific to P2P services generally do not apply in the present matter, which involves designated file transfers between a corporation's servers and individual

account holders' personal computers, with DMCA-based takedown systems, Terms of Service and a contractual agreement between the parties as noted *supra*. Moreover, unlike in P2P services wherein millions of unidentified anonymous personal computers make up the distribution infrastructure, it apparently is undisputed that Defendants formed a visible corporate entity and located their file storage servers expressly in Texas—that is, in plain sight in Plaintiffs' "back yard" and territory, an unlikely place for any business to choose to position its assets if it plans to use them to systematically induce unlawful behavior among its international customers. A more detailed explanation of Defendants' systems and service appear *infra* and in Exhibit R.

113. It must be acknowledged that many of the works accused as being infringed in this matter are wasting assets having low or negligible residual or monetizable value.

114. Many of these works have been broadcast on television and already are subject to permissible consumer recording, time-shifting, unlimited subsequent viewing, and even commercial-skipping using VCRs, TiVo, and similar devices, all of which reduce their economic value. Example such works include Warner's *Harry Potter* movies and Disney's 2010 *Alice In Wonderland* film released for broadcast on TV and subject to such treatment.

115. Many more Plaintiff works, including feature films and TV shows, are already available for unlimited commercial-free "all-you-can-drink" Internet streaming, either free or by paying a few dollars a month to Plaintiffs' own licensed distributors such as Hulu, Amazon, and Netflix. For example, TV episodes of popular shows such as Fox's *Bones* and *Better Off Ted,* CBS's *How I Met Your Mother,* and Universal's *BattleStar Galactica* and *The Rockford Files* are available for unlimited viewing at no per-view cost, using a $7.99/month flat-rate Netflix account. Similarly, Columbia Pictures' *The Girl With The Dragon Tattoo* is available, free, for unlimited

streaming viewing by Amazon Prime members.[3]

116. This would properly value such assets in the pennies-per-use range or at a fraction of a cent or even less—even lower if practical barriers make the rightsholder's work more difficult to obtain through a file-sharing site than from the distributor, and as authorized third-party streaming services inexpensively providing licensed entertainment content such as Netflix are becoming available internationally.

117. Plaintiffs also likely benefit economically from Internet redistribution of their works by consumers, which benefit could be enhanced through business cooperation with centralized file sharing service sites such as Defendants', and Plaintiffs have the technical ability and business opportunity to optimize this benefit but they apparently have not evaluated that benefit or diligently explored this opportunity. *Cromarty Expert Report at 163-173.*

118. It is my opinion that, both for business reasons and due to "laws of physics," Defendants materially lack the ability to control infringement by Internet users. As noted *supra* and detailed in Exhibit R, DFP and related technology is broadly technically inadequate or deficient to provide such control, and no competent science exists yet to support technical or marketing claims of any such technology or product when applied to this problem domain.

119. It is my opinion that despite these material technical limitations, Defendants are demonstrating substantial effort in applying the admittedly inadequate tools that do exist to detect and respond to instances of possible copyright violation. Based on my technical and business expertise and the facts presented in this matter, in my opinion Defendants' efforts to

[3] Strikingly, many of these same "free" works were listed among Plaintiff-accused files. E.g. *Plaintiffs MSJ / Sehested Declaration Exhibit A.* Note, however, declarant did not opine that any file found on Defendants' server was confirmed as an infringing work—only, apparently, that files had suggestive names. See discussion *supra* concerning filename metadata.

apply available technologies meet or exceed the standard of reasonable business practice applied in the Internet service industry in attempting to meet their obligation with respect to copyrighted content.

120. In my opinion, the Defendants' systems offer a specific substantial non-infringing use and benefit to normal law-abiding Internet users, one occupying an important market niche neglected by most of Defendants' business competitors. Indeed, during the course my investigations my family and I have fruitfully benefited from lawful use of the Hotfile service. There is a substantial legitimate business case for the existence and market success of a business such as that of the Defendants. *Cromarty Expert Report at 154-173.*

121. Hotfile lacks a public search capability for files stored on the Hotfile server or links to them. Users may know of their own files, but not anyone else's unless granted access by being told the link to that file. Plaintiffs suggest this is part of a strategy to induce infringement—that Defendants cleverly induce infringement by building a system that *lacks* business and technical mechanisms to induce infringement. *Plaintiff MSJ at p.4.* This suggestion is technically erroneous, non-factual, and obtuse business reasoning.

122. Hotfile offers customers an extension of a personal computer user's private storage, either to their own devices (e.g. between their PC and phone/PDA) or among private groups (among family members, business colleagues, a company's customer base, etc.), as described *supra.* A website-wide search capability would destroy the privacy Hotfile customers enjoy as to their files. It would take away from them their decision and control as to who sees their content and who does not.

123. A parent may wish to share a video of her child with grandparents, but not with unknown child abductors anonymously trolling the Internet. A business may wish to share opportunities

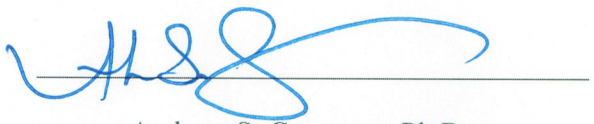
only with its loyal repeat customer base. An amateur videographer may wish to share his work with a select audience, but not publish the video to the public. A political dissident may wish to share cell-phone videos of political brutality with her cohort or a New York Times reporter but not with her nation's secret police.

124. Further, although filename metadata are not reliable as to content, a suggestive filename made public by a service provider can have a disastrous effect. If, as an investment banker, I had placed a file named Disney_plan_to_acquire_Columbia_Pictures_in_Aug_2012.pdf on a private file-sharing service for later remote access and reference on my Blackberry or laptop computer, and then the service provider made it publicly discoverable through a search interface, the existence of the suggestive name alone—and especially if associated with me as an identifiable user, and no matter what the file's content—could spur illegal insider trading and FINRA or SEC violations, and my investment bank could go out of business overnight due to the improper disclosure.

125. Other services that provide file storage and sharing for individual registered paying customers, e.g. Amazon S3, do not provide public search or indexing of all their clients' private content.

126. The fact that Hotfile does not provide a public site-wide search feature directly supports their legitimate product mix, business model, and customers' highest use cases and needs.

Executed in Palo Alto, CA this 5th day of March, 2012



Andrew S. Cromarty, Ph.D.

APPENDICES AND EXHIBITS

A. Materials Relied Upon

All materials listed in Appendix A of *Expert Report of Andrew S. Cromarty, Ph.D.,* attached here as Exhibit R.

Plaintiff's Motion and Memorandum of Law in Support of Summary Judgment Against Defendants Hotfile Corp. and Anton Titov with attached exhibits.

All materials attached herein as Exhibit X, including:

The Girl with the Dragon Tattoo free unlimited viewing offer (Amazon.com web screenshot).

Google *Internet Service Provider Copyright Code of Practice – TCF Consultation Draft,* dated 6 March 2009.

Harry Potter and the Order of the Phoenix TV broadcast announcement (examiner.com web screenshot).

National Research Council Reference Manual on Scientific Evidence - Third Edition. (cover page provided)

Roku Affiliate Program description webpage.

Roku Refer-a-friend Affiliate Offer webpage.

VCloud9 Publisher License Agreement between Hotfile and Vobile - Exhibit B

Wal-Mart Affiliate Program description webpage.

B. Curriculum Vitae of Dr. Andrew Cromarty

Curriculum Vitae

Andrew Cromarty, Ph.D.

Expertise

- Distributed computing
- Internet, broadband, networking
- Corporate IT, security, datacenter
- Web commerce, business models
- High-tech management & finance
- Software & product development
- Multimedia, entertainment tech
- Computer & Information Science

Professional Summary

Energetic, focused leader with over 20 years business experience in large and small companies, including as CTO of a billion-dollar publicly-traded consumer broadband corporation; CTO of a $100M consumer wireless hotspot services joint venture; Chairman of a Lucent wireless content-distribution/e-commerce spinout; manager or co-founder of several high-technology startups; CTO/CIO of an entertainment software/services company; CTO/CIO of an investment bank; member of Board of Directors for satellite, broadband wireless, and venture investment corporations; and research roles in the highest management-awarded corporate scientist positions at Digital, ADS, and Compaq.

Proven track record in management & operations, software development and service delivery, new technology creation, intellectual property evaluation, business model refinement, and team building and leadership. Experience includes product/service design, definition, development, and delivery; R&D and IT management; and project, line, corporate management, corporate strategic partnering, staff management, public relations, technology transfer, and intellectual property management. Managed development of a wide range of systems, from research prototypes through commercial products and services. Leading technical expertise in system architecture, networking, distributed computing and communications, and broadband, including pioneering work in multimedia content distribution and delivery that yielded many worldwide Internet firsts.

Strong general management approach based on a customer-focused hands-on leadership style. International service delivery experience, including as CTO of corporations with wholesale and retail terrestrial landline/wireless and satellite service operations in North America, Caribbean, Europe, and Asia. Experienced, press-trained, capable writer and public speaker.

Curriculum Vitae

Employment History

From: 2010 **Distributed Systems Technology LLC**
To: Present Palo Alto, CA
Position: *President and CEO*
(Business & IP advisory)

From: 2009 **Minerva Consulting**
To: Present Palo Alto, CA
Position: *Partner*
(Business & IP advisory)

From: 2007 **Union Square Advisors**
To: 2008 San Francisco, CA
Position: *CIO & CTO*

Founding CIO/CTO of investment bank specializing in mergers and acquisition (M&A) and late-stage private placement investment. Reported to President/founder. Conducted M&A and investment due diligence, provided detailed intellectual property analyses internally and to clients, negotiated and managed 45 vendor and supplier contracts & licenses, and built and oversaw the bank's internal operations, security, and regulatory compliance infrastructure. Architected/implemented complete corporate mail, CRM, security, datacenter, virtualization, document management, mobile/BES, website, backup/DR/BCP, conferencing, web/videoconferencing, and VOIP/telecommunications systems. Perfect corporate security record maintained (no breaches or leaks) during the entire several-year tenure. New business development included bringing the bank its largest private placement client. Served as the investment bank's internal diligence expert on tech industry clients and opportunities across semiconductor & communications, enterprise software, clean/green tech, and Internet verticals. Worked directly and extensively with clients' management teams, including IP advisory.

From: 2005 **DAX Solutions, Inc.**
To: 2007 Los Angeles, CA
Position: *CIO & CTO*

CIO/CTO at the entertainment industry's largest Web-based/SaaS global media asset & enterprise workflow management service supplier for film/TV industry, supporting thousands of customer users across hundreds of productions on five continents. Presided over operations during firm's growth to 55% market share over 2 years, at 80% year-over-year revenue & customer growth. Reported to CEO.

Managed internal operations, field ops, product development, IT & engineering (software development, operations, global distributed server/content distribution network, outsourcing/offshoring, technical customer relations, service delivery, architecture, and security). Designed, architected, and built a new industry-redefining enterprise-level service business, the industry's first high-definition digital dailies screening and distribution system for film/TV executives, and integrated it securely into customer infrastructure at Disney and other major studios/networks. Defeated entrenched incumbents in a six-way competitive race, winning an exclusive quarter-million-dollar contract with Walt Disney Pictures; line-managed Disney contract and customer relationship. Grew product/service to serve new clients (Showtime, Lifetime, Walden Media, Fox, FX, LionsGate, ABC Touchstone).

Managed major product updates and product/service enhancements. Rearchitected CDN and datacenter operations, including servers, networking, and multi-terabyte asset storage management systems. Managed major software product updates, including Oracle/DB2/Websphere to open source/MySQL/JBOSS migration, user feature enhancements, storage access enhancements. Oversaw new trouble ticket, CRM, and project planning system implementations. Negotiated new datacenter contract, upgraded critical Internet service to a diversified tier 1 provider base, instituted new management & operations processes, and selectively outsourced operations, to reduce operations costs 40% and improve customer-facing service level from 2 nines to 4 nines. Managed and developed leasing, outsourcing/ offshoring, manufacturing and vendor relationships. Defined and instituted professional staff management practices including formal review and bonus incentive programs, to align manager performance with company goals and facilitate corporate growth. Frequently marketed/sold to and directly supported the firm's highly demanding customers.

From: 2001 **City Lights Network**
To: 2005 Palo Alto, CA
Position: *President & Principal*

Provided advisory services to firms in startup, restart, or growth phase, often accepting an interim Chief Officer role. Engagements included Starfish Health (as CTO and VP Operations), Fifth Day Therapeutics (as CTO and CIO), and RFG, a highly-regarded boutique analyst firm (as Strategic Consulting Partner). As professional due-diligence advisor for VCs and private investors, evaluated hardware & software investment candidates. Engaged by Global 500 computing and financial industry firms to advise on architecture, compliance, and operations. As a "hired gun" CXO, designed and developed service offerings, managed outsourced development, developed business models, supported investment activities, developed intellectual property portfolio, business

relationships, growth plans, financial models, and software technology for several startups. Designed and developed software for a startup's consumer web-based service offering, managed outsourced web development, developed business models, supported investment activities. Developed intellectual property portfolio, business relationships, growth plans, financial models, and software technology for a biotech drug discovery startup, applying mathematical modeling and computer simulation techniques to developmental genomic regulatory networks to produce new drug candidates. Evaluated investment candidates in enterprise security, high-volume collaborative consumer multimedia, and distributed/grid enterprise software for professional investors.

From: 1999 **SoftNet Systems, Inc.**
To: 2001 San Francisco, CA
Position: *Chief Technical Officer*

Member of the five-person executive team governing a billion-dollar publicly-traded broadband services corporation, growing it from 350 to 700 technical staff, 20,000 to 30,000 subscribers, 30,000 to 60,000 email users, and operations from 70 to over 100 cities internationally. Chief officer for parent corporation and all operating subsidiaries, actively participating in their operations. Operating units included the nation's third-largest cable Internet provider, the first two-way VSAT satellite broadband provider, and a $100 million broadband wireless service provider joint venture. Reported to CEO/Chairman.

Line-managed the firm's corporate IT, pre-spinout business incubator, and corporate technology staff. Responsibilities included technical operations & service delivery, new product and business development, new technology development, corporate strategy, intellectual property, press and investor/analyst presentations, corporate venture investment, staff development, market realignment/restructuring/M&A and discontinuation/creation of subsidiaries, and cost reduction and quality improvement. Served on Board of Directors of SoftNet Ventures, the corporation's venture capital investment arm, and led or conducted due diligence and investment activities.

Led software and hardware architecture teams as CTO of $100MM broadband wireless subsidiary/JV. Designed proprietary on-site multi-level caching server systems, with networked wireless delivery, remote management, semi-formal security policy, and industry-defining performance. Developed the broadband wireless industry's first consumer equipment certification program and first semi-formal security policy for wireless services.

Supervised a $5M P&L pre-spinout multimedia content hosting subsidiary with operations in 90 cities, including financials, product technology, strategy, staffing, sales & marketing, partnering, and external investment

negotiation. Oversaw competitive, performance, and vendor/supplier relationships for content management, cable & satellite broadband businesses, internal enterprise IT applications, and external web hosting business.

Led efforts that improved profitability and operating efficiency. Refined product mix, reduced failure rate, improved service reliability by nearly two nines to 99.7% in key markets; implemented technology upgrades to reduce expense and improve performance of service delivery by 40%. Rearchitected cable network and standardized fielded hardware and software to cut operating expenses in managing $20 million of deployed capital assets.

As corporate strategy officer, tracked 7 global geographies, kept contact with 188 companies or institutions, and maintained trend data on 90 competitors and partners. Led a successful defense against a competitor's patent attack. Frequently worked directly with strategic partners and individual consumer customers.

From: 2000 **Freewire Networks, Inc.**
To: 2001 Murray Hill, NJ
Position: *Chairman*

Lucent spinoff: Wireless consumer broadband service/content/e-commerce provider.

Initiated successful Series A investment ($8M post valuation). Led Board through successful hiring of new CEO. Mentored management team on business model and operations, including strategy, business approach and service architecture for delivering live wireless commerce & multimedia content to consumers in-venue.

From: 1996 **Digital Equipment Corp. & COMPAQ Computer Corp.**
To: 1999 Palo Alto, CA
Position: *Principal Scientist, Corporate Strategy & Technology (CTO's) Division; Manager, Networked Entertainment Technology*

Member of the renowned Western Research Laboratory and Network Systems Laboratory, developing novel Internet system architectures and the business models to exploit them.

Designed and developed new networked hardware-software architectures for high-performance internetworked multimedia. Developed a portfolio of strategic partners; achieved many worldwide historic Internet transaction, service performance, & scalability firsts, including first to stream 1,000,000 live videos for an event, world's first Java-based distributed Internet games demo, and world's first live wireless webcasts. Served as press-trained designated corporate spokesperson for broadband

and multimedia. Consulted to senior management of 50 customer/partner firms on business models and operations.

Developed managed-services business model and architecture for an international web-based sports news distribution joint venture with Reuters, later spun out as SportsWeb and sold to CBS Sportsline. Defined hardware-software architecture, partnering plan, and cost-benefit and cashflow breakeven analyses to establish service tiers.

From: 1990 **Distributed Systems Technology / Distributed Systems Research**
To: 1996 Palo Alto, CA
Position: *President & Founder*

Founded and ran a profitable business for six years. Major clients included GE Aerospace, US Navy. Led architecture team for a $43M DARPA-funded distributed automation program. Contracts included design of a performance management system for assessing and tracking the training and on-the-job competence of US Navy personnel; multidimensional visualization techniques to assist Navy operators in route planning tasks; and the design of a strict real-time task scheduling approach for a distributed situation assessment system and semiformal design specification of a distributed real-time underwater semirobotic situation assessment, planning, and execution system. Developed a novel business in turnkey catalog web services targeted at growth-oriented small retailers and implemented it profitably.

From: 1983 **Advanced Decision Systems**
To: 1990 Mountain View, CA
Position: *Acting Division Manager, Corporate Marketer & Principal Scientist*

Manager for 8 years in a consistently profitable startup that grew from 35 to 200 employees, became the dominant supplier of applied AI systems to the US Government, and launched a successful public spinout (Verity). Performed general manager functions for a corporate division with a multimillion-dollar P&L. Reported to President or SVP.

Managed approximately 20 successful software development projects over 8 years, consistently delivering working software to external customers on-time and on-budget. Started a computer systems focus within the company and grew it into a corporate division; directed and supervised the company's staff and contract efforts on the application of machine intelligence technology to computer systems hardware and system software, including distributed systems, advanced computer architectures, intelligent operating systems, programming languages, database technology, computer security, robotic and expert systems, real-time processing techniques, packet radio and networking

applications, and reliable fault-tolerant computing. Built and led the team that produced the world's first virtual machine-based distributed cross-platform infrastructure for live object/process migration. As corporate marketer, built a new multimillion-dollar client base that became the firm's single largest stable source of contract revenue.

Education

Year	University	Degree
1988	University of Massachusetts Amherst, MA	Ph.D., Computer and Information Science
1980	University of Massachusetts Amherst, MA	MS, Computer and Information Science
1978	Wesleyan University Middletown, CT	BA, Music
1978	Wesleyan University Middletown, CT	BA, Biology and Psychology (double degree)

Publications

Monographs and Book Chapters

[1] Cromarty, A., Adams, T., Wilson, G., Cunningham, J., Tollander, C., and Grinberg, M., "Distributed Database Considerations in an Expert System for Radar Analysis." Expert Data Base Systems, Benjamin/Cummings (pub.), 1986.

[2] Cromarty, A., Chapter 3 of the monograph World Sugar, Connell Commodities (pub.), Westfield NJ, 1977.

[3] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." In A. Bond and L. Gasser (eds.), Readings in Distributed Artificial Intelligence, Morgan Kaufman (pub.), 1988.

[4] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." In L. Kerschberg (ed.), Expert Database Systems (monograph based on April 1986 Proceedings of the First International Conference on Expert Database Systems, Charleston, South Carolina), 1987.

[5] Cromarty, A., Pattern Recognition in Natural and Artificial Systems. Ph.D. Dissertation, University of Massachusetts, Amherst MA. Unpublished. 1983.

[6] Cromarty, A., Programming Constructs for Real-Time Distributed Knowledge-Based Systems. Ph.D. Dissertation, University of Massachusetts, Amherst MA. Published by University Microfilms, Ann Arbor, Mich. 1987.

Journal and Proceedings Articles and Reports

[1] Adams, T., Cromarty, A., McCune, B., Wilson, G., Grinberg, M., Cunningham, J., and Tollander, C., "A Knowledge-Based System for Analyzing Radar Systems." invited paper, Proc. Military Microwaves '84 London, England, 1984.

[2] Cromarty, A., Adams, T., Cunningham, J., and Tollander, C., "Science and Technology Analyst's Assistant." Final Technical Report (Revised), ADS TR-1035-01. Published as DTIC Technical Report ADA168552, January 1986.

[3] Cromarty, A., Adams, T., Wilson, G., Cunningham, J., Tollander, C., and Grinberg, M., "Distributed Database Considerations in an Expert System for Radar Analysis." pp. 586-602, Proc. First International Workshop on Expert Database Systems, Kiawah Island, South Carolina, Oct 24-27, 1984.

[4] Cromarty, A., "A Model of the Anuran Retina." Technical Report 81-35, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1981.

[5] Cromarty, A., Cation, M., Dove, K., Edwards, T., Leech, M.~J., Newman, N., and Wong, R., "Distributed Processing Topology." Technical Report TR-3112-01, Advanced Decision Systems, Mountain View, California, October 1986.

[6] Cromarty, A., "Communications in Advanced Architecture Computing Systems for Distributed Problem-Solving Applications." Distributed Processing for Ballistic Missile Defense project, ADS Technical Memorandum TM-3098-9, Advanced Decision Systems, July 1987.

[7] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." Proceedings of the First International Conference on Expert Database Systems, Charleston, South Carolina, pp. 47-59, April 1-4, 1986.

[8] Cromarty, A., Cunningham, J., Dove, D., and O'Reilly, C., "Performance Maintenance for a Heterogeneous Distributed Computing System." Final Report, Distributed Processing for Ballistic Missile Defense project, ADS Technical Report TR-87-3098-1, Advanced Decision Systems, 1987. Published as DTIC Technical Report ADB12017L, 1988.

[9] Cromarty, A. "Depth as a disambiguating cue in visual localization of objects." Published as Technical Report 81-37, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1981.

[10] Cromarty, A., Edwards, T., Grover, M., Kinion, P., O'Reilly, C., and Railey, M., "Dynamic Adaptive Resource Management for Real-Time Distributed Planning." Final Report (Vol. I), ADS Technical Report No. 3191-1, April 1990. (Also published by the U.S. Air Force as a Rome Air Development Center Technical Report in 1990.)

[11] Cromarty, A., "Entertainment on the Internet: Executable content, entertainment corporations, and the future." Digital Internet Innovators News, Spring 1998.

[12] Cromarty, A., "Entertainment on the Internet: How Different Audiences Are Affected." Digital Internet Innovators News, Winter 1997.

[13] Cromarty, A., and Bauer, E., "Linux in the Datacenter : An Analysis of Linux Use for Large-Scale Database Applications ." Robert Frances Group, October 2005.

[14[Cromarty, A., Grover, M., and Vitarelli, J., "A Model of Trans-/Post-SIOP Strategic Distributed Planning." Final Report (Vol. II), ADS Technical Report No. 3191-2, April 1990.

(Also published by the U.S. Air Force as a Rome Air Development Center Technical Report in 1990.)

[15] Cromarty, A., Hatfield, F., Kenig, N., Morgan, K., Smith, S., Whitebread, K., and Williams, D., "SOAS System Design, Version 1.1." Semiformal specification and design report for DARPA's Submarine Operational Automation System program, published as a GE Aerospace program technical memorandum, April 1991.

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[18] Cromarty, A., Leech, M. J., Kinion, P., Tollander, C., Dove, K., and Edwards, T., "Reconstitution, Reconfiguration, and Knowledge-Based Routing in a Heterogeneous Distributed Computing Environment." Final Report, Distributed Processing Topology project, Technical Report TR-87-3112-02, Advanced Decision Systems, 1987. Published by the U.S. Air Force as Rome Air Development Center Technical Report RADC-TR-88-131, 1988.

[19[Cromarty, A., Morgan, K., and Whitebread, K., "SOAS Situation Assessment (SA) Component Design." Situation assessment design report for DARPA's Submarine Operational Automation System program, published as a GE Aerospace program technical memorandum, December 1991.

[20] Cromarty, A. "Neural models of visuomotor integration in amphibians." Invited paper, 28th International Congress of Physiological Sciences, Budapest, Hungary, 1980. Published in Adv. Physiol. Sci. vol. 30: G. Szekely, E. Labos, and S. Damjanovich (eds.), Neural Communication and Control.

[21[Cromarty, A., O'Reilly, C., Mitola, J., and Adams, T., "Artificial Intelligence Applications to the Real-Time EW Problem" (Final Report). Technical Report, Advanced Information & Decision Systems, Mountain View, California, 12 November 1984.

[22[Cromarty, A., Rudahl, K., Ruggles, L., and Sutton, R., "A VLSI Associative Search Network for Knowledge Acquisition: A Design Study." Tech. Rept. 83-04, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1982.

[23[Cromarty, A., Shapiro, D., and Fehling, M., "'Still Planners Run Deep': Shallow Reasoning for Fast Replanning." John F. Gilmore (ed.), Applications of Artificial Intelligence, pp. 138-145, Proceedings SPIE 485, 1984.

[24[Cromarty, A., "SportsWeb: Exploring New Business Models at the Internet's Service Frontier." Digital Forefront, Summer 1998.

[25[Cromarty, A., "The CoinLisp Reference Manual." Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1982.

[26[Cromarty, A., "The Role of Entertainment on the Web: How Different Audiences Are Affected." Digital Internet Innovators News, Winter 1997.

[27] Cromarty, A., "What are Current Expert System Tools Missing?" invited paper, Proceedings IEEE Computer Conference, San Francisco CA, February 1985.

[28[Cunningham, J., Dove, D., Andrews, D., O'Reilly, C., and Cromarty, A., "Model-Based Fault Management." Distributed Processing for Ballistic Missile Defense project, Technical Memorandum ADS-TM-3098-2, Advanced Decision Systems, June 1987.

[29] Grover, M., Kinion, P., and Cromarty, A., "Cooperating Expert Systems (COPES) Software Development Plan." ADS Technical Report No. TR-2200-003, March 1989.

[30[Grover, M., Kinion, P., and Cromarty, A., "Design Criteria for Cooperating Expert Systems (COPES)." ADS Technical Report No. TR-2200-002-C, March 1989.

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[32] Hatfield, F., and Cromarty, A., "A Concept and Architecture for a Proficiency Management Support System." Final Report, US Navy Contract N00039-95-C-0030, June 1995.

[33[Hatfield, F., and Cromarty, A., "Proficiency Management Toolset (PMToolSet): Analysis and Requirements." Interim Report, US Navy Contract N00039-95-C-0030, March 1995.

[34] Hatfield, F., and Cromarty, A., "Proficiency Tracking and Authoring Tools for C4I Environments (ProTRACE): Technology and Architecture." Interim Report, US Navy Contract N00039-95-C-0030, April 1995.

[35[Hatfield, F., and Cromarty, A., "Visualization and Analysis for Cruise Missiles." Final Report, US Navy Contract N60921-94-C-A132, June 1994.

[36[Lara, R., Arbib, M., and Cromarty, A., "Neural modeling of prey-predator interactions in frog and toad visuomotor coordination." Soc. Neurosci. Abs. 5:469, 1979.

[37[Lara, R., Arbib, M., and Cromarty, A., "The Role of the Tectal Column in Facilitation of Amphibian Prey-Catching Behavior: A Neural Model." J. Neurosci. 1982.

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[39[Miltonberger, T., Cromarty, A., and Lawton, D., "Feasibility Study of an Artificial Intelligence Approach to Space Object Identification" (Final Report), Technical Report TR-2077-2, Advanced Decision Systems, Mountain View, California, April 1985.

[40[Miltonberger, T., Cromarty, A., Lawton, D., and Muller, H., "Preliminary Results on a Model-Based Image Understanding System for Detecting Space Object Anomalies from Inverse Synthetic Aperture Radar (ISAR) Images." Proceedings Fifth Annual Phoenix IEEE Conference on Computers and Communications, March 1986.

[41] Morgan, K., Whitebread, K., Kendus, M., and Cromarty, A., "Integration of Domain and Resource-Based Reasoning for Real-Time Control in Dynamic Environments." Proceedings of the NASA SOAR Conference, August 1992.

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[45] Weymouth, T., and Cromarty, A., "COINS-3D (An Adaptation of MOVIE-BYU): System Description and Reference Manual." Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1979.

[46[Wilson, G., Cromarty, A., Adams, T., Grinberg, M., Tollander, C., and Cunningham., J., "AI Assists Analysts in Identifying Soviet Radar Systems." Defense Systems Review, January 1984.

Select Presentations, Invited Lectures and Invitational Workshops

[1] "AI in the 80's: Transferring the technology," Invited Keynote Speaker lecture (Plenary Management Session) for Aerospace Applications of AI Conference, Dayton OH, Oct 14-17, 1986.

[2] AI Planning Workshop (satellite workshop of National Conference on Artificial Intelligence), Washington, DC, Aug 1984.

[3] "Cooperating Expert Systems." Technical Interchange Workshop, Decision Aids Branch, RADC/COAD, Rome NY, Feb 17, 1988.

[4] DARPA Workshop on Planning and Problem Solving in Animate Systems. Bishop's Lodge, Santa Fe NM, June 17-19, 1985.

[5] "Distributed Planning Architectures, or Planning in a Distributed Computing Environment." Technical Exchange Workshop, Knowledge Engineering Branch, RADC/COES, Rome NY, May 18, 1988.

[6] "Distributed System Reconstitution for Strategic Distributed Planning" (with M. Grover). Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Jan 11, 1989.

[7] "Distributed System Topology for the SDI Battle Management/C3 System." Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Nov 1986.

[8] "Dynamic Process Migration for Reconstitution and Reconfiguration in a Heterogeneous Distributed Computing Environment." Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Dec 1987.

[9] "Information processing in autonomous mobile vehicles" (with R. Drazovich), DARPA Workshop on Autonomous Ground Vehicles, Leesburg VA, Oct 24-26 1983.

[10] Intelligent Decision Support Systems, two-day public lecture series (sole speaker) presented to audiences in Boston MA, Atlantic City NJ, and Washington DC, Jan 1986.

[11] "Knowledge-based fault management using heterogeneous dynamic process migration." Artificial Intelligence Technology Fair Workshop, Knowledge Engineering Branch, RADC/COES, Rome NY, Nov 1988.

[12] Invited keynote talk, EnterTech Entertainment and Technology Conference, Carlsbad CA, April 1999.

[13] "New Domains and Collective Visions: All Things Digital." Invited panel session, Univ. of California/Red Herring's DIGIVATIONS: Global Digital Technology and Media Conference, Bacara Resort, Santa Barbara, California, September 24–26, 2000.

[14] "Linux in the Datacenter : An Analysis of Linux Use for Large-Scale Database Applications ." Public national lectures series, Robert Frances Group, October 2005.

[15] "The Death of Product Design." Invited lecture and panel session, Asilomar Microcomputer Workshop, Pacific Grove, California, April 28-30, 2010.

[16] "Education and the Innovation Economy: A brief status report." Invited lecture and panel session, California Assembly Select Committee on Innovation and the Economy: Innovation Symposium, Livermore, California, July 13, 2010.

Awards, Honors, Professional Associations and Achievements

Cum Laude Society, Newark Academy (1974)

Bausch and Lomb Honorary Science Award (1974)

National Science Foundation Summer Research Fellowship, for neurophysiology research (1977)

National Institutes of Health/NINCDS Research Assistantship, for computer science and mathematical modeling of biological systems (1979-1980)

DAAD Fellowship, to conduct neuroethology research in Germany (1980)

National Institutes of Health/NINCDS Research Assistantship, for computer science and mathematical modeling of biological systems (1981-1982)

Teaching Assistantship, University of Massachusetts at Amherst (1982)

National Science Foundation Research Assistantship, to design a new programming language (1983)

Past Vice President (Pioneer Valley chapter) and Member, ACM

Member, Institute of Electrical and Electronic Engineers (IEEE)

Visiting Scholar, Stanford University (1990)

Board Positions

Former college fraternity President, now serving on national executive board. Served on four corporate boards and numerous boards of advisors; presently serving on University of California President's Advisory Board and on Board of Directors of Forensic Expert Witness Association (San Francisco). Position history includes:

2011 – present	Board of Directors & VP, Forensic Expert Witness Assn. (San Francisco)
2002 – present	President's Board on Science and Innovation, Univ. of California
2001 – 2002	Contributing Editor, Thumbtribes wireless journal
2001 – 2002	Board of Advisors, AdCritic.com
2001 – 2002	Board of Advisors, Globallinx Network Inc.
2000 – 2001	Board of Directors/Chairman, Freewire Networks (Lucent spinout)
2000 – 2001	Board of Directors, Aerzone Corporation
2000 – 2001	Board of Directors, Intelligent Communications, Inc. (Intellicom)
2000 – 2001	Board of Directors, SoftNet Ventures (corporate venture fund)
1998 – 2002	Board of Advisors, Univ. Calif. Digital Media Innovation Program
1998 – 2004	President's Advisory Council, Wesleyan University
1999 – 2000	Trustee and President, Covenant Presbyterian Church
1996 – present	Trustee, Kappa Alpha Society Foundation

C. Exhibit R: Cromarty Expert Report

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF FLORIDA
MIAMI DIVISION

Civil Action No. 11-20427-CIV-JORDAN

DISNEY ENTERPRISES, INC., TWENTIETH CENTURY FOX FILM CORPORATION, UNIVERSAL CITY STUDIOS PRODUCTIONS LLLP, COLUMBIA PICTURES INDUSTRIES, INC., and WARNER BROS. ENTERTAINMENT INC.,	)
Plaintiffs,	)
v.	)
HOTFILE CORP., ANTON TITOV, and DOES 1-10.	)
Defendants	)

EXPERT REPORT OF ANDREW S. CROMARTY, PH.D.

Andrew S. Cromarty, Ph.D.

18 NOVEMBER 2011
Date

Table of Contents

I. INTRODUCTION AND BACKGROUND

1. I have been retained by Defendants Hotfile Corp. ("Hotfile") and Anton Titov (collectively, "Defendants") as an expert. In my capacity as an expert, I was asked to offer my opinion on specific technical and business questions bearing on alleged secondary infringement of Plaintiffs' copyrights by Hotfile Corp. and Anton Titov as asserted by Plaintiffs in their Complaint. If additional claims as to infringement are asserted, I reserve the right to opine on those claims as well. My expertise extends to the technical areas of the alleged copyright infringement, by virtue of, at minimum, my extensive training in computer science and commercial experience as set forth below. I will not offer opinions of law, as I am not an attorney.

2. I have been engaged through Distributed Systems Technology LLC, a company of which I am an owner, through Berg Software Designs. Berg Software Designs bills $600 per hour for my time working on this matter plus reasonable expenses, of which I receive a lesser indeterminate amount computed after business operations expenses of Berg Software Designs and Distributed Systems Technology LLC. My compensation is in no way related to the outcome of this litigation.

3. A list of the materials I considered is attached as Exhibit A.

II. QUALIFICATIONS

4. I have received the following academic honors, awards, appointments, and recognition: Visiting Scholar, Stanford University (1990); National Science Foundation Assistantship, to design a new programming language (1983); Departmental Teaching Assistantship, University of Massachusetts at Amherst (1982); National Institutes of Health/NINCDS Research

Assistantship, for computer science and mathematical modeling of biological systems (1981-1982); Deutscher Akademischer Austausch Dienst (DAAD) Doctoral Fellowship, to direct neurophysiology and computer modeling research in Europe (1980); National Institutes of Health/NINCDS Research Assistantship, for computer science and mathematical modeling of biological systems (1979-1980); National Science Foundation Summer Research Fellowship, for neurophysiology research (1977); Bausch and Lomb Honorary Science Award (1974); Cum Laude Society, Newark Academy (1974); National Merit Scholarship Finalist (1974).

5. During my professional career I have held senior technical positions at several corporations, including Principal Scientist at both Digital Equipment Corporation and Compaq Computer Corporation, the highest management-awarded corporate scientist hiring rank at those corporations, and Division Research Director and then Corporate Principal Scientist at ADS, the highest management-awarded corporate scientist rank at that corporation, for a combined total of approximately a decade.

6. I have held numerous senior corporate executive and technical management positions during my career, including Chief Technology Officer (CTO) and Chief Information Officer (CIO) of Union Square Advisors, a San Francisco technology mergers & acquisition investment bank; CIO and CTO of DAX Solutions, Inc., a primary provider of Internet-based digital asset services to the Hollywood TV and movie industry, with international operations; CTO of SoftNet Systems, Inc., a billion-dollar NASDAQ-traded Internet services and telecommunications company; Chairman of the Board of Freewire Networks, Inc., a wireless broadband service, content, and e-commerce business; CTO of ISP Channel, then the third-largest cable Internet provider in the United States; CTO of Aerzone Corp., a $100 million wireless broadband service joint venture; and Board of Directors member of additional firms including Intelligent

Communications Inc., an international satellite service provider, and SoftNet Ventures, a corporate venture investment fund. Presently I am a Partner at Minerva Consulting, and the President and CEO of Distributed Systems Technology LLC.

7. I earned a Ph.D. in Computer and Information Science from the University of Massachusetts at Amherst, awarded in 1988, writing my doctoral dissertation on "Programming Constructs for Real-Time Distributed Knowledge-Based Systems." While there I also wrote a second doctoral dissertation on mathematical modeling and computer simulation of brain structure and function. I earned a Master of Science in Computer and Information Science the University of Massachusetts at Amherst in 1980. I earned a Bachelor of Arts double degree in Biology and Psychology, and simultaneously a Bachelor of Arts degree in Music, from Wesleyan University in 1978.

8. Since obtaining my Ph.D., I have worked in numerous technical management positions and overseen dozens of successful projects developing software, hardware, and services. My experience includes overseeing technical staff from groups very small in size to hundreds of employees. My experience in these projects has been consistently direct and hands-on, and has delivered working products and services to paying customers. I also have worked as a computing professional by developing software and teaching programming in over 30 languages.

9. I have personally authored on the order of one million lines of software code.

10. I am credited with a number of worldwide historic multimedia, Internet and technology firsts, including first to stream 1,000,000 live videos on the Internet for an event, world's first demonstration of Java-based distributed Internet games, world's first live wireless webcasts, world's first streaming video live from an international film festival, and the first high-definition "set-top box" networked screening product and system for the movie industry.

11. My specific relevant experience with networking, internetworking, and multimedia content sharing or delivery over the Internet includes:

12. Active on the Internet in its successive historical manifestations since approximately 1975.

13. Developed and published novel networking and distributed computing techniques for my doctoral research 1983-1988.

14. Active networking and electronic communications researcher and experimentalist since 1978, involved in defining and implementing novel communications protocols, experiments, and techniques including: packet radio techniques, propagation research, TCP/IP extensions, administrative management of a subset of the public Internet allocated for packet radio use, design and implementation of American Red Cross emergency/disaster communications systems, and design and creation of networked satellite communications systems and packet gateways to the Internet.

15. Created and directed a Computer Systems group that grew into a corporate division and developed novel networking and distributed computing techniques including internetworked multimedia delivery and distribution methods,1983-1990.

16. Founder and President of a startup firm in 1990 that provided distributed computing and networking consulting analyses, software, and services to U.S. Government/military and commercial clients 1990-1993; and subsequently in 1994-1996, provided to commercial customers e-commerce, Web catalog, and Internet services, entailing early market study, in-house development, and adoption of open-source software tools implementing networking and shopping technology and development of an early form of affiliate marketing business website, on the World Wide Web starting in 1994. Among my firm's catalog Web sites were the first

known hockey retailer and the first known soccer retailer on the Web, software for which was executing on a Web server on a public host computer delivering multimedia content at least as early as 1994.

17. Principal Scientist at the Network Systems Laboratory of Digital Equipment Corporation, 1996-1999. While at Digital Equipment Corporation, I developed a number of networking methods and systems, which may be subject to contractual nondisclosure agreements. In 1996 I developed the networking method of filtering active content from HTTP traffic at a network firewall. I also developed in 1997 the methods and systems of internetworked peripheral devices and services including methods and systems related to wirelessly internetworking printers, keyboards, remote displays and monitoring systems, and in 1998, additional architectures, methods and systems for high-performance internetworked multimedia client-server systems that were used for applications including education and entertainment.

18. While at Digital Equipment Corporation, I also held the title of Manager of Networked Entertainment. I actively managed a collection of entertainment-related server equipment and Internet services, at Digital's corporate Internet gateway and distributed in locations throughout the world throughout the late 1990's, primarily for the purpose of delivering audio, video, and other complex multimedia content worldwide. Digital was a multi-billion-dollar company and creator of the first and largest Internet corporate gateway in the world, and my responsibilities included researching, evaluating, and developing both technologies and Internet-related business models for Internet multimedia delivery on behalf of that corporation. Among other activities, I developed the business model, including cash-flow break-even model and Internet pricing structure, for a joint venture of Digital Equipment Corporation and Reuters named SportsWeb, which later was successfully spun out and acquired by CBS Sportsline. I also met with and

lectured to senior executives from major corporate Digital business partners as to industry trends, including Internet business models and technology related to multimedia and entertainment, on approximately 50 occasions. Similarly, after Digital's acquisition by Compaq Computer Corporation, I was the invited Keynote Speaker at the EnterTech Entertainment and Technology conference created to introduce the Silicon Valley and Hollywood industries, where I lectured to Hollywood industry executives on business models and technologies for entertainment and other multimedia content.

19. From 1999 and thereafter, I have served as a senior executive of several broadband and Internet-related firms ranging up to a billion dollars in size and spanning all forms of network connectivity with global operations. As Chief Technical Officer of NASDAQ-traded broadband corporation SoftNet Systems Inc., I served on the senior executive team of chief officers managing the corporation and oversaw technical and field operations for the parent corporation and its operating unit subsidiaries, comprising a technical staff of approximately 700 employees as we grew this company to a market capitalization of approximately two billion dollars. This included serving as CTO of ISP Channel, then the third-largest cable Internet service provider in the United States with tens of thousands of customers, and line-managing the pre-spinout corporate incubator. I also served as CTO of Intellicom, the first two-way VSAT satellite Internet service provider, with international operations. In my roles at ISP Channel and Intellicom I led specific large-scale efforts to develop new business models appropriate to the firms' intellectual capital and market opportunities. As founding CTO and member of the Board of Directors of the hundred million dollar wireless broadband firm Aerzone Corp., I led technical development and business strategy development for the premier hotspot wireless broadband service provider, with international operations. As a member of the Board of Directors of

corporate venture capital fund SoftNet Ventures, I directed and performed technical and business model due diligence on scores of investment or merger/acquisition matters. As Chairman of the Board of Directors of Freewire Networks, an e-commerce startup corporation to provide multimedia broadband services in sports arenas and other entertainment venues, I led a successful Series A funding effort, culminating in spinout from Lucent Technologies Inc. and an eight million dollar post valuation, and I oversaw the hiring of a new CEO. As CTO and CIO of technology investment banking firm Union Square Advisors, my duties included performing due diligence on merger and acquisition candidates as to technology and business factors, assisting clients in developing their intellectual property portfolios, bringing in new customers, working closely with the other chief officers especially as to operations and banking compliance matters, and overseeing all technical operations for the firm.

20. During 2005-2007, I was CTO/CIO of DAX Solutions Inc., the film and TV industry's primary provider of Digital Asset Exchange asset management and workflow services over the Internet (some details of which may be subject to commercial nondisclosure obligations). In that capacity I oversaw technical development and line-managed the firm’s operations and field service teams, providing digital dailies and workflow services to many of the largest entertainment firms in Hollywood and throughout much of the world. My specific responsibilities included managing the development, deployment, and operation of DAX's state-of-the-art proprietary digital asset watermarking/fingerprinting technology and intellectual property and associated digital rights management systems and software. At DAX we operated the largest known Internet-based system in the world for securely managing film and TV industry digital assets, with over 3,000 industry accountholders. My responsibilities also included oversight and management of security for these copyrighted entertainment assets, and

required working with, educating, and advising many of the largest entertainment firms in the world as to security technology and policy for their own copyrighted multimedia film and TV digital asset content, much of which they entrusted me to hold and manage for them on my servers in Los Angeles, in their own facilities, and throughout the world.

21. My technical experience includes mathematical analysis, software development, technique development, and publication in technical areas that additionally arise the present matter, including work on pattern recognition, pattern matching, multidimensional and visual signal and image analysis, probability and other mathematical confidence models as applied to pattern recognition systems, and computational complexity of real-time computations. My Masters thesis developed descriptive and mathematical models of visual signal processing. My first doctoral dissertation developed mathematical techniques for feature-based pattern analysis and visual pattern matching, and I also performed research on biological and computer visual recognition systems. My later research, lecturing, and publications addressed topics including methods for space object identification, systems for feature-based matching and analysis of imagery data, strengths and weaknesses of mathematical techniques for probabilistic decision-making, heuristic as well as algorithmic techniques, and analyses of combinatoric complexity of algorithms for real-time signal analysis and computational reasoning applications.

22. My business experience includes extensive development and evaluation of new, alternative, and competitive business models. I developed competitive business models early in the development of the Web for my own and other startup companies. I advised and consulted on business models as a Strategic Consulting Partner at boutique analyst firm RFG. At Digital Equipment Corporation my responsibilities included developing and evaluating business models, expressly including business models for multimedia and entertainment content delivery and use

on the Internet. As a member of the Board of Directors of corporate venture capital fund SoftNet Ventures, as CTO of billion-dollar broadband corporation SoftNet, and later as CTO of investment bank Union Square Advisors, I evaluated well in excess of sixty investment and merger & acquisition opportunities, including their business operations and business models.

23. I have not testified at trial in the previous ten years. I have testified as an expert witness in depositions on three dates in 2011.

24. A full list of my publications is included in my curriculum vitae, attached hereto as Exhibit B.

25. If called as a witness at trial, I would testify as to the statements and opinions contained in this report.

III. PRINCIPAL QUESTIONS ADDRESSED IN THIS REPORT

26. In the course of this report, I review and offer expert opinions as to at least the following four primary questions raised in this matter:

1. Did and do Defendants follow industry-standard practices to effect control over digital assets to the extent technically practicable?
2. Is Hotfile's affiliate program consistent with widely-respected customer incentive programs that are common among Internet businesses?
3. Is Hotfile's revenue model consistent with widely-respected Internet revenue models under which customers pay for better service performance?
4. From a technical perspective, does Hotfile materially have the ability to control copyright infringement by its users?

IV. SUMMARY OF OPINIONS

27. For reasons discussed in detail below, it is my expert opinion that the Defendants employ standard, widespread, long-standing, respected business models, systems, and technical methods that were developed long ago for a wide range of respected and accepted business purposes.

28. It is my opinion that the Defendants' customer incentive programs are common Internet business practice, and they are widely used by many of the most respected and successful corporations offering services on the Internet. Further, Plaintiffs likely benefit economically from Internet redistribution of their works by consumers, which benefit could be enhanced through business cooperation with centralized file sharing service sites such as Defendants', and

Plaintiffs have the technical ability and business opportunity to optimize this benefit but they apparently have not evaluated that benefit or diligently explored this opportunity.

29. It is my opinion that Hotfile's "premium" service is structured to allow customers to obtain better service performance. I further find nothing in Defendants' service offering that provides any incentive to make illicit (*vs.* licit) use of the service.

30. It is my opinion that, both for business reasons and due to "laws of physics," Defendants materially lack the ability to control infringement by Internet users. The technology is broadly technically inadequate or deficient to provide such control, and no competent science exists yet to support technical or marketing claims of any proposed such technology or product when applied to this problem domain. Even any future tools not yet in existence but hypothesized capable of providing such control would be either computationally infeasible to employ or unable to justify confidence as to their reliability and efficacy, due to the mathematics of pattern analysis as applied to complex digital copyrighted works and the insufficiency of needed information about such copyrighted works.

31. It further is my opinion that despite these material technical limitations, Defendants are demonstrating substantial effort in applying the admittedly inadequate tools that do exist to detect and respond to instances of possible copyright violation. Based on both my technical and business expertise, I conclude that Defendants' efforts to apply available technologies meet or exceed the standard of reasonable business practice applied in the Internet service industry in attempting to meet their obligation with respect to copyrighted content.

32. In my opinion, the Defendants' systems offer a specific substantial non-infringing benefit to normal law-abiding Internet users, one occupying an important market niche neglected by most of Defendants' business competitors. There is a substantial legitimate business case for the

existence and market success of a business such as that of the Defendants.

V. SYSTEMS AND METHODS OF DEFENDANT SYSTEMS

33. I provide in this report a description of the Defendants' system and methods. I understand that Hotfile operates the website www.hotfile.com. Details about operations of Internet and the World Wide Web and the systems and methods used by Hotfile and/or visitors to www.hotfile.com are described in Appendix H.

VI. COMPLAINT, AND APPLICABLE LEGAL FINDINGS TO DATE

34. In formulating my opinion, I have relied on the Court's orders of which I am aware, including its Order on Motion to Dismiss. *Order on Motion to Dismiss, July 8, 2011.* I expressly reserve the right to supplement or modify my opinions and this report if the Court modifies or provides additional orders or opinions.

35. I understand a copyright is found to be directly infringed only if a plaintiff shows that he owns a valid copyright and that the other party copied some of the protected elements of that work of his copyright.

36. I understand that in the present matter, the Court already has found that the Plaintiffs have failed to state a cause of action for direct infringement by Defendants, and the Court therefore has dismissed Plaintiff's Complaint Count as to direct infringement in this matter by Defendants. *Order on Motion to Dismiss, July 8, 2011.*

37. I understand the Court has directed that a defendant may be liable for inducing copyright infringement if he "distributes a device with the object of promoting its use to infringe copyright, as shown by clear expression or other affirmative steps taken to foster infringement" and that someone commits contributory infringement when he, with knowledge of the infringing acts, nonetheless "induces, causes, or materially contributes to the infringing conduct of another." *id. at 7.* And further, I understand that the Complaint alleges that hotfile.com is a website that Hotfile uses to promote copyright infringement and alleges that Hotfile took affirmative steps to foster this infringement by creating a structured business model that encourages users to commit copyright infringement. *id.* I understand that to allege a claim for vicarious infringement, a plaintiff must allege that the defendant "infringes vicariously by profiting from direct infringement while declining to exercise a right to stop or limit it." *id at 8.*

38. I understand that Defendants have asserted a defense based on the Safe Harbor provision under the Digital Millenium Copyright Act ("DMCA"). I understand one of the mandates of the Safe Harbor is that the service provider "does not receive a financial benefit directly attributable to the infringing activity, in a case in which the service provider has the right and ability to control such activity." *17 USC §512((d)(2)).*

39. I understand that in response to Defendants' interrogatories, Plaintiffs have proposed certain example effective "supervisory measures," i.e., proposed effective technical means or effective business practices, which Plaintiffs contend Defendants have the practical ability to implement but did not. Question No. 3 of the First Set of Interrogatories and Plaintiffs' response thereto is hereby included by reference. *Plaintiffs' Responses and Objections to Defendant Hotfile Corp.'s First Set of Interrogatories, at 8.*

VII. TECHNICAL AND HISTORICAL BACKGROUND

40. I provide in this section an overview of relevant technical background. This establishes a technical vocabulary and historical context for my opinions later in this report.

A. A half-century of file sharing

41. File sharing over computer networks, including the Internet and its precursor networks, already was common and well-specified more than forty years ago. File transfer protocols, notably including today's File Transfer Protocol, were developed just for this purpose. For example, in 1971 the Internet specification publication RFC114, "A File Transfer Protocol," detailed many of the benefits of remote content sharing using an "extended file transfer protocol":

> Indirect usage … does not require that you explicitly log into a remote system or even know how to "use" the remote system. An intermediate process makes most of the differences in commands and conventions invisible to you. For example, you need only know a standard set of network file transfer commands for your local system in order to utilize remote file system. This assumes the existence of a network file transfer process at each host cooperating via a common protocol. Indirect use is not limited to file transfers. It may include execution of programs in remote hosts and the transfer of core

> images. The extended file transfer protocol would facilitate the exchange of programs and data between computers, the use of storage and file handling capabilities of other computers (possibly including the trillion-bit store data computer), and have programs in remote hosts operate on your input and return an output. *RFC114 at 1.*

42. Subsequently, the modern Internet File Transfer Protocol was further specified in 1980, published as RFC959 "File Transfer Protocol" in 1985, and has continued in use through the present day.

43. Importantly, these file transfer methods were developed without the contemporaneous ability, or objective, of transferring modern copyrighted entertainment or other multimedia files. At the time these file sharing techniques were conceived and developed, substantially all such content was in non-digital form.

44. For example, the now-common "MP3" digital music format did not emerge until the late 1990's. And at the time the File Transfer Protocol was specified, high-definition digital formats, CDs, and DVDs had not yet been invented and brought to market.

45. As networking developed, from its earliest days, free file-sharing services arose to provide the many legitimate and needed benefits of file sharing to the networked community.

46. For example, over a third of a century ago, the SIMTEL Archive file sharing system was created and made publicly available to all users on the ARPANET (i.e., the Internet), first at the Massachusetts Institute of Technology and then moved to and maintained at the White Sands Missile Base, a U.S. Government facility, throughout most of the 1980's. The primary use of the Archive was file sharing of free software among Internet users, under the U.S. Government's *de facto* financial and administrative sponsorship.

47. Another very widely used file sharing system, "gatekeeper.dec.com," was established in the late 1980's as an Internet-wide file sharing site established by Digital Equipment Corporation, the first computer company in the world to create a corporate Internet gateway:

> History
>
> The FTP archive on gatekeeper.dec.com, later to become gatekeeper.research.compaq.com, first went on-line in the late 1980's. … In its heyday, gatekeeper was a prominent Internet FTP site. Just about any public domain software package you wanted or needed could be found on gatekeeper. One of gatekeepers' primary functions was to give Digital software developers, living on the DECNET based internal corporate network, access to public domain software available from the Internet. (The Digital internal DECNET host, DECPA::, mounted the gatekeeper FTP archive via NFS.) Gatekeeper was also used by Digital product groups to provide software updates and patches to Internet customers. "*What happened to gatekeeper.dec.com?" at 1.*

48. There were many other such file sharing sites across the Internet throughout the past forty or more years. File sharing sites are a historical commonplace, and a long-standing necessity for routine use of computer networks.

49. Today there is a vibrant marketplace of firms offering a range of file sharing services under a variety of different terms or business models.

50. An important characteristic of modern file sharing and file storage services is provision of a fungible, apparently infinite, ubiquitous store for one's own digital data. These services serve as a geographic and virtual extension of the native file capacity available in the user's

personal computing environment.

51. For example, Amazon.com rents file space to anyone with a credit card at inexpensive rates in essentially unlimited capacity through its Simple Storage Service ("S3"). Amazon S3 implements a "freemium" pricing model, that is, some file storage services are offered free, with more services and improved performance available if the customer pays for them (called an "upsell").

52. Dropbox, a firm that offers Internet file storage from one's personal computer or PDA cell phone under a "freemium" model, is backed by first-tier venture capital investors including Sequoia Capital, Greylock, Accel Partners, and Goldman Sachs. *SecondMarket's Q3 2011 Private Company Report* Dropbox was recently reported by BusinessInsider as one of SecondMarket's Top Ten Most-Watched venture-backed firms. Market analysis firms SecondMarket and Crunchbase describe Dropbox as using file sharing to solve existing problems in Internet email, device interoperability, and mobile access to personal data: "Dropbox was founded in 2007 by Drew Houston and Arash Ferdowsi. Frustrated by working from multiple computers, Drew was inspired to create a service that would let people bring all their files anywhere, with no need to email around attachments. … Guiding their decisions was a relentless focus on crafting a simple and reliable experience across every computer and phone." *SecondMarket Overview of Dropbox; Crunchbase Overview of Dropbox.*

53. Commercial file sharing sites have become the single most important medium through which open source software is distributed today. For example, the well-known open source repository Sourceforge presently contains "software in over 260,000 projects" serving "2.7 million developers" and "46 million consumers." This file sharing service specializing in source code sharing is owned and operated by a NASDAQ-traded public corporation with a market

capitalization well in excess of $100,000,000. *About Sourceforge.* Other well-known open source file sharing services include Launchpad and Github. The use of such file sharing services for distribution of open source software is well understood in the IT profession and by expert practitioners as central to the operations and essential to the viability of the open source software industry.

54. File sharing services offer increasing value to legitimate users as multimedia technology advances. For example, it is now common for cell phones such as a Blackberry or iPhone to take high-resolution photographs and shoot high-definition movies. The resulting collection of digital assets quickly becomes very large, and for technical reasons email is a very poor choice for sharing them. File sharing services are a far better solution to sharing such assets. Indeed, Apple recently released its iCloud service to address this need for its own customers. Users of other brands of devices, however, continue to need a third-party commercial file sharing service to obtain these communications benefits.

55. Firms such as Picasa (a Google subsidiary) and Flickr (a Yahoo subsidiary) provide file sharing services to the consumer visual multimedia file sharing market, employing a freemium pricing model with upsells. *About Picasa; Flickr FAQ; Flickr Upgrades.*

56. Defendants' system and service, Hotfile, is a *de facto* market competitor of these established modern firms. For example, customers of these other services can choose to use Hotfile as an alternative service provider, or *vice versa.*

57. Some file sharing services focus on particular markets, business opportunities, or "use cases" (styles of customer use). Such market specialization may present both benefits and limitations to the customer.

58. Overall, however, with respect to the kind of content that may be stored or accessed and

the degree of service provider *vs.* customer control that is possible, these services are generally indistinguishable both technically and in the market. All provide file storage as a service; all promote their storage services as part of their business model; all permit users to store files without the service provider's knowledge of or regard for the internal contents of the files, which may in fact be opaque to the service provider for technical or privacy reasons; all require their users to accept responsibility for obtaining, and representing they do have, any rights required to upload content as a condition of use; and all continue the nearly half-century-old technical and business practice of providing remote storage for files of arbitrary type and content for remote use and access.

59. Thus the technology for sharing files among distant networked users is not a new invention designed for sharing copyrighted digital works owned by others or as a specific mechanism for infringing copyright.

60. Quite to the contrary, file sharing has been in perpetual use, starting decades before it became technically feasible to move commercial entertainment media over computer networks. Network file sharing predates substantially all modern digital entertainment content, and it has a decades-long history of substantial non-infringing use.

61. Existing Internet file sharing services are a direct technical and business continuation of this nearly half-century-old unbroken practice of sharing content over computer networks, among university, business, personal, and government file sharing sites.

62. Common uses of commercial file sharing services today include:

- allowing an individual to gain access to personal data across many devices, such as between a PC and a PDA/cell phone, or between work and home computers;
- sharing data securely with business colleagues, such as between attorneys and

their client or experts;

- sharing computer source code and related data, such as through Sourceforge;
- sharing self-authored multimedia works such as pictures, music performances, and movies among members of a group, such as within a family, a Boy Scout troop, a music band, or a commercial entertainment production company; or
- moving files from one location to another, such as a student writing an essay written on a shared computer in a school computer lab, then depositing it at a file sharing site for later pickup from a home personal computer.

63. Sharing content and services between computers and between computer users is what networked computers are meant to do, and why computer networks exist.

64. Consequently, as file sharing is a long-lived technology, in widespread use for a large and varied number of individual purposes, the mere presence, availability, investment in, commercial promotion of, or use of file sharing technology or services offers no technical foundation upon which to ascribe any specific intent to either individual users or service providers—other than to store and retrieve some data.

B. A brief technical explanation of file sharing

65. Although the presentation to the human user (if there is one) may differ across competing file sharing services, the underlying technology is substantially identical. The local computer connects to a remote computer over a network such as the Internet. The two computers conduct a stylized conversation, using a strict set of phrases (a network "protocol") they agree on. And the contents of the file is retrieved from storage on one computer, transferred between the computers

over the network, and stored at the second computer.

66. In such file transfers there typically are exactly two computers involved—the local (sometimes "client") computer, such as a personal computer at home, and the remote ("server") computer, such as a server computer at a file sharing site. (Intermediate computers that may sit between them on the network do not play a material role in this description.)

67. The local computer has a way to indentify the remote computer, such as an Internet domain name or, more rarely, a numeric Internet Protocol ("IP") address, which the local computer uses to initiate a temporary connection between them.

68. A remote computer, such as the file sharing service's server computer, may receive no information as to how it was named or addressed by the clients connecting to it. For example, the server may have no information as to the name used by the client computer to identify the server computer. Similarly, if the digital asset was named on a third computer, such as using a link (a "URL") residing on a separate web server under the control of an independent third party, the file sharing service's server may receive no information from which it could be aware of or determine this. Only the client computer and its user, not the server or its administrator, will be aware that such a third-party web server or its link exists and was employed to locate the file at the file sharing service. This is inherent in the design of the World Wide Web and Internet protocols.

69. For a variety of technical reasons, a remote computer such as a file sharing service's server may not have accurate or reliable information as to the location, identity, or even the true IP address of the client computers connecting to it. As one example, at some corporations all connections from every employee are routed through a single address before reaching the Internet, and this single address is what the remote file share service will see for all such users.

As another example, in some countries where Internet service is limited or access is tightly controlled by government, an entire region or nation may be routed through and appear to originate at a single IP address or a small block of addresses.

70. Further, technology is commonly available and in widespread use that obscures the local computer's IP address, identity, and location, so that a connection from one location appears to originate at another location. Network Address Translation ("NAT") and "onion routing" are two common such techniques. This technology sees a wide variety of uses in practice, ranging from enforcing corporate networking policies on traveling employees, to achieving free speech while avoiding political scrutiny of a local user's government monitors, to moving contraband content such as pornography or stolen information untraceably, to achieving anonymity for personal privacy reasons.

71. Use of such obscuring technology is entirely under the control of the local computer and its user, and a remote service provider generally cannot detect, determine, or confirm that such obscuring technology has been employed. As may be expected, the information on how to use such technology is public and readily available to those motivated to find and employ it.

72. This ability for an individual to forge their location or network identity when connecting to a remote server is an inherent design characteristic of the Internet and its communications protocols.

73. Also unknown, and generally unknowable, by the server computer administrator is the content or nature of the contents of the files placed there by client computers or their users. For example, the client computer and its user, not the server, establish the file's name and its implied file "type." On some computers, metadata such as the filename of a well-named file may provide a suggestive clue to the content, but this information is inherently unreliable. In fact, the client

computer or its user generally has complete liberty to choose any filename they wish, consistent with certain minimal syntactic limitations. For example, a picture file may be named as if it is an audio file, or an email message may be name and stored as if a software program. Any desired degree of obscuring of a filename is permissible. This is an inherent characteristic of filenames, and results from the design intent of filesystem developers to provide as flexible as possible a set of data management tools to computer users, for them to use in their sole discretion.

74. Thus filenames are a completely unreliable source of information as to the contents of the file they contain. The name of a file may or may not be of any value at all in helping to identify the file or its contents. The only requirement for a filename is, it must be unique.[1]

75. File content can be further obscured, intentionally or unintentionally, through certain common operations on files. For example, for space efficiency and other conveniences, sometimes one or more files are bundled together in a single file using an "archive" format, such as the common ZIP format. Compression techniques applied to such files reduce their size, at a significantly increased computational cost of recovering the original files for inspection or use. Such archives further can be encrypted for privacy, requiring a password or much stronger decryption means to recover the archive file's inner contents for inspection or use.

76. Files also may be encoded using a technique that is not encryption per se but has a similar effect, such as through conversion to a format more suitable for certain kinds of network transmission or cross-platform storage and use.

77. Such encoded or encrypted file objects become effectively opaque to the file sharing service—that is, they cannot be inspected, easily or at all. Problems recovering the information in such a file include not knowing that it has been encoded or encrypted, not knowing the format

[1] Including file path/URL as appropriate.

of encoding or encryption, not knowing the decryption data such as password or key required to recover the content, or not knowing the algorithm for recovery. Technology is now ubiquitous to permit such encoding and encryption. Today, decrypting a routinely encrypted individual file using the required decryption key is possible in a short time, while recovering the file's contents without the needed decryption key is believed by mathematicians to be essentially impossible—for example, to take much longer than a human lifetime just to decrypt and inspect a single file.

78. Encoding or encryption technology is commonplace and has a very wide range of legitimate uses.

79. Particularly on file sharing services, encryption is a choice that a user or customer may make in their sole discretion at their own client computer to enhance the privacy of data they deposit with the file sharing service.

80. Digital asset encryption is considered a properly protective "best practice" within the Information Technology ("IT") profession whenever private information of any kind is placed outside one's own direct control, including on file sharing servers administered by a third party like an Internet file sharing service firm.

81. In the event that the server is compromised by "crackers,"[2] the user's encrypted data remain safe, because such files are impossible for the cracker to recover and inspect. However, encrypted files also are typically impossible for the file sharing service to inspect.

82. Consequently, as encoding and encryption technology are in routine and widespread use and have many legitimate uses, no single conclusion about intent of either individual users or service providers can reliably be drawn from the mere presence, availability, promotion, or use of file encoding or encryption technology, including in files on file sharing services.

[2] Sometimes, less properly, called "hackers."

83. During the late 1990's a second, alternative model of file or content sharing gained currency, called "peer-to-peer" ("P2P") networking. In P2P networking, computers already connected by a communications network such as the Internet join an informal coalition of computers that agree to pool and share their spare computing resources, such as their file space, network capacity, and/or processing power.

84. P2P networks are inherently decentralized—there is no central administration of a P2P network of computers. There also is no server *per se* in P2P networks—rather, every computer can serve as both a client of and a server to other computers, even simultaneously and for the same file.

85. Peer-to-peer file sharing quickly became a common means of sharing content, alternative to using centralized public or commercial file sharing services. P2P networks offer the advantage of harnessing spare unused capacity, small individually but large in the aggregate, of a very large number of confederated computers working in a cooperative manner.

86. In P2P file sharing, an individual file is splintered into small fragments, and individual fragments of a single file may be delivered to a single client simultaneously by many other computers in the P2P network.

87. Although companies have emerged to extract financial gain from (i.e. to "monetize") such networks, in practice it appears most P2P activity is non-commercial.

88. For technical reasons largely stemming from P2P's decentralized nature and design aspects of the Internet, P2P activity cannot be regulated or controlled, reliably monitored, or accurately measured.

89. Some P2P networks additionally were explicitly designed to offer enhanced anonymity to all users, for example for privacy or to allow their use in totalitarian countries.

90. Anonymity in P2P networks also benefits from client's ability to obscure source locations and addresses that is inherent in the Internet, described *supra*. This affords individuals sharing files via P2P networks an unusually high degree of anonymity, which can be employed for licit purposes or exploited for illicit ones. It is well understood by those skilled in the art that the majority of Internet traffic throughout the decade 2000-2010 was a combination of "spam" email and P2P file traffic. This occurred notwithstanding persistent, public attempts by commercial copyright holders or their agents to identify users who they allege employ P2P networks to infringe copyright on commercial entertainment content.

91. By comparison, commercial file sharing services such as that of the Defendants provide a relatively poor opportunity, and a markedly higher degree of danger or risk, for those seeking to infringe copyright through illicit distribution of digital assets.

92. Commercial file sharing services operating in the United States typically have centralized servers, a formal Acceptable Use Policy to which users must agree that forbids infringing acts, a notification procedure in accordance with the DMCA, an account structure for at least their more frequent users, a corporate legal structure, business risk to manage, and a stated policy of compliance with the DMCA. The business model, financial and legal requirements, and technical operations practices of commercial file sharing services make them very poorly suited to, and an unwise choice for, individuals who seek knowingly to infringe copyright through illicit distribution of digital assets.

C. Technical and business challenges in identifying or confirming infringement

93. Several technical conditions or limitations must be met to evaluate a potential or alleged infringing digital duplication of a copyrighted work.. At a minimum, first, a copyrighted original work must exist with a still-valid current copyright. Second, the copyright holder must identify that original work as one over which they assert copyright. Third, a second digital object must exist and must be identified as a potentially infringing instance. Fourth, a competent comparison of the two instances must be made, sufficient to confirm or disconfirm the alleged infringement.

94. Many of these conditions or limitations result from infringement instance identification, evaluation, and response being a multi-step, multi-party process. Technology can assist this process, and relevant technology has evolved and continues to evolve. But technology alone is not a complete remedy for addressing infringement. Instead, a cooperative process among all parties is essential. This fact results from the information theoretic nature of the comparison task.

95. The first limitation exposes a difficult challenge for both content owners and the owners of a file sharing service. For many works, such as those created before 1923 or released into the public domain, there is no currently valid copyright. Computer instances of these works bear no distinguishing mark to separate them from copyrighted works. As a business matter it cannot reasonably be assumed that a work has a particular copyright status; that is what markings are for, and technical users rely on them to answer such questions.

96. The second limitation is rarely met. Most computer files do not bear a copyright notice. All that is available on a server is the bytes of data in the file, not identifying legal metadata. It is

apparent from inspection and experience that the vast majority of digital data (email messages, personal blogs, calendars, notes, student essays, databases, etc.) bear no explicit copyright markings. Additionally, there is an enormous volume of publicly placed copyrighted content made available by rightsholders and intended for distribution. Examples include content published under Creative Commons licensing, such as is commonly used on Wikipedia, and open source software bearing licenses that permit and encourage redistribution and sharing such as the GNU Public License or Berkeley Software Distribution license.

97. The storage and duplication of this vast majority of data is non-infringing simply because—perhaps apart from email messages—these data typically remain under the control of the author *qua* copyright holder. As noted *supra,* modern file sharing services provide a fungible, apparently infinite, ubiquitous store for one's *own* digital data, and from the file owner-user's perspective, such a service is an extension of his own computer: Files stored there for individual or shared use remain materially under his own control.

98. For the vast majority of computer digital assets, the most common case is that the second technical limitation is virtually never practiced, because individual users experience no need to assert their rights over their own files, whether stored locally or by their service providers.

99. The third limitation is challenging because a third-party entity (such as a file sharing service) holding a file may have no reliable or practicable technical means for associating it with a copyrighted work, while a copyright holder may have no knowledge of the existence or content of the second digital object. This is exacerbated by the plethora of permission models (Creative Commons, GPL, unstated, etc.) commonly employed for legitimate distribution and redistribution of content on the Internet and the fact that content can be posted or shared from anywhere in the world. The obvious implication of the latter concern is the volume, variety, and

untraceability of such postings. A more subtle corollary is that authors and rightsholders are distributed worldwide. The problem of determining the identity of a rightsholder is not limited to comparing works to a few thousand assets of a few companies located near Burbank, California, for example.

100. At a minimum, this means that a business collaboration, such as occurs under a proper balance of business interests, is required to meet the third limitation. In essence, this only can function as a business partnership. It is well understood among those experienced in business partnering that that such a collaboration only can succeed and persist if it occurs under business terms reasonable to both parties. For example, one party cannot be expected to absorb all the other party's costs, and no party can be expected to allowed to lay off[3] all its costs or risks onto the other party.

101. There also may be additional parties to the business arrangement. For example vendors or suppliers may be engaged to provide tools or services for or facilitate the business collaboration between the primary partners. (As one example, Vobile is such a vendor in the present matter.) An important factor to resolve in building such a successful lasting business relationship is to properly, fairly, and rationally assign the costs associated with such vendors or suppliers.

102. Further, as part of such a reasonable balance of interests, it must be understood by all parties that no party can be expected to perform tasks that are impossible for it to perform. As one example, decrypting an encrypted file without benefit of the decryption keys, as noted *supra,* may not be technically feasible, and other such operations may be exceptionally expensive,

[3] In business parlance, to "lay off one's costs onto one's partners or competitors" is to find a clever business arrangement through which your firm obtains disproportionate economic benefit from a deal, contract, or *de facto* business arrangement by getting, or tricking, other firms into unduly absorbing and paying your business costs for you.

beyond the reasonable ability of a single party to bear. In such circumstances, business experience shows that a reasonable business accommodation by the other party is the only successful means of maximizing the parties joint ability to succeed and meet common goals.

103. The fourth limitation *supra* requires that competent comparison of the two instances must be made, sufficient to confirm or disconfirm the infringement. There are two challenges presented by this requirement. First, either individually or in the aggregate, the comparison may not be technically feasible, whether due to reasonable business requirements imposed by the third limitation or due to strictly technical factors. Second, the comparison must be competent.

104. Unless a digital copy of the original work exists and is available, there is no base case against which either a copyright holder or a service provider can compute a comparison for the purpose of identifying a possible infringement. In practice, an assertion of copyright over a second digital asset to be evaluated, there must have been a asset itself in digital form such that a comparison computation can proceed.

105. Where the two files do exist in digital format, computational comparison as to equivalence of their underlying digital assets is fraught with difficulty. Except in the case where the works are identical and simple file system comparisons of total file identity suffice, there is no established accepted reliable technical standard from either computer science or information science for comparing two creative works to determine whether one is an instance or derivative work of the other.

106. Techniques for identifying and comparing two candidate files, particularly such as two multimedia files, can be classified relevantly for purposes of this report according to the following dimensions: exact vs. inexact; algorithmic vs. heuristic; and total vs. partial.

107. Exact techniques are those that lack or eliminate uncertainty, while inexact techniques

carry some uncertainty or inexpressibility. As a simple example, a file's size may be reported as "11,223,445 bytes" or as "11 MB"; the former is exact, while the latter is inexact, that is, an approximation.

108. Algorithmic techniques are expected to produce exactly the same result each time applied, and typify cases where the input data is well understood or well behaved. Heuristic techniques employ a simplifying "rule of thumb" and are designed for problems that may be poorly understood, computationally intractable when handled algorithmically, or relatively unstructured. It is common that heuristic techniques are employed to provide a best-effort answer that is not entirely reliable, but often achieved at a lower cost than an exact algorithmic technique.

109. Total identification or matching techniques are a class of techniques that apply to all of a digital asset. Partial techniques do not apply to the entire asset. One example of a partial technique is subset-matching approaches that attempt to identify or match two works based on finding only a subsets of each—say, the first five minutes of two video files—that are identical. Subset-matching techniques as described are exact, partial, and heuristic (because they assume that a small segment matching implies the entire assets match). Another class of partial techniques is "feature extraction" approaches that attempt to find some simple characteristic or feature of assets—say, the amount of green, or the number of key frames, or the average pixel value of successive frame blocks—and only match those features rather than the entire two assets. Feature extraction techniques as described are inexact, partial, and heuristic.

110. "Digital fingerprinting" is a term of art used to describe a collection of techniques for developing a simplified representation of a digital asset that is less reliable but more convenient to use than complete byte-by-byte exact algorithmic total matching of the files.

111. Importantly, the term is a misnomer. Unlike humans, files have no natural fingerprint. Rather, exercising human discretion, a person selects and applies a technique for mathematical simplification of files.

112. Since there is no limit to such mathematical techniques, there is no limit to the number of such digital "fingerprints" a file may have. The analogy to human fingerprints lies in the assumption, or assertion, that "collisions" are infrequent. A "collision" occurs whenever two files have the same digital fingerprint. A part of the human discretion applied involves selecting a mathematical technique that supports the hope for infrequent collisions. The science of information theory governs and predicts the rate at which collisions are likely to occur. Of course, as with a human population, in a sufficiently large population of files it is expected that collisions will occur.

113. One method of digital fingerprinting is file hashing. File hashing is a technique of computing a single long number corresponding to the contents of a file. Hashing is exact and algorithmic, in that applying the hash algorithm later to the same file or any true copy of it will produce exactly the same hash value. Its use is heuristic in that collisions may occur, though rarely for a suitably chosen hash technique. Two common well-known mathematical techniques for computing hashes are "MD5" and "SHA1".

114. Once a file hash value has been computed, it can be stored efficiently as a numeric value and used later with the same hashing algorithm applied to a different file. If the second file "hashes to" (yields) the same numeric value (and if the technique was suitably chosen), it is highly likely that the two files have precisely the same content. This is not certain, due to the possibility of collisions; confirmation requires that the two files are exhaustively compared using an exact algorithmic total comparison technique.

115. Hash techniques are moderately efficient. As one example, on a 1.8 billion instruction per second processor attached by gigabit Ethernet to a NAS filestore, computing a SHA1 checksum on a sample high-definition video asset (30fps, 720p, H.264, 48KHz stereo audio) proceeded at a rate of approximately 120 megabytes/second and 7 seconds of elapsed time (dominated by network transfer time) per second of processing time.

116. A primary disadvantage of hash techniques is their lack of robustness in the presence of file changes. The smallest possible change in the underlying file—for example, trimming a single video frame from a video file—will result in entirely different hash values. The hash comparison then will say that the two files differ, although they may be from substantially equivalent underlying digital assets.

117. As applied to indentifying possible instances of copyright infringement, hashes are effective at detecting a second instance of a known infringing file being uploaded. They are not effective at detecting an attempt to upload a slightly different version of the same underlying digital asset, however.

118. Feature-based pattern matching techniques have different, and widely varying, disadvantages. The disadvantages depend on the specifics of the feature-matching technique employed. In general, a disadvantage of feature-based techniques is that by design they ignore most data, under a personal theory that the extracted features chosen by the engineer who developed the technique either adequately represent or adequately identify the underlying digital asset.

119. Feature-based techniques also have the difficulty that there often is no inherently correct judgment or assessment criterion that provides a "yes"/"no" answer as to two files' similarity. Instead, typically, an engineer or developer simply picks some intuitively appealing metric and

threshold, and applies them as if they are correct and true. Among other risks, this technique often is not amendable to a sensitivity analysis that determines how often and under what circumstances the method will experience one of its "failure modes," that is, ways it is certain to fail due to its own flaws.

120. One manufacturer of digital fingerprinting and infringement detection software and services is Vobile, Inc. ("Vobile"). Based in part on the business experience of Hotfile as related by Mr. Titov, it is my technical inference that the techniques employed by Vobile employ partial subset-matching feature-based heuristic methods of identifying and matching files, for example by matching features extracted from small partial samples of a file to a stored database of pre-computed feature samples.

121. Although there is a large well-developed mathematical discipline of feature-based pattern matching and signal analysis, there is presently no science of digital asset matching.

122. For example, there is no set of standards, either developed by unaffected third parties or jointly developed and broadly accepted by all parties in all affected industries, as to testing methods, agreed proper scientific design, standard test input data sets, experimental apparatus or measurement techniques, standards for assessing experimental outcomes, metric for assessing cost/benefit tradeoffs of competing techniques, publications venue for reporting results, or product or service quality and reliability.

123. The digital fingerprinting product market presently is dominated by engineering-before-science. It resembles the patent medicine market of a century ago, as opposed to the regulated drug manufacturing market of today. Patents are filed and issued, and proprietary digital fingerprinting solutions are promoted and sold. But the products' inner workings typically are opaque to all buyers and users, unvetted by any broadly trusted independent third party,

uncharacterized as to specific performance or failure modes, and not commensurable to other products in the market.

124. Neither issued patents nor commercial success, such as purchases by rightsholders or service providers, provide a basis for concluding that digital fingerprinting tools work. Customers on both sides of the balance of business interests are compelled to buy such tools, whether they work or not, as a defensive measure, and both parties lack the technical ability and inside information to determine accurately and reliably whether the product they purchased actually works.

125. A correctly-functioning efficacious digital fingerprinting tool must combine features and capabilities that are quite difficult or impossible to achieve in a single product. For example, the product must achieve high match rate, low false positive rate, ability to discriminate copies from non-copies, affordability, and insensitivity to substantial common variations in content such as varying encoding parameters and many sophisticated forms of obfuscation by intentional infringers.

126. Digital fingerprinting techniques require a tradeoff decision to be made between poor quality and expensive performance. Feature extraction algorithms can be simple or complex, and relatively effective or highly ineffective. However, the scale cost cannot easily be avoided. The distribution of file sizes on Defendants' system is unknown to me, and may not be practical to compute. But if, for example, there are 93,000,000 files and each is comparable to the one-minute video cited *supra* in the hash example, then computing a one-second-per-file hash computation for those files would take three years, if they all could be cached on a single server.

127. Tens of millions of video files of any appreciable or typical size cannot all be cached in primary memory on a single server. If the more realistic architectural assumption is made that the

files are on a NAS connected by a gigabit Ethernet, simply computing the hash value for all these files would require approximately twenty server-years, that is twenty elapsed years when executed on one server working full-time with no other tasks to occupy it.

128. [redacted]

129. This means a technique reportedly advocated as state of the art by Plaintiffs' trade organization—one that demonstrably is a non-total heuristic technique, with attendant flaws and weaknesses—takes approximately one hundred times longer to deliver a result than the example SHA1 computation. And that result is considerably less certain, that is, lower quality for identification purposes, than a SHA1 comparison.

130. All such digital fingerprinting techniques are essentially useless as soon as an unknown encoding or recoding or encryption is applied at the client computer before a file is uploaded to the file sharing system. In particular, even the simplest rapid encryption techniques will scramble the data sufficiently to eliminate all the features a digital fingerprinting technique could extract for inferring possible infringement. If this were not true, residual information would be extractable from the encrypted asset and thus the encryption technique would have failed. Cryptologists therefore design encryption techniques precisely so that mathematical feature extraction, signal analysis, and comparable techniques are certain to fail, and will be entirely

ineffective.

131. When even simple rapid inexpensive encryption techniques are employed, the length of time required to produce data suitable for inferring infringement is lengthened by months to years. Thus for example, processing 93,000,000 existing files would take millions of years. And as noted *supra,* the file sharing service provider has no reliable information from which to determine whether a particular file is encrypted. In some instances, one file is intentionally hidden inside another, using techniques such as steganography, such that even upon careful inspection it is not possible to confirm the type or contents of a file or determine what digital asset it contains. Such techniques can be used trivially and at will by uploaders to convert positives to false negatives, or negatives to false positives. Meanwhile, more assets are being loaded onto file sharing servers each day, compounding the scale of the infringement inference challenge.

132. From the point of view of a purchasing decision-maker such as a service provider, there is no way for a well-intentioned technology buyer to differentiate between the many digital fingerprinting and comparable product options available. And absent a science and a standard for testing and evaluating such products, agreed upon in advance by rightsholders—and since rightsholder notably are all authors of copyrighted works, not merely large entertainment corporations—it is impossible for a service provider to know what product would be satisfactory to rightsholders before the fact.

133. There are technical alternatives to digital fingerprinting that may be more effective in limiting copyright infringement. Such techniques have the advantages of superior traceability of infringers and decreased burden on service providers, in that they are put into effect by the rightsholders during each performance rather than imposed on service providers.

134. One example alternative is watermarking. In watermarking, a unique visible or invisible marking is introduced into the copyrighted work, ideally uniquely at each performance. For a wide range of use cases and distribution or performance venues, watermarking is now technically and financially feasible.

135. Use of this technique by rightsholders would allow them to focus their enforcement efforts on infringers rather than service providers, and would free service providers from the burden of sharing another industry's business risk.

136. Other alternatives, such as Digital Rights Management technology, also exist. When properly used, Digital Rights Management (DRM) has proven very effective in limiting illicit redistribution of copyrighted digital works.

D. File sharing and Internet business models

137. Firms doing business on the Internet routinely combine older pre-Internet "bricks and mortar" business models and some new business models well-suited to the economics and technical features of the Internet.

138. The different economics of the Internet has resulted in widespread growth and adoption of certain new business models. For example, unlike the physical world, the Internet reduces the cost of doing certain kinds of business on an international scale nearly to zero. Commercial sale and delivery of digital goods can happen nearly instantaneously, including clearing a financial transaction and final delivery of the product to the customer, nearly anywhere on the planet.

139. Selling to an international clientele also implies selling across all cultures globally, and

into all markets simultaneously. It can be difficult or impossible to predict, from the vantage point of a business started in one country or culture, how best to identify and sell to a market in a different culture, country, or language.

140. One response to this different economics of product and services sales on the Internet is a much higher use of indirect sales, including particularly through resellers who are internationally dispersed and whom the product or server provider has never met. These resellers serve as an "indirect sales channel" in conventional sales parlance, but they differ from indirect sales agents common in bricks and mortar businesses by virtue of a different relationship. They typically are more "arms-length," less well known, and under less influence by the product or service provider. However, this is traded off against the business advantage of globally expanded reach.

141. One form of reselling common on the Internet is an "affiliate marketing" relationship. An affiliate is a firm or person that is provided incentives, such as a "revenue split" (a share of sales revenue), for bringing new customers to the product or service provider.

142. An affiliate marketing program is especially useful if one has developed a product or service and does not know with confidence what the best markets for it are around the world. The question can be "outsourced" to affiliates, in return for a share of the revenue they bring in when they successfully sell the vendor's product or service into to new markets.

143. Examples of well-known firms that employ affiliate marketing, customer-incentive, or similar programs under which one customer is paid to refer others include: Amazon.com, the roughly $100 billion-valuation publicly traded Internet sales firm; 1and1, the German web hosting firm historically reported as the largest web hosting firm in the world; eBay, the world's largest Internet auction business (affiliate marketing slogan: "Earn money when you deliver quality traffic"); Ooma, the Internet Voice over IP (VOIP) service firm; and regional telephone

and DSL Internet service provider Sonic.net.

VIII. OPINIONS AND ANALYSIS

144. I present in this section my analysis of, and conclusions as to, the Principal Questions set forth *supra* in relation to the accusations in the Plaintiffs' Complaint.

A. Hotfile follows industry-standard practices to effect control over digital assets to the extent technically practicable.

145. SHA/MD5 hash matching is a best-effort and reasonable business practice that addresses an important class of potential infringements by unknown third-party actors on the Internet. Once a specific file has been properly identified as an infringing instance, the same actor or other actors in possession of that file may attempt to upload it again to Defendants' systems in violation of Hotfile policy. By remembering hashes of such offending files and computing hashes on new files, a service provider can—at some expense—identify when an offending file has been uploaded again, and take appropriate action, such as quarantining or deleting the file and notifying, suspending, or cancelling the user and user's account consistent with any applicable policy of the service provider.

146. I understand from Mr. Titov that Hotfile uses hashing in this manner and for this purpose, and has for some time.

147. [redacted]

[redacted]

148. It is to be expected that Plaintiffs are generally familiar with many technologies they can use themselves, such as those described *supra,* for effecting control of their own digital assets, techniques that are alternatives to methods like digital fingerprinting that impose Plaintiffs' business risk and costs on service providers. For example, DRM technology is employed when Plaintiffs' vendors or business partners and/or their downstream distributors produce and sell DVDs or stream movies over the Internet. Similarly, watermarking is well-known in the industry, and watermarking at the granularity of individual performances of copyrighted works is a technology that has been productized by and available from their suppliers and business partners for at least a half-decade.

149. However, I have seen nothing, in the Complaint or elsewhere, to indicate the Plaintiffs are making good business decisions to research, evaluate, employ, or even contemplate use of these or comparable techniques, as an alternative to Plaintiffs externalizing their own business risk and costs by laying off that burden on Defendants and other independent service providers.

150. I also have seen nothing, in the Complaint or elsewhere, to indicate that Plaintiffs are offering or have offered to Defendants and other service providers to absorb the legal risks or business costs associated with protecting Plaintiffs' copyrighted works.

151. For example, I am aware of no offer ever made by Plaintiffs to pay for the additional

capital expense or operations expense to Defendants or any other service provider when those service providers purchase and deploy technology for controlling or attempting to control infringement of Plaintiffs' digital assets, even if the technology is preferred, recommended, or demanded by Plaintiffs or their industry association, is costly, and/or provides no tangible business benefit whatsoever to the service provider.

152. I further understand from Mr. Titov that Hotfile provides Special Rightsholder Accounts ("SRAs") that give rightsholder special business privileges and conveniences as to providing takedown notices and obtaining a rapid response to them. Among other features, in essence the SRA account gives the rightsholder a near-instantaneous takedown capability.

153. [redacted]

B. Customer incentive programs are common Internet business practice.

154. I have reviewed the Defendants' service including their pricing/promotional information on their website. (Details of Defendants' service and their technical and business operations are described in Appendix H to this report.) Comparing Defendants' service offering and marketing to industry norms for promotion of Internet services generally, I observe that the Defendants' offering is promoted in the manner common to a very wide range of legitimate and respected

Internet service firms. This variously includes Amazon.com, eBay, Yahoo, and others.

155. There is a legitimate multi-party-sharing market niche ignored by Defendants' direct market competitors. Dropbox, for example, has a convenient user interface for saving and restoring files but for consumer (non-enterprise) accounts using Dropbox's service apparently requires anyone viewing a file to hold the same account credentials as the account holder who performed the upload. This requires that Dropbox users share their confidential account credentials—their login and password information—in order to share files among a group.

156. For example, if a band of musicians wish to share recordings of their music among the band's members using Dropbox, first one musician must set up a Dropbox account, and then she must share her password with the other musicians, losing personal control over the account. This limitation occurs in many file storage service sites, and appears to result from limited or unthorough study of potential customer use cases.

157. Other file service providers, such as Picasa and Flickr, do provide some ability for others to share file assets without needing the originator's uploading password. However, they generally have specialized in narrow markets, such as only photography or only video and photography.

158. This creates an unfilled market niche. There is a market need for passwordless general-purpose file sharing, that is, sharing of content not limited to specialized filetypes or narrow use cases foreseen by the service provider's management or engineering teams.

159. Examples of this market niche are the musician who wishes to share a recording or composition with other band members without sharing her account password, or the need to efficiently share a file with a business colleague without creating a Web site or FTP site.

160. This market need is so common and well-understood that it is the subject of a widely-

published Internet cartoon authored by one of the Internet's most popular cartoonists. The cartoon depicts someone advising a friend on all the available but unsatisfactory options for sharing a file with a third friend, even listing Dropbox as an unsatisfactory alternative. In the end, file sharing is accomplished by physically carrying a copy of the file down the street on a memory device. *XKCD Cartoon.* The cartoon is funny precisely because this is such a well-understood need that remains unanswered. In fact, the term "Sneakernet" was coined over a decade ago to refer to this physical "solution" to this Internet problem.

161. Hotfile's business model and service model make filling this market niche possible. Hotfile combines the general-purpose file handling features of Dropbox with the passwordless access of the photo sharing services. Hotfile's service is in fact the solution to the common problem identified by the XKCD cartoon.

162. Defendants' service thus fills an important legitimate business niche for file sharing on the Internet.

163. I am aware of nothing in the present matter demonstrating that the cost to Plaintiffs from any alleged infringement exceeds actual business benefit from such alleged infringement. That is, it is entirely possible—and apparently unexplored by Plaintiffs—that contrary to their Complaint, any alleged infringement through file sharing activities of Defendants' customers or business partners actually increases interest in, demand for, and sales of Plaintiffs' product, and is of net economic benefit to Plaintiffs.

164. This is of particular interest because today there is a widespread and growing business belief that some amount of "free" content distribution actually increases sales. It is a means of using the Internet to cost-effectively expose to a new or wider audience works that were not well monetized under existing industry sales regimes or were viewed as overpriced in the market.

Indeed, this is the economic basis of the "freemium" pricing model.

165. Also widespread is the belief that those in the Plaintiffs' industry consistently are slow to, or fail to, adopt modern marketing and distribution methods suitable for new distribution media such as the Internet.

166. For example, I am aware of no attempt by Plaintiffs to harness the business opportunity afforded by Internet file sharing technology to exploit "superdistribution" or "long tail" marketing opportunities, under which Plaintiffs themselves profitably incentivize Internet redistribution of their content by rewarding redistributors who return some revenue to the content rightsholder or who find ways to redistribute Plaintiffs' content that otherwise would sit on the shelf unsold.

167. I similarly am aware of no information presented by Plaintiffs in the present matter indicating they are repricing their product as a rational business response to the market signals they receive when their works are alleged to be illicitly redistributed.

168. Under conventional microeconomic pricing theory, such product repricing would be a rational business response by Plaintiffs to optimize their profits on those copyrighted works.

169. Moreover, repricing offers an opportunity for Plaintiffs and their industry peers to maintain or improve their control of their product distribution and copyrighted works, to surprise and delight their customer base, and to their own increase profits.

170. No such rationalized product pricing to regain copyright control and increase profitability is reported or contemplated by the Complaint or any other Plaintiff pleading or documentation of which I am aware in the current matter.

171. These failures by Plaintiffs and their industry generally poignantly suggest Plaintiffs are seeking to repeat the "Napster error." When industry rightsholders became concerned a decade

ago that Napster was abetting illicit redistribution, they arguably attempted to destroy that company. This was an exceptionally unwise business action by rightsholders, because Napster was the rightsholders' only prospective business partner, and damaging Napster predictably[4] forced the consumer demand underground into a wide range of P2P services, an error from which the music industry itself says it has never financially recovered. Their business error was to destroy a prospective partner—the one corporation with whom they had an opportunity to employ their exceptional deal-making skills to forge business agreements that would allow them to retain control over and monetize their copyrighted works using new emergent distribution media.

172. Centralized file sharing services offer an additional business partnering advantage to rightsholders over a P2P prospective partner: takedowns. Notwithstanding the technical difficulties in properly identifying infringing instances noted *supra,* file sharing services such as Hotfile, with its centralized architecture can—and Hotfile does—implement takedown procedures. For technical reasons, such takedowns are effectively impossible to fully implement in P2P systems such as Gnutella. This further enhances the potential of centralized file sharing services such as the Defendants as cooperative business partners of Plaintiffs, and provides additional rational business impetus for them to pursue such constructive relationships.

173. Rather than view alleged consumer redistribution via file sharing as a copyright violation, Plaintiffs have the opportunity to understand it as unmet market demand for their product. Rather than view a file sharing service as an alleged contributory infringer, Plaintiffs have the opportunity to view them as a valued prospective business partner.

[4] In fact, predicted. I accurately forecast precisely this outcome for the music industry, in a public speech in 2000. *Cromarty UC/Red Herring DIGIVATIONS panel, 2000.*

C. Hotfile customers pay for better service, not for ability to infringe copyright.

174. It is common for service providers on the Internet to offer "tiers" of service, with different service tiers providing better performance (larger volume, better speed, etc.) for a higher fee. For example, this typifies Internet Service Provider (ISP) connection fees for cable Internet and telephone company DSL services. Details and examples appear in Appendix H to this report.

175. Also common both on the Internet and in the software market is a zero-cost introductory pricing level, with customers paying the provider only if they purchase premium service tiers above the free service level. This is known as a "freemium" pricing model, cf. *supra.*

176. Hotfile offer service tiers according to a freemium pricing model.

177. Freemium pricing models encourage business and revenue growth and facilitate customer acquisition by building interest in a service by eliminating customer objections to sale based on pricing or uncertain value-for-money.

178. Freemium models are particularly useful or appropriate where customers may be hesitant to accept a service offered by an unknown or untested vendor, where a market has commoditized into a price war and "free" beats all other competitors prices, where the vendor's marginal cost of serving an additional customer at a useful introductory level of service is very low, and/or where a structural difference such as a proprietary advantage exists to motivate upsell purchase behavior by customers.

179. Freemium products are not seen in the market where one product or service is substituted

for another. That is, customers adopt a freemium model's upsells precisely because they feel they are getting an advantage such as a performance improvement or elimination of a distraction or impediment for their money.

180. For example, Yahoo is understood to be the largest email service provider on the Internet. Yahoo offers its basic level of email service free of fees to customers, but "free" customers must visit Yahoo's website to read their email, and when they do they are confronted with advertisements. Yahoo's email service employs a freemium model under which, for an upsell fee of about two dollars per month, customers may download their email into their personal computer's mail program without viewing advertisements. All the prior Yahoo mail services are still offered to premium Yahoo customers, but additional conveniences are provided for the premium fee.

181. Hotfile's business approach is similar, and common. Free users receive an introductory level of service with "rate throttling." Premium-tier Hotfile accounts have the same services available to free users, but as paying customers they receive more and faster service and, like Yahoo's advertisements and email-download feature, Hotfile premium users are not rate-throttled.

D. Hotfile materially lacks the "ability to control" infringement even using state-of-the-art technology.

182. The state of the digital fingerprinting market today precludes satisfaction of the fourth technical requirement *supra* for evaluating a potential or alleged infringing digital duplication of a copyrighted work, namely, that a competent comparison of the two instances must be made, sufficient to confirm or disconfirm the infringement.

183. Because there is no science of digital asset matching, it is not possible to perform a neutral competent evaluation of either the products or the claims of vendors of digital fingerprinting and other products and services purported to offer an "ability to control." There is no accepted standard against which to make such a comparison.

184. There also presently is no basis in either science or business practice to merit accepting the claims of these anti-infringement product vendors. There products may or may not work, but without an accepted methodology for reviewing and assessing them, no confidence in such tools for "ability to control" is justified.

185. In essence, features-based techniques for analyzing a digital asset reduce the asset to a small set of numbers. It is obvious that information is lost in this reduction. Less obvious is that the information lost necessarily is essential to recognizing the underlying work, from a mathematical or information theoretic viewpoint. The greater the reduction, the more information is lost. The greater the reduction, the greater the chances that legitimate works will be falsely accused.

186. According to Motion Picture Laboratories, Inc. ("MovieLabs") documents describing Vobile's products, the Vobile methods in particular reduce an entire one- to two-hour movie to a single number.

187. I am aware that MovieLabs has performed internal tests of competing products in the market for digital fingerprinting. MovieLabs is a joint venture of companies such as Plaintiffs and others in their industry, and has been described as the research and development arm of the Motion Picture Association of America ("MPAA") by the Los Angeles Times. *Los Angeles Times article.* MovieLabs thus is not an independent scientific evaluator. MovieLabs's digital fingerprinting analysis does not report, and apparently does not consider, essential test cases such

as encoding/encryption. MovieLabs reports also opine that some false positives may be acceptable, suggesting a bias against service providers such as Defendants and a possible willingness to lay off the entertainment industry's inherent risks and economic costs onto others. MovieLabs further acknowledges that scalability (i.e., economic or "laws of physics" viability) was unaddressed in many of their reports and analyses.

188. Overall, however diligently MovieLabs pursued their business goals, reports published by MovieLabs must be understood to be movie studios speaking, not an independent third party, and those reports support an opinion that there is "no science yet" as to digital asset comparison or technology-based copyright infringement determination.[5]

189. As to the research performed by MovieLabs discussed *supra,* I am aware of no documents produced to date in this matter that identify MovieLabs's experimental design and analysis methodology, such as which feature methods or transcodes are considered. These details also do not appear in MovieLabs's publications as produced, notably including Craig Siedel's article, aptly titled "Content Fingerprinting from an Industry Perspective." *Seidel.* Full public details on scientific methodology are essential to gaining confidence in the merits of resulting analyses.

190. Nothing in the MovieLabs documents and reports produced to date in this matter change my opinion that the state of digital asset matching and fingerprinting cannot be called a mature or reliable science and it provides an inadequate foundation upon which to define legal obligations.

191. Even market acceptance and similar business measures provide no confidence that an

[5] Additional difficulty in assessing reports by MovieLabs arose during this analysis due to an improper production of those reports. Specifically, data in the MovieLabs reports heavily employ color graphics to summarize quantitative findings, but only black-and-white PDFs were produced. This has a technical effect as to these documents similar to redacting document metadata before production.

"ability to control" is offered by putative infringement detection and identification tools, since under the weight of current law and market conditions, both service providers and rightsholders are essentially forced to buy whatever product is available, whether or not there is reason to have confidence in it.

192. Demonstrations of the effectiveness of such digital fingerprinting and related products also are unreliable as a measure of their utility, correctness, or reliability. This is because the proper test of such a product is not merely whether it can be shown to work, but also and more importantly, whether it can be shown not to fail; and if it does fail, to understand and carefully characterize when and why. Presently, however, the field is insufficiently mature to provide reliable high-quality unbiased answers to these questions.

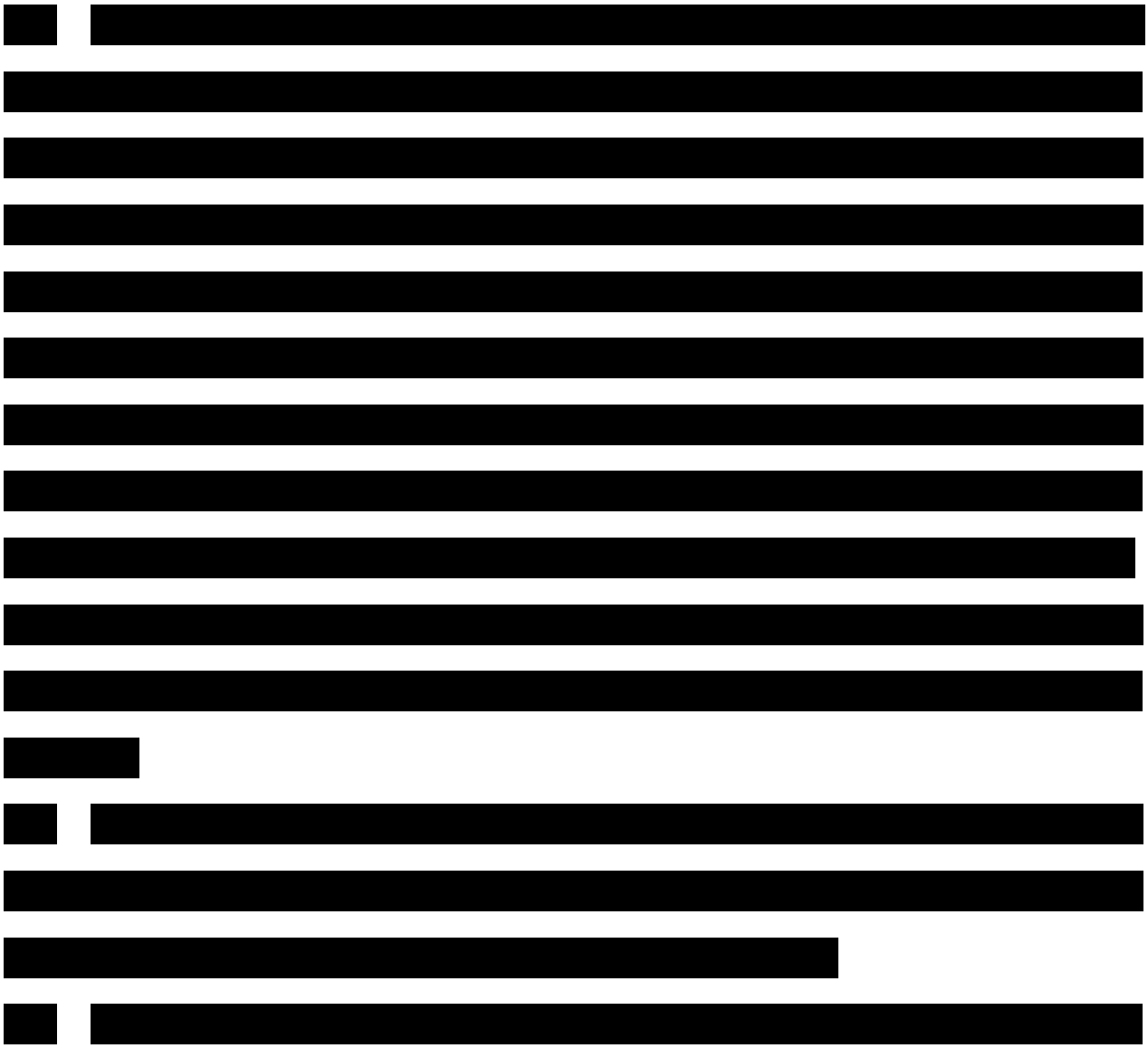
193. As noted *supra,* feature extraction, subsetting, and related techniques trade off quality for speed or computational tractability. Again because there is no science to govern this tradeoff and the decisions are made by individual engineers and kept proprietary, the tradeoffs being made between quality and economic factors are unknown.

194. The information science and computer science that applies is known, however, and is not favorable to these products. An unlimited number of possible morphisms or transformations can be applied to a given digital asset, and it is in the nature of mathematical modeling that no feature extraction system can adequately model them all; this is inherent in the nature of mathematical modeling and of feature selection.

195. As one example, it appears that either simple encryption or simple methods of introducing extra "noise" time segment slices into a digital video asset are likely to defeat Vobile's systems. The latter would greatly increase its false negative failure rate, and the former would completely disable it.

196. These are well-known techniques employing tools already available for any personal computer. Their availability and easy use would enable simple tools to be built and freely distributed that can permanently disable these, and likely all other, digital fingerprinting methods.

197. Those countermeasures would not, however, defeat technologies such as watermarking and DRM that rightsholders can employ entirely on their own, without added burden to service providers.



[redacted]

201. In summary, although Plaintiffs themselves potentially could better control infringement, and notwithstanding Defendants' business reasonable best efforts to be of assistance to another industry, Defendants materially lack the "ability to control" infringement. This is so because the technology to do so is technically inadequate/deficient, uneconomic, unvalidated, and unreliable. It is so because the economic and, especially, computational expense to control infringement requires the service provider to "defy the laws of physics," for example, in some circumstances by promptly performing millions of years of computation in a day. And it is so because of the nature of the copyright problem itself, wherein multiple business players who may not even know of each others' existence or asset holdings are nonetheless be required to "know what they don't or can't know" to control infringement.

IX. TRIAL EXHIBITS

202. I may rely on visual aids and demonstrative exhibits that demonstrate the bases of my opinions. Examples of these visual aids and demonstrative exhibits may include, for example, charts, drawings, excerpts from patent specifications or other public sources, patent file histories, interrogatory responses, deposition testimony and deposition exhibits, as well as optical components, charts, diagrams, videos and animated or computer-generated video.

203. Other than as referred to in this report, I have not yet prepared any exhibits for use at trial as a summary or support for the opinions expressed in this report, but I expect to do so in accordance with the Court's scheduling orders.

X. SUPPLEMENTATION OF OPINIONS

204. I expect to testify regarding the matters set forth in this expert report, if asked about these matters by the Court or the parties' attorneys.

205. I understand that discovery is ongoing in this case. I therefore reserve the right to adjust or supplement my opinions after I have had the opportunity to review deposition testimony or in light of additional documents or arguments that may be brought to my attention, including any additional orders from the Courts. I also reserve the right to adjust or supplement my analysis in light of any new data or alternative opinions advanced by or on behalf of Plaintiffs.

APPENDICES

Report Errata

The following typographical errors are noted in the main body of this report as produced on November 18, 2011.

Title page: Case name has changed to Civil Action No. 11-20427-CIV-WILLIAMS/TURNOFF.

p.14 para. 73: “may be name” should read “may be named”.

p.14 para. 77: “not that it” should read “not knowing that it”.

p.34 para. 157: “only or video” should read “only video”.

p.35 para. 164: “Exposing to a new or wider works” should read “expose to a new or wider audience works”.

A. Materials Relied Upon

i. Non-BATES-numbered documents

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Amazon S3 storage pricing. http://aws.amazon.com/s3/pricing/

Retrieved 20111104.

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Available at: http://kapowsoftware.com/solutions/web-intelligence/antipiracy.php

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Los Angeles Times (pub.), September 21, 2007. Published at:
http://opinion.latimes.com/bitplayer/2007/09/the-content-rec.html

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ii. BATES-numbered documents

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DISNEY005895.pdf

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MPAA000033.pdf

MPAA000071.pdf

MPAA000097.pdf

MPAA000142.pdf

Thumbs.db

WARNER027504.pdf

WARNER027548.pdf

WARNER027550.pdf

WARNER027576.pdf

WARNER027583.pdf

WARNER027781.pdf

WARNER027787.pdf

WARNER027806.pdf

WARNER027810.pdf

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WARNER027834.pdf

WARNER072163.pdf

WARNER072176.pdf

WARNER072203.pdf

WARNER072215.pdf

WARNER072300.pdf

WARNER027815.xls

H. Internet operations and Hotfile services

1. This Appendix provides a brief overview of Internet and Web operations, and then provides details about the systems and methods used by Hotfile and/or visitors to www.hotfile.com.

a. Brief overview of Internet and World Wide Web operations

2. For purposes of this exposition, the Internet is a worldwide network of interconnected computers, or of interconnected networks of such computers. These server computers are sometimes also called "Internet hosts". The World Wide Web (or "Web") is an abstract service overlaid on the Internet that uses some of its computers. The Web comprises server software executing on server computers and the files or other "resources" that they can provide upon request.
3. "Links" (text strings of a particular format) in some files "point to" or identify other resources on the Web. The author of an individual file or "web page" determines what links it contains and where they point. Most often—although not exclusively—access to these stored resources distributed around the Internet is achieved using a "browser" software program that an individual chooses to execute on his computer, such as a work or home computer located anywhere in the world.
4. The user's computer, sometimes called a "client" of the "server," makes "requests" of the server, and assuming it chooses to do so, the server responds to the request, most often by returning a requested resource such as a file. A wide variety of non-file resource types also

exist for delivery on the Internet, such as live-streamed audio or video.

5. The server does not control the client computer, and in fact, generally is prohibited from inspecting the contents of the client computer. This is a requirement of the relevant Internet protocol specifications. Indeed, the server generally does not even know of the existence or nature of client computers on the Internet, and further, when the server comes to know any information about a client, under typical operations the server is designed to "forget" the existence of each client as soon as it has responded to a client's request. This characteristic permits servers to efficiently serve large numbers of clients and thus achieve "scalability."
6. Each server on the Internet has one or more numeric addresses, and the Internet offers a directory service called the Domain Name System that allows one or more names for a server to be used, translating them to one of the server's numeric addresses. Private name and directory services also exist, not under any centralized control.
7. As noted *supra,* a server typically cannot reliably determine where a request comes from in the Internet. Internet protocols only require that the server is provided enough return-address information to respond to that request. Such return address information may be ephemeral, obscured, translated en route to different addresses, rerouted to other locations, or even falsely identified on the Internet. If so, this is unknowable by the server.
8. The web server similarly cannot know what web sites previously were visited by the client or its user. This includes, the server does not reliably know what name or address the client or its user used to reach the server, nor how it was obtained. For example, if a private domain name server is in use by the client, or if a second web server contains a link pointing to the receiving server and the client computer's user follows that link (e.g. by clicking on it when it is displayed to him), the receiving server typically will have no knowledge of this.

9. Although a web browser may optionally send a server hints as to a referring link, provision and accuracy of such data are entirely under the control of the browser and its user, and may be further modified en route. Numerous freely-available privacy enhancement browser "add-ons" exist to give this control to the user. Further, many corporate, national, or personal proxy or firewall systems remove or forge such identifying source data en route for privacy reasons. Certainly any user who wishes to can obscure where he comes from when visiting a web site such as Hotfile. *MozillaZine network.http.sendRefererHeader at 1.*

10. It is common on the Internet for users to assemble links into a public or private index of sites or Internet locations. Browsers support this through "bookmarks"; users may trader links, e.g. by email, and have done so since the early 1990's; and anyone may create their own web server and use it to publish links that point to any server and any resource they wish. This is inherent in the intended design of the Web.

11. It also is common for users to provide substitute link names for an original link, and there are services that offer this service freely on the Internet. This often is done to simplify links or make them easier to type. Well-known services such as bit.ly, amzn.to, and tinyurl.com offer this convenience to all Internet users, typically on a free and anonymous basis. These shortened aliases are increasingly common and valuable as Internet use moves to mobile platforms such as PDAs and cell phones, where there is a premium placed on short names that minimize onerous typing requirements. They also are of value when a link must be short enough to be remembered (for example, when read on a billboard while driving on a highway), and they see significant commercial use in such applications.

12. As with use of link indexes and links generally, the server and its owner-administrator will not know that such a substitute link was used by users in requests ultimately directed towards

the server. In this regard, link index servers used by a client computer's user to locate files on a file sharing service are analogous to a telephone directory book in the possession of a caller. The called party does not know that the caller used a telephone directory to find and call them.

13. To the extent the Internet's HTTP protocol specification defines a means of identifying such a referring "index" server used by distant client computer users, it also gives such index web sites the ability to obscure their own use as referring sites. The HTTP Internet protocol specifically directs that "Referer" [sic] information is not to be provided when such a forwarding web site employs standard web security: "Clients SHOULD NOT include a Referer header field in a (non-secure) HTTP request if the referring page was transferred with a secure protocol.". *RFC2616 at 151, emphasis in original.* The decision to use standard web security is increasingly common today for even routine Web connections, and is taken at the sole discretion of the referring (index) site. Thus notwithstanding observations *supra* as to server limitations, simply by implementing standard inexpensive web security practices on their own index server, owners or administrators of an index or forwarding web site may gain a *de facto* ability to eliminate referring data in clients' browser requests to a file sharing server—that is, to hide from the file sharing service the existence, identity, and use of the index site.

b. Summary of www.hotfile.com operations, pricing, and consumer use

14. [redacted]

[redacted]

19. [redacted]

20. When a user has accepted Hotfile's policy, he may choose and upload a file from his client computer with a few mouse clicks. The transfer of a copy of the file from his client computer to a Hotfile server then proceeds automatically. When the transfer is complete, the user is presented with a URL ("Uniform Resource Locator," a text string comprising Web address) pointing to the uploaded file's location on the Hotfile servers. For example, uploading a file named "pictureofmydog.gif" may result in a URL being created and displayed such as "http://hotfile.com/dl/135394112/220ead1/pictureofmydog.gif.html". Importantly, the filename component of the URL (e.g., "pictureofmydog") is chosen by the uploading user, not the server or its owner-administrator. This feature permits users to give meaningful names to the digital assets they wish to share with colleagues, friends, customers, or family on the Internet.

21. The resulting URL may be kept private, for private use. If it is not revealed to others, its long name and numeric components make it unlikely anyone will guess the name, affording a degree of privacy or security.

22. Alternatively, the URL may be shared with others. Anyone who enters the URL into their Web browser, or who clicks on it when displayed as a link in a bookmark list or index web page, will have access to the uploaded resource. This is how sharing is accomplished on the Internet.

23. A non-registered Hotfile user who attempts to "visit" (use) the URL is presented with a Hotfile web page offering a business choice pursuant to Hotfile's "freemium" business model (cf. *supra)*. The downloading/viewing user may choose a free "Regular Download" at no cost, which provides limited download speeds, one download at a time, and a limit of two downloaded files per hour, with a brief delay before downloads start after they are requested. Alternatively, the downloading user may choose a premium (paid) High Speed Download, which offers unrestricted download speed, no initial service delay, and an unrestricted number of file downloads per hour, subject to available computing and communications resources to service received requests. Further user performance incentives to upgrade to a premium paid account include "Fast download even when servers are busy," support for download accelerators, and support for resuming downloads that fail midstream due to Internet communications errors (cf. *supra*), and "Hot/Direct Linking," which offers accountholders the ability to share the performance benefits they have purchased for files they upload.

24. For example, if a parent with a premium account uploads family photographs and videos taken using a PDA or cell phone camera at her child's sporting event and then shares the resulting URL by email or SMS text message, other family members anywhere on the Internet immediately can view those photos and videos. In this case, the premium accountholder parent's paid-account performance benefits are shared by the entire family when obtaining and viewing these family digital assets.

25. Payment by Hotfile premium accountholders in the United States is accomplished through PayPal, an eBay subsidiary, and is charged on a recurring monthly basis. Presently offered premium service "tiers" are based on the amount of file transfer volume an accountholder wishes to rent, and for how long. For example, $9/month rents 100 gigabytes (100 GB) of Hotlink file transfer traffic.

26. This is typical pricing for Internet file storage and access. As one example, Amazon.com rents storage to anyone on the Internet through its "S3" Internet-based ("cloud"-based) storage service at prices in the range of $10 to $14 monthly per 100 GB. *Amazon S3 Pricing at 1.* Similarly, Amazon's Elastic Compute Cloud ("EC2"), "a web service that provides resizable compute capacity in the cloud" with the business goal to "to make web-scale computing easier for developers," similarly operates under a freemium model with free uploads and a marginal price for premium download service of approximately $12 per GB of file transfer traffic monthly. *Amazon EC2 at 2. Amazon EC2 Pricing at 3.* Amazon's services are very widely used by companies across the Internet; as one example, the publicly-traded multi-billion-dollar entertainment movie streaming firm Netflix is a customer of Amazon's cloud services.

27. Pre-payment discounts are offered by Hotfile as part of their pricing mix. This is common in the Internet and Web hosting industry; for example, well-known major web hosting firms such as Bluehost and 1and1 offer pre-payment discounts for web hosting services.

28. Hotfile service pricing compares favorably and predictably with alternative commercial storage and data transfer costs. For example, raw storage purchased as hard disk equipment presently costs approximately $5 per 100 GB single-quantity capital cost, but any operating

expense must be borne by the buyer and a raw hard disk is not inherently Internet-accessible or structured as a reliable ubiquitous service. Major phone carriers in the United States such as ATT presently offer data transfer (with no storage) in the general range of $10 per GB. Hotfile's pricing tiers are intermediate, falling between the cost of raw storage and the cost of mobile data transfers by carriers, as is to be expected: Hotfile's business operations can employ cheaper terrestrial communications, they offer (and must pass through costs for) added management and reliability services, and they can achieve economies of scale in their large storage arrays.

29. Hotfile also has a reseller program,. Under this program, in essence Hotfile is a wholesale provider of storage accounts, and its resellers are individual retailers around the Internet who market and resell its underlying services. Presently Hotfile lists over a dozen resellers who resell its services in the United States, approximately thirty payment systems (such as PayPal) worldwide that are accepted and used for payments, and over one hundred countries for which there are resellers. The wholesale discount on accounts through indirect channels is nominally 20% of the retail price for direct single-quantity sales by Hotfile.

30. Hotfile's published policy is that they "do not restrict any country - free downloads for everyone are guaranteed." For example, Hotfile downloads are permitted as a means for individuals to communicate in countries where totalitarian regimes may otherwise wish to control information flow to citizens, or where speech or information sharing may be restricted or repressed.

31. Hotfile has an "affiliate" marketing program. Under this program an affiliate may be paid for usage generated by the affiliate. As discussed *supra,* an affiliate marketing program allows a

business to reach markets or cultures outside its own, particularly on the Internet, which is international in scope. Affiliates earn commissions according to a published Earnings Table. One business incentive metric for awarding affiliates is achieving a high download-to-upload ratio. Incentivizing increased user activity is a rational business decision because, under the freemium business model, increased traffic driven to a site will result in conversions at some fixed rate to premium (paying) users. In addition, Hotfile further directly incentivizes these conversion by employing a second published metric computed based on conversions to premium user accounts attributable to an affiliate. A third incentive rewards premium accounts sold through advertising on the affiliate's web site. Amazon.com offers a similar sell-through incentive for sales by its affiliates. Finally, affiliates receive a permanent commission on referred sales for uploaders who become registered Hotfile customers, in that a first Hotfile customer earns 20% of the net sales of a second uploader who registers under the first customer's referral link. Hotfile's marketing program is substantially similar to refer-a-friend and affiliate marketing programs employed by large successful Internet sales, web hosting and telecommunications service provider companies such as Amazon.com, eBay, 1and1 and Ooma. *Amazon.com Associates Program Advertising Schedule. Ooma referral offer at 1. 1and1 referral offer. 1and1 Affiliate Marketing Overview. eBay Partner Network Overview.*

B. Curriculum Vitae of Dr. Andrew Cromarty

Curriculum Vitae

Andrew Cromarty, Ph.D.

Expertise

- Distributed computing
- Internet, broadband, networking
- Corporate IT, security, datacenter
- Web commerce, business models
- High-tech management & finance
- Software & product development
- Multimedia, entertainment tech
- Computer & Information Science

Professional Summary

Energetic, focused leader with over 20 years business experience in large and small companies, including as CTO of a billion-dollar publicly-traded consumer broadband corporation; CTO of a $100M consumer wireless hotspot services joint venture; Chairman of a Lucent wireless content-distribution/e-commerce spinout; manager or co-founder of several high-technology startups; CTO/CIO of an entertainment software/services company; CTO/CIO of an investment bank; member of Board of Directors for satellite, broadband wireless, and venture investment corporations; and research roles in the highest management-awarded corporate scientist positions at Digital, ADS, and Compaq.

Proven track record in management & operations, software development and service delivery, new technology creation, intellectual property evaluation, business model refinement, and team building and leadership. Experience includes product/service design, definition, development, and delivery; R&D and IT management; and project, line, corporate management, corporate strategic partnering, staff management, public relations, technology transfer, and intellectual property management. Managed development of a wide range of systems, from research prototypes through commercial products and services. Leading technical expertise in system architecture, networking, distributed computing and communications, and broadband, including pioneering work in multimedia content distribution and delivery that yielded many worldwide Internet firsts.

Strong general management approach based on a customer-focused hands-on leadership style. International service delivery experience, including as CTO of corporations with wholesale and retail terrestrial landline/wireless and satellite service operations in North America, Caribbean, Europe, and Asia. Experienced, press-trained, capable writer and public speaker.

Curriculum Vitae

Employment History

From: 2010 To: Present
Distributed Systems Technology LLC
Palo Alto, CA
Position: *President and CEO*
(Business & IP advisory)

From: 2009 To: Present
Minerva Consulting
Palo Alto, CA
Position: *Partner*
(Business & IP advisory)

From: 2007 To: 2008
Union Square Advisors
San Francisco, CA
Position: *CIO & CTO*

Founding CIO/CTO of investment bank specializing in mergers and acquisition (M&A) and late-stage private placement investment. Reported to President/founder. Conducted M&A and investment due diligence, provided detailed intellectual property analyses internally and to clients, negotiated and managed 45 vendor and supplier contracts & licenses, and built and oversaw the bank's internal operations, security, and regulatory compliance infrastructure. Architected/implemented complete corporate mail, CRM, security, datacenter, virtualization, document management, mobile/BES, website, backup/DR/BCP, conferencing, web/videoconferencing, and VOIP/telecommunications systems. Perfect corporate security record maintained (no breaches or leaks) during the entire several-year tenure. New business development included bringing the bank its largest private placement client. Served as the investment bank's internal diligence expert on tech industry clients and opportunities across semiconductor & communications, enterprise software, clean/green tech, and Internet verticals. Worked directly and extensively with clients' management teams, including IP advisory.

From: 2005 To: 2007
DAX Solutions, Inc.
Los Angeles, CA
Position: *CIO & CTO*

CIO/CTO at the entertainment industry's largest Web-based/SaaS global media asset & enterprise workflow management service supplier for film/TV industry, supporting thousands of customer users across hundreds of productions on five continents. Presided over operations during firm's growth to 55% market share over 2 years, at 80% year-over-year revenue & customer growth. Reported to CEO.

Managed internal operations, field ops, product development, IT & engineering (software development, operations, global distributed server/content distribution network, outsourcing/offshoring, technical customer relations, service delivery, architecture, and security). Designed, architected, and built a new industry-redefining enterprise-level service business, the industry's first high-definition digital dailies screening and distribution system for film/TV executives, and integrated it securely into customer infrastructure at Disney and other major studios/networks. Defeated entrenched incumbents in a six-way competitive race, winning an exclusive quarter-million-dollar contract with Walt Disney Pictures; line-managed Disney contract and customer relationship. Grew product/service to serve new clients (Showtime, Lifetime, Walden Media, Fox, FX, LionsGate, ABC Touchstone).

Managed major product updates and product/service enhancements. Rearchitected CDN and datacenter operations, including servers, networking, and multi-terabyte asset storage management systems. Managed major software product updates, including Oracle/DB2/Websphere to open source/MySQL/JBOSS migration, user feature enhancements, storage access enhancements. Oversaw new trouble ticket, CRM, and project planning system implementations. Negotiated new datacenter contract, upgraded critical Internet service to a diversified tier 1 provider base, instituted new management & operations processes, and selectively outsourced operations, to reduce operations costs 40% and improve customer-facing service level from 2 nines to 4 nines. Managed and developed leasing, outsourcing/ offshoring, manufacturing and vendor relationships. Defined and instituted professional staff management practices including formal review and bonus incentive programs, to align manager performance with company goals and facilitate corporate growth. Frequently marketed/sold to and directly supported the firm's highly demanding customers.

From: 2001 **City Lights Network**
To: 2005 Palo Alto, CA
Position: *President & Principal*

Provided advisory services to firms in startup, restart, or growth phase, often accepting an interim Chief Officer role. Engagements included Starfish Health (as CTO and VP Operations), Fifth Day Therapeutics (as CTO and CIO), and RFG, a highly-regarded boutique analyst firm (as Strategic Consulting Partner). As professional due-diligence advisor for VCs and private investors, evaluated hardware & software investment candidates. Engaged by Global 500 computing and financial industry firms to advise on architecture, compliance, and operations. As a "hired gun" CXO, designed and developed service offerings, managed outsourced development, developed business models, supported investment activities, developed intellectual property portfolio, business

relationships, growth plans, financial models, and software technology for several startups. Designed and developed software for a startup's consumer web-based service offering, managed outsourced web development, developed business models, supported investment activities. Developed intellectual property portfolio, business relationships, growth plans, financial models, and software technology for a biotech drug discovery startup, applying mathematical modeling and computer simulation techniques to developmental genomic regulatory networks to produce new drug candidates. Evaluated investment candidates in enterprise security, high-volume collaborative consumer multimedia, and distributed/grid enterprise software for professional investors.

From: 1999 **SoftNet Systems, Inc.**
To: 2001 San Francisco, CA
Position: *Chief Technical Officer*

Member of the five-person executive team governing a billion-dollar publicly-traded broadband services corporation, growing it from 350 to 700 technical staff, 20,000 to 30,000 subscribers, 30,000 to 60,000 email users, and operations from 70 to over 100 cities internationally. Chief officer for parent corporation and all operating subsidiaries, actively participating in their operations. Operating units included the nation's third-largest cable Internet provider, the first two-way VSAT satellite broadband provider, and a $100 million broadband wireless service provider joint venture. Reported to CEO/Chairman.

Line-managed the firm's corporate IT, pre-spinout business incubator, and corporate technology staff. Responsibilities included technical operations & service delivery, new product and business development, new technology development, corporate strategy, intellectual property, press and investor/analyst presentations, corporate venture investment, staff development, market realignment/restructuring/M&A and discontinuation/creation of subsidiaries, and cost reduction and quality improvement. Served on Board of Directors of SoftNet Ventures, the corporation's venture capital investment arm, and led or conducted due diligence and investment activities.

Led software and hardware architecture teams as CTO of $100MM broadband wireless subsidiary/JV. Designed proprietary on-site multi-level caching server systems, with networked wireless delivery, remote management, semi-formal security policy, and industry-defining performance. Developed the broadband wireless industry’s first consumer equipment certification program and first semi-formal security policy for wireless services.

Supervised a $5M P&L pre-spinout multimedia content hosting subsidiary with operations in 90 cities, including financials, product technology, strategy, staffing, sales & marketing, partnering, and external investment

negotiation. Oversaw competitive, performance, and vendor/supplier relationships for content management, cable & satellite broadband businesses, internal enterprise IT applications, and external web hosting business.

Led efforts that improved profitability and operating efficiency. Refined product mix, reduced failure rate, improved service reliability by nearly two nines to 99.7% in key markets; implemented technology upgrades to reduce expense and improve performance of service delivery by 40%. Rearchitected cable network and standardized fielded hardware and software to cut operating expenses in managing $20 million of deployed capital assets.

As corporate strategy officer, tracked 7 global geographies, kept contact with 188 companies or institutions, and maintained trend data on 90 competitors and partners. Led a successful defense against a competitor's patent attack. Frequently worked directly with strategic partners and individual consumer customers.

From: 2000 **Freewire Networks, Inc.**
To: 2001 Murray Hill, NJ
Position: *Chairman*

Lucent spinoff: Wireless consumer broadband service/content/e-commerce provider.

Initiated successful Series A investment ($8M post valuation). Led Board through successful hiring of new CEO. Mentored management team on business model and operations, including strategy, business approach and service architecture for delivering live wireless commerce & multimedia content to consumers in-venue.

From: 1996 **Digital Equipment Corp. & COMPAQ Computer Corp.**
To: 1999 Palo Alto, CA
Position: *Principal Scientist, Corporate Strategy & Technology (CTO's) Division; Manager, Networked Entertainment Technology*

Member of the renowned Western Research Laboratory and Network Systems Laboratory, developing novel Internet system architectures and the business models to exploit them.

Designed and developed new networked hardware-software architectures for high-performance internetworked multimedia. Developed a portfolio of strategic partners; achieved many worldwide historic Internet transaction, service performance, & scalability firsts, including first to stream 1,000,000 live videos for an event, world's first Java-based distributed Internet games demo, and world's first live wireless webcasts. Served as press-trained designated corporate spokesperson for broadband

and multimedia. Consulted to senior management of 50 customer/partner firms on business models and operations.

Developed managed-services business model and architecture for an international web-based sports news distribution joint venture with Reuters, later spun out as SportsWeb and sold to CBS Sportsline. Defined hardware-software architecture, partnering plan, and cost-benefit and cashflow breakeven analyses to establish service tiers.

From: 1990 **Distributed Systems Technology / Distributed Systems Research**
To: 1996 Palo Alto, CA
Position: *President & Founder*

Founded and ran a profitable business for six years. Major clients included GE Aerospace, US Navy. Led architecture team for a $43M DARPA-funded distributed automation program. Contracts included design of a performance management system for assessing and tracking the training and on-the-job competence of US Navy personnel; multidimensional visualization techniques to assist Navy operators in route planning tasks; and the design of a strict real-time task scheduling approach for a distributed situation assessment system and semiformal design specification of a distributed real-time underwater semirobotic situation assessment, planning, and execution system. Developed a novel business in turnkey catalog web services targeted at growth-oriented small retailers and implemented it profitably.

From: 1983 **Advanced Decision Systems**
To: 1990 Mountain View, CA
Position: *Acting Division Manager, Corporate Marketer & Principal Scientist*

Manager for 8 years in a consistently profitable startup that grew from 35 to 200 employees, became the dominant supplier of applied AI systems to the US Government, and launched a successful public spinout (Verity). Performed general manager functions for a corporate division with a multimillion-dollar P&L. Reported to President or SVP.

Managed approximately 20 successful software development projects over 8 years, consistently delivering working software to external customers on-time and on-budget. Started a computer systems focus within the company and grew it into a corporate division; directed and supervised the company's staff and contract efforts on the application of machine intelligence technology to computer systems hardware and system software, including distributed systems, advanced computer architectures, intelligent operating systems, programming languages, database technology, computer security, robotic and expert systems, real-time processing techniques, packet radio and networking

applications, and reliable fault-tolerant computing. Built and led the team that produced the world's first virtual machine-based distributed cross-platform infrastructure for live object/process migration. As corporate marketer, built a new multimillion-dollar client base that became the firm's single largest stable source of contract revenue.

Education

Year	University	Degree
1988	University of Massachusetts Amherst, MA	Ph.D., Computer and Information Science
1980	University of Massachusetts Amherst, MA	MS, Computer and Information Science
1978	Wesleyan University Middletown, CT	BA, Music
1978	Wesleyan University Middletown, CT	BA, Biology and Psychology (double degree)

Publications

Monographs and Book Chapters

[1] Cromarty, A., Adams, T., Wilson, G., Cunningham, J., Tollander, C., and Grinberg, M., "Distributed Database Considerations in an Expert System for Radar Analysis." Expert Data Base Systems, Benjamin/Cummings (pub.), 1986.

[2] Cromarty, A., Chapter 3 of the monograph World Sugar, Connell Commodities (pub.), Westfield NJ, 1977.

[3] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." In A. Bond and L. Gasser (eds.), Readings in Distributed Artificial Intelligence, Morgan Kaufman (pub.), 1988.

[4] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." In L. Kerschberg (ed.), Expert Database Systems (monograph based on April 1986 Proceedings of the First International Conference on Expert Database Systems, Charleston, South Carolina), 1987.

[5] Cromarty, A., Pattern Recognition in Natural and Artificial Systems. Ph.D. Dissertation, University of Massachusetts, Amherst MA. Unpublished. 1983.

[6] Cromarty, A., Programming Constructs for Real-Time Distributed Knowledge-Based Systems. Ph.D. Dissertation, University of Massachusetts, Amherst MA. Published by University Microfilms, Ann Arbor, Mich. 1987.

Journal and Proceedings Articles and Reports

[1] Adams, T., Cromarty, A., McCune, B., Wilson, G., Grinberg, M., Cunningham, J., and Tollander, C., "A Knowledge-Based System for Analyzing Radar Systems." invited paper, Proc. Military Microwaves '84 London, England, 1984.

[2] Cromarty, A., Adams, T., Cunningham, J., and Tollander, C., "Science and Technology Analyst's Assistant." Final Technical Report (Revised), ADS TR-1035-01. Published as DTIC Technical Report ADA168552, January 1986.

[3] Cromarty, A., Adams, T., Wilson, G., Cunningham, J., Tollander, C., and Grinberg, M., "Distributed Database Considerations in an Expert System for Radar Analysis." pp. 586-602, Proc. First International Workshop on Expert Database Systems, Kiawah Island, South Carolina, Oct 24-27, 1984.

[4] Cromarty, A., "A Model of the Anuran Retina." Technical Report 81-35, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1981.

[5] Cromarty, A., Cation, M., Dove, K., Edwards, T., Leech, M.~J., Newman, N., and Wong, R., "Distributed Processing Topology." Technical Report TR-3112-01, Advanced Decision Systems, Mountain View, California, October 1986.

[6] Cromarty, A., "Communications in Advanced Architecture Computing Systems for Distributed Problem-Solving Applications." Distributed Processing for Ballistic Missile Defense project, ADS Technical Memorandum TM-3098-9, Advanced Decision Systems, July 1987.

[7] Cromarty, A., "Control of Processes by Communication over Ports as a Paradigm for Distributed Knowledge-Based System Design." Proceedings of the First International Conference on Expert Database Systems, Charleston, South Carolina, pp. 47-59, April 1-4, 1986.

[8] Cromarty, A., Cunningham, J., Dove, D., and O'Reilly, C., "Performance Maintenance for a Heterogeneous Distributed Computing System." Final Report, Distributed Processing for Ballistic Missile Defense project, ADS Technical Report TR-87-3098-1, Advanced Decision Systems, 1987. Published as DTIC Technical Report ADB12017L, 1988.

[9] Cromarty, A. "Depth as a disambiguating cue in visual localization of objects." Published as Technical Report 81-37, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1981.

[10] Cromarty, A., Edwards, T., Grover, M., Kinion, P., O'Reilly, C., and Railey, M., "Dynamic Adaptive Resource Management for Real-Time Distributed Planning." Final Report (Vol. I), ADS Technical Report No. 3191-1, April 1990. (Also published by the U.S. Air Force as a Rome Air Development Center Technical Report in 1990.)

[11] Cromarty, A., "Entertainment on the Internet: Executable content, entertainment corporations, and the future." Digital Internet Innovators News, Spring 1998.

[12] Cromarty, A., "Entertainment on the Internet: How Different Audiences Are Affected." Digital Internet Innovators News, Winter 1997.

[13] Cromarty, A., and Bauer, E., "Linux in the Datacenter : An Analysis of Linux Use for Large-Scale Database Applications ." Robert Frances Group, October 2005.

[14[Cromarty, A., Grover, M., and Vitarelli, J., "A Model of Trans-/Post-SIOP Strategic Distributed Planning." Final Report (Vol. II), ADS Technical Report No. 3191-2, April 1990. (Also published by the U.S. Air Force as a Rome Air Development Center Technical Report in 1990.)

[15] Cromarty, A., Hatfield, F., Kenig, N., Morgan, K., Smith, S., Whitebread, K., and Williams, D., "SOAS System Design, Version 1.1." Semiformal specification and design report for DARPA's Submarine Operational Automation System program, published as a GE Aerospace program technical memorandum, April 1991.

[16] Cromarty, A., "Internetworked Multimedia and Networked Entertainment Technology." Compaq Forefront, Fall 1998.

[17] Cromarty, A., "Kainic acid ablation of thalamo-tectal region 'disinhibits' prey-selective tectal units in the frog Rana temporaria". Invited paper, presented at DARPA Workshop on Planning and Problem Solving in Animate Systems, Santa Fe, New Mexico, 1985.

[18] Cromarty, A., Leech, M. J., Kinion, P., Tollander, C., Dove, K., and Edwards, T., "Reconstitution, Reconfiguration, and Knowledge-Based Routing in a Heterogeneous Distributed Computing Environment." Final Report, Distributed Processing Topology project, Technical Report TR-87-3112-02, Advanced Decision Systems, 1987. Published by the U.S. Air Force as Rome Air Development Center Technical Report RADC-TR-88-131, 1988.

[19[Cromarty, A., Morgan, K., and Whitebread, K., "SOAS Situation Assessment (SA) Component Design." Situation assessment design report for DARPA's Submarine Operational Automation System program, published as a GE Aerospace program technical memorandum, December 1991.

[20] Cromarty, A. "Neural models of visuomotor integration in amphibians." Invited paper, 28th International Congress of Physiological Sciences, Budapest, Hungary, 1980. Published in Adv. Physiol. Sci. vol. 30: G. Szekely, E. Labos, and S. Damjanovich (eds.), Neural Communication and Control.

[21[Cromarty, A., O'Reilly, C., Mitola, J., and Adams, T., "Artificial Intelligence Applications to the Real-Time EW Problem" (Final Report). Technical Report, Advanced Information & Decision Systems, Mountain View, California, 12 November 1984.

[22[Cromarty, A., Rudahl, K., Ruggles, L., and Sutton, R., "A VLSI Associative Search Network for Knowledge Acquisition: A Design Study." Tech. Rept. 83-04, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1982.

[23[Cromarty, A., Shapiro, D., and Fehling, M., "'Still Planners Run Deep': Shallow Reasoning for Fast Replanning." John F. Gilmore (ed.), Applications of Artificial Intelligence, pp. 138-145, Proceedings SPIE 485, 1984.

[24[Cromarty, A., "SportsWeb: Exploring New Business Models at the Internet's Service Frontier." Digital Forefront, Summer 1998.

[25[Cromarty, A., "The CoinLisp Reference Manual." Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1982.

[26[Cromarty, A., "The Role of Entertainment on the Web: How Different Audiences Are Affected." Digital Internet Innovators News, Winter 1997.

[27] Cromarty, A., "What are Current Expert System Tools Missing?" invited paper, Proceedings IEEE Computer Conference, San Francisco CA, February 1985.

[28[Cunningham, J., Dove, D., Andrews, D., O'Reilly, C., and Cromarty, A., "Model-Based Fault Management." Distributed Processing for Ballistic Missile Defense project, Technical Memorandum ADS-TM-3098-2, Advanced Decision Systems, June 1987.

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[30[Grover, M., Kinion, P., and Cromarty, A., "Design Criteria for Cooperating Expert Systems (COPES)." ADS Technical Report No. TR-2200-002-C, March 1989.

[31] Grover, M., Kinion, P., Cromarty, A., and Edwards, T., "Cooperating Expert Systems (COPES)." Final Report, ADS Technical Report No. TR-2200-004, June 1989. (Also published by the U.S. Air Force as a Rome Air Development Center Technical Report in 1990.)

[32] Hatfield, F., and Cromarty, A., "A Concept and Architecture for a Proficiency Management Support System." Final Report, US Navy Contract N00039-95-C-0030, June 1995.

[33[Hatfield, F., and Cromarty, A., "Proficiency Management Toolset (PMToolSet): Analysis and Requirements." Interim Report, US Navy Contract N00039-95-C-0030, March 1995.

[34] Hatfield, F., and Cromarty, A., "Proficiency Tracking and Authoring Tools for C4I Environments (ProTRACE): Technology and Architecture." Interim Report, US Navy Contract N00039-95-C-0030, April 1995.

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[37[Lara, R., Arbib, M., and Cromarty, A., "The Role of the Tectal Column in Facilitation of Amphibian Prey-Catching Behavior: A Neural Model." J. Neurosci. 1982.

[38] Levitan, S., and Cromarty, A., "Vds: An Interactive VLSI Design System." Technical Report 81-36, Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1981.

[39[Miltonberger, T., Cromarty, A., and Lawton, D., "Feasibility Study of an Artificial Intelligence Approach to Space Object Identification" (Final Report), Technical Report TR-2077-2, Advanced Decision Systems, Mountain View, California, April 1985.

[40[Miltonberger, T., Cromarty, A., Lawton, D., and Muller, H., "Preliminary Results on a Model-Based Image Understanding System for Detecting Space Object Anomalies from Inverse Synthetic Aperture Radar (ISAR) Images." Proceedings Fifth Annual Phoenix IEEE Conference on Computers and Communications, March 1986.

[41] Morgan, K., Whitebread, K., Kendus, M., and Cromarty, A., "Integration of Domain and Resource-Based Reasoning for Real-Time Control in Dynamic Environments." Proceedings of the NASA SOAR Conference, August 1992.

[42] O'Reilly, C., and Cromarty, A., "`Fast' Is Not `Real-Time': Designing Effective Real-Time AI Systems." Applications of Artificial Intelligence, Proceedings SPIE 548, John F. Gilmore, ed., 1985.

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[45] Weymouth, T., and Cromarty, A., "COINS-3D (An Adaptation of MOVIE-BYU): System Description and Reference Manual." Department of Computer and Information Science, University of Massachusetts, Amherst, Massachusetts, 1979.

[46[Wilson, G., Cromarty, A., Adams, T., Grinberg, M., Tollander, C., and Cunningham., J., "AI Assists Analysts in Identifying Soviet Radar Systems." Defense Systems Review, January 1984.

Select Presentations, Invited Lectures and Invitational Workshops

[1] "AI in the 80's: Transferring the technology," Invited Keynote Speaker lecture (Plenary Management Session) for Aerospace Applications of AI Conference, Dayton OH, Oct 14-17, 1986.

[2] AI Planning Workshop (satellite workshop of National Conference on Artificial Intelligence), Washington, DC, Aug 1984.

[3] "Cooperating Expert Systems." Technical Interchange Workshop, Decision Aids Branch, RADC/COAD, Rome NY, Feb 17, 1988.

[4] DARPA Workshop on Planning and Problem Solving in Animate Systems. Bishop's Lodge, Santa Fe NM, June 17-19, 1985.

[5] "Distributed Planning Architectures, or Planning in a Distributed Computing Environment." Technical Exchange Workshop, Knowledge Engineering Branch, RADC/COES, Rome NY, May 18, 1988.

[6] "Distributed System Reconstitution for Strategic Distributed Planning" (with M. Grover). Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Jan 11, 1989.

[7] "Distributed System Topology for the SDI Battle Management/C3 System." Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Nov 1986.

[8] "Dynamic Process Migration for Reconstitution and Reconfiguration in a Heterogeneous Distributed Computing Environment." Technical Exchange Workshop, Distributed Systems Branch, RADC/COTD, Rome NY, Dec 1987.

[9] "Information processing in autonomous mobile vehicles" (with R. Drazovich), DARPA Workshop on Autonomous Ground Vehicles, Leesburg VA, Oct 24-26 1983.

[10] Intelligent Decision Support Systems, two-day public lecture series (sole speaker) presented to audiences in Boston MA, Atlantic City NJ, and Washington DC, Jan 1986.

[11] "Knowledge-based fault management using heterogeneous dynamic process migration." Artificial Intelligence Technology Fair Workshop, Knowledge Engineering Branch, RADC/COES, Rome NY, Nov 1988.

[12] Invited keynote talk, EnterTech Entertainment and Technology Conference, Carlsbad CA, April 1999.

[13] "New Domains and Collective Visions: All Things Digital." Invited panel session, Univ. of California/Red Herring's DIGIVATIONS: Global Digital Technology and Media Conference, Bacara Resort, Santa Barbara, California, September 24–26, 2000.

[14] "Linux in the Datacenter : An Analysis of Linux Use for Large-Scale Database Applications ." Public national lectures series, Robert Frances Group, October 2005.

[15] "The Death of Product Design." Invited lecture and panel session, Asilomar Microcomputer Workshop, Pacific Grove, California, April 28-30, 2010.

[16] "Education and the Innovation Economy: A brief status report." Invited lecture and panel session, California Assembly Select Committee on Innovation and the Economy: Innovation Symposium, Livermore, California, July 13, 2010.

Awards, Honors, Professional Associations and Achievements

Cum Laude Society, Newark Academy (1974)

Bausch and Lomb Honorary Science Award (1974)

National Science Foundation Summer Research Fellowship, for neurophysiology research (1977)

National Institutes of Health/NINCDS Research Assistantship, for computer science and mathematical modeling of biological systems (1979-1980)

DAAD Fellowship, to conduct neuroethology research in Germany (1980)

National Institutes of Health/NINCDS Research Assistantship, for computer science and mathematical modeling of biological systems (1981-1982)

Teaching Assistantship, University of Massachusetts at Amherst (1982)

National Science Foundation Research Assistantship, to design a new programming language (1983)

Member, ACM (past Vice President, Pioneer Valley chapter)

Board Positions

Former college fraternity President, now serving on national executive board. Served on four corporate boards and numerous boards of advisors; presently serving on University of California President's Advisory Board. Position history includes:

2002 – present	President's Board on Science and Innovation, Univ. of California
2001 – 2002	Contributing Editor, Thumbtribes wireless journal
2001 – 2002	Board of Advisors, AdCritic.com
2001 – 2002	Board of Advisors, Globallinx Network Inc.
2000 – 2001	Board of Directors/Chairman, Freewire Networks (Lucent spinout)
2000 – 2001	Board of Directors, Aerzone Corporation
2000 – 2001	Board of Directors, Intelligent Communications, Inc. (Intellicom)
2000 – 2001	Board of Directors, SoftNet Ventures (corporate venture fund)
1998 – 2002	Board of Advisors, Univ. Calif. Digital Media Innovation Program
1998 – 2004	President's Advisory Council, Wesleyan University
1999 – 2000	Trustee and President, Covenant Presbyterian Church
1996 – present	Trustee, Kappa Alpha Society Foundation

HOW TO START

Overview

1&1 Affiliate Programs

Affiliate Testimonials

Affiliate Terms & Conditions

We make everything easy for you:

We take care of support
We handle the billing
You get paid

Hosting Products are Easy to Sell

No other web host brings you so many great products to choose from! As an affordable 'one-stop shop', 1&1 has more shared hosting plans, more server choices, email solutions and hosted business solutions than just about anyone. With over 40 hosting products, this means no matter what your referrals want, we've got the right hosted solution at the right price. Visit the 1and1.com website to view all the great products you could be earning from.

Benefits of Being a 1&1 Affiliate

The 1&1 affiliate program is a great money making opportunity that allows you to partner with the world's largest hosting company. Recommending our high demand web hosting and domain products is simple. Best of all - **you can join our affiliate program absolutely free.**

You can earn up to $300 per sale! For more details, check out our Commission Structure.

- Earn up to $300 per sale
- 120 day cookie duration
- Highest affiliate conversion rate in the industry
- Dedicated affiliate marketing support team (live chat, toll free phone support, and email)
- Well known worldwide brand
- Great monthly promotions
- Easy to sell products
- **Free to join**, nothing to sign (no obligations whatsoever)
- No monthly minimums (in our internal program)

3 easy steps to your success

Register

Sign up for the 1&1 affiliate program in Commission Junction, Pepperjam, or Zanox and become an affiliate

Share Your Affiliate Tracking Link

Our easy and unique affiliate tools will let you spread the word

Earn Money

By promoting your 1&1 affiliate link, you earn great commissions whenever you refer new customers to 1&1.

Start Earning Now

Register as a 1&1 affiliate and start immediately!

Get access to great affiliate tools
Earn up to $300 per sale

Join Now!

Already a Customer?

Choose your preferred login method:

1&1 Customer ID or 1&1 Domain

Enter your 1&1 Customer ID or 1&1 Domain:

Remember me

Show Affiliate Tools

partner of the world's #1 web hosting company.

about 1&1 both offline and online. These tools are offered exclusively to 1&1 affiliates.

There is no limit to how much you can earn. Remember, your affiliate link must be used to earn commissions.

How do I Join?

We give you several options to join us. All you need is 5 minutes! **Joining is absolutely free!**

All you need is 5 minutes! **Joining is absolutely free!**

You may join our external affiliate program in Commission Junction (CJ) or LinkShare, the largest and most trusted affiliate networks in the world:

commission junction

LinkShare™ a Rakuten company

What Do I Sell?

You are selling the world's most popular and affordable web hosting products. 1&1 offers everything from domains, instant mail, shared web hosting, to enterprise servers and more. All in all, 1&1 has over 30 commissionable products for you to profit from. We have something for every budget and skill level. There is no limit to how much you can make! Visit 1&1's Main Hosting Website to see the full range of products we offer.

MEMBER OF united internet

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How do I Join?

All you need is 5 minutes! **Joining is absolutely free!**

You may join our external affiliate program in Commission Junction (CJ) or LinkShare, the largest and most trusted affiliate networks in the world:

commission junction

LinkShare™ a Rakuten company

Start Earning Now

Register as a 1&1 affiliate and start immediately!

Get access to great affiliate tools
Earn up to $300 per sale

Join Now!

Already a Customer?

Choose your preferred login method:

1&1 Customer ID or 1&1 Domain

Enter your 1&1 Customer ID or 1&1 Domain:

Remember me

Show Affiliate Tools

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1&1 Affiliate Program - Terms & Conditions

1. Preamble

These special program terms are in addition to the general terms & conditions of the 1&1 Affiliate Program. These special conditions also govern obligations of 1&1 Affiliates.

2. Definitions

The following terms are defined for the purposes of this agreement between 1&1 and the Affiliate:

Account: legitimate participation in the 1&1 Affiliate Program pursuant to registration by the Affiliate with full and accurate indication of the content registration information – including the indication of the main domain and the applicable substantive description of the Affiliate site.

Valid Click: a click is valid if a User on a Affiliate website voluntarily and knowingly clicks on a tracking link for the 1&1 Affiliate Program and is directed to the 1&1 website. Determination of valid clicks is based on the 1&1 transaction log system and verified by 1&1 with reasonable discretion.

Valid Sale: a sale is valid when a User makes a valid click on the 1&1 website and voluntarily and knowingly buys contract products subject to charge. Valid sales are determined like valid clicks using the 1&1 transaction log system and verified by 1&1 with reasonable discretion.

Tracking-Link: employed by the 1&1 Affiliate Program for use by the Affiliate such that the Affiliate may present content on its website identifying reference to the 1&1 website. The link is used exclusively by Affiliates in its unchanged form.

Tracking-Cookie: with a valid click on a tracking link, a tracking cookie is downloaded on the User's computer if permitted by the browser settings. The tracking cookie contains information about the last valid clicks and, through the 1&1 transaction log system, can be used to retroactively credit the valid sale of a Affiliate.

Pay-Per-Sale Affiliate Program (pay per Valid Sale): by implementing a 1&1 tracking link on the Affiliate website and forwarding visitors from the Affiliate website to the 1&1 website via a valid click, thereby arranging the sale or use of 1&1 contract products, the Affiliate is entitled to payment corresponding to the current compensation table.

User: any natural person who voluntarily and knowingly, without coercion or deception from the Affiliate or third-party compensation, with the exception of a 1&1-designated bonus system, visits the Affiliate website and, subsequently through a tracking link, the 1&1 website.

Contract Products: are paid goods or services to be offered by the Affiliate under this pay-per-sale Affiliate Program to the User per **Appendix 1**.

Affiliate Website: German-language webpages of the Affiliate, whose content is

reviewed by 1&1 at the time of the Affiliate's registration, located on the given or registered (main) domain or another domain or subdomain if content is identical to the designated main domain of the registered account.

1&1-Site: is the specified URL of 1&1 Internet Inc., pointed to by the Affiliate tracking link, under which 1&1 sells contract products and promotions online per the general terms of the Affiliate Program.

3. Remuneration

3.1 1&1 pays remuneration for Affiliate services, the amount to be determined by the current compensation table of this agreement.

3.2 The remuneration referred to in the compensation table equals net price plus value added tax, where applicable.

3.3 Multiple remunerations for contract products from pay systems other than 1&1 are prohibited. Only net contracts where the contract is activated are considered eligible sales.

3.4 1&1 determines amount of compensation according to market conditions, with reasonable discretion. Changes in remuneration occur at the beginning of the calendar month with a prior notification period of two weeks. Contracts already in effect are excluded from the revised compensation rates.

3.5 A payment claim occurs when a contract generated through a Affiliate is carried out over a period of at least 60 days. Payment claim is possible only when the Customer provides payment to 1&1 for contracted products for a period of 60 days (the minimum period). Previous periods (up to three months) where the Customer was released from, or credited for, the monthly fee, for example as part of a promotion, are not counted towards the minimum payment period described here.

4. Tracking and Reporting

4.1 The placement of tracking cookies occurs only after a valid User clicks on a 1&1 advertisement which takes the User to the destination website through a hyperlink. 1&1 reserves the right to allow individually selected Affiliates exemption from these tracking cookies. Any registration differing from paragraph 8.2 of this agreement requires a separate written consent from 1&1.

4.2 The duration of the tracking cookie is 30 days. Per the requirements of Section 8.2, a tracking cookie can only be overwritten by a new cookie ("last cookie wins" logic).

5. Rights of the Affiliate

5.1 Mediated contracts for products are exclusively between the Customer and 1&1. 1&1 reserves the right to refuse Customers from its Affiliates.

5.2 The Affiliate is not entitled to accept offers, make or answer statements, or act on behalf of 1&1.

5.3 Contract design and settlement with the End Customer is the sole and absolute decision of 1&1. If the contract with the End Customer, through acts or decisions of 1&1, is prematurely terminated or otherwise not fully implemented, the Customer will have no right to objections or claims regarding possible recovery of compensation.

6. Obligation of Affiliates to 1&1

6.1 The Affiliate is under obligation, using all technical possibilities, to design and present its website, including all entries in search engines,

directories, and link lists, to third parties in such a way that only valid User clicks and/or valid sales are generated on the 1&1 website.

6.2 1&1 provides the Affiliate with the required tracking links together with the URL of each page of the site. The Affiliate is not permitted to change the 1&1-provided HTML code or banner. The provided advertising materials may only be used on the websites of Affiliates. The use of this advertising is only permitted in connection with this agreement. Any disclosure of information or advertising to third parties is not permitted.

6.3 The linking of advertising material shall be allowed only on defined 1&1 landing sites (so-called "landing pages").

6.4 In addition to paragraph 10.2, the use of names, registered and unregistered trademarks, service marks, and/or logos of 1&1 is generally permitted only if the Affiliate receives prior consent from 1&1. In particular, the Affiliate is not permitted to use the brand called „1&1", even in a modified spelling, as part of a domain or subdomain. The Affiliate is obligated to ensure its website does not violate intellectual property rights, including copyrights, as well as any applicable laws pertaining to data protection.

6.5 The use of the name, registered and unregistered trademarks, or service marks of 1&1 in search engine marketing is not permitted. The advertising of branded keyword "www.1und1.de" with the visible URL, other 1&1 business domains, and so-called "Keyword Typos" are not permitted. Moreover, it is not permitted to link directly from search ads to the 1&1 site.

6.6 Regarding the optimization of its website, the Affiliate must comply with relevant guidelines of search engines, especially for pages which link to the landing page of the 1&1 Affiliate Program. Any techniques performed only for the purposes of improving the search engine ranking of the Affiliate site or which are misleading to the User, or which are of no use are prohibited. The uses of special hidden text or links, irrelevant keywords, unnecessary repetition of substantially identical content on multiple pages or under subdomains and domains, and "doorway pages" that are optimized for search engines ("cloaking") are inadmissible in this context.

6.7 The sending of e-mails by the Affiliate with advertisements for 1&1 is permitted only in accordance with legal requirements.

6.8 The Affiliate is obligated to include a provider ID with business offers. The Affiliate is obligated to ensure its website is in accordance with all laws regarding consumer protection. Violence, sexually explicit or pornographic content, discriminatory statements and representations with respect to race, sex, religion, nationality, disability, sexual orientation, or age are not allowed on the website of the Affiliate and/ or in connection with participation in the Affiliate Program. In particular, advertising without permission on sites that distribute royalty-proprietary content such as music or videos (for example, P2P sites or file-sharing services) is prohibited. The design of the Affiliate website is not permitted to negatively affect the reputation of 1&1 or the reputation of its good or services, brands, or business activities.

6.9 1&1 is intent on conveying a clear brand image for its End Customers. The Affiliate is not permitted, without written consent from 1&1, to tie in and/or combine 1&1 products with its own offers or offers from third parties and advertise or offer them as retail items to the End Customer.

6.10 A Affiliate is not permitted to load the 1&1-shop in an iFrame within its website.

6.11 The above provisions also apply to Affiliate referrals through links to third-party sites.

6.12 The Affiliate can place the tracking link for the 1&1 site on its website at any time in any number. 1&1 may, however, require Affiliates to change the placement of the tracking link if it affects the reputation of 1&1 business activities, goods or services, or the 1&1 brand name.

7. Confidentiality

7.1 Unless otherwise provided for in this agreement or without written consent of the other party, all information which the collaborating parties contribute to this transaction, including the rules of the agreement, commercial and financial information, customer and vendor list data, and pricing and sales information, is treated as strictly confidential.

7.2 Under this agreement, information gained about Customers/Users may only be used for billing purposes by Affiliates of 1&1. Other uses, particularly for marketing or sales purposes, are not permitted.

Products and Commissions

For a full list of all of our products and their commissions please visit our commission info page .

HOW TO START

Overview

1&1 Affiliate Programs

Affiliate Testimonials

Affiliate Terms & Conditions

1&1 Affiliate Testimonials

"1&1 is always a welcome addition to the Affiliate Summit. We are happy that such a large company has chosen to exhibit. The 1&1 team is both friendly and knowledgeable about their products and their affiliate program."

Shawn C. New Jersey

"The 1&1 affiliate team goes above and beyond. They are enthusiastic about their affiliate program and their excitement is contagious. They are really great about following-up and making sure all of my needs have been met and I understand everything about the affiliate program. They have worked with me to help me learn how to earn more referrals in lots of creative ways. They explain things clearly and make it all easy. The 1&1 affiliate team very friendly and a real pleasure to work with!"

Carrie C.
Atlanta, GA

"Namespaceinc.com attributes its success to "Concentrating on search engine keywords in order to reach a wide audience of website developers and small businesses in need of web hosting." When asked why they decided to become a 1&1 affiliate, Joe F. answered, "We only partner with merchants and brands that are market leaders in terms of size, quality of service, and reputation. 1&1 certainly fits the criteria."

Joe F. Massachusetts

"1&1 is very professional in their approach to affiliate marketing and it is a pleasure to work with them. The affiliate team's advice about 1&1 and numerous other topics have been invaluable to us."

James Martell British Columbia, Canada

"My 1&1 ad was already getting clicks but I knew I could do better. One call to the 1&1 affiliate team and a simple recommendation increased my clicks and affiliate sales dramatically. Thanks 1&1."

Kate D. Ontario, Canada

"I first met the 1&1 affiliate team at the Affiliate Summit in Las Vegas in February this year. They are some of the most valuable mentors I have ever met in the internet marketing circle! Their extensive knowledge in the world of affiliate marketing simply stuns me! When I have the privilege of talking to Joshua or Jesse I always hang up the phone with a new idea or something that I can help take my business to a new level! They simply take themselves out of the equation and offer online marketing strategies that always increase my sales and commissions significantly! I consider the 1&1 affiliate team true friends and am honored to be a 1&1 affiliate!"

Tim A. Florida

"Most of my promotion of 1&1 occurs through my mailing list. I've used advice from Joshua and his affiliate team on several occasions. This has helped increase my open rate and my click rate on 1&1 ads."

Justin D. Georgia

"One thing I like the best about 1&1's affiliate program is that I've always been able to reach the affiliate team by phone or email. This is unusual in the world of 'set-it-and-forget-it' affiliate programs. Although I'm just getting started with promoting my 1&1 affiliate link, I have high hopes for earning a lot with the program."

Stephanie A. New Jersey

'A strong respected brand like 1&1 has helped me develop content about its products and services. 1&1 has a great conversion rate for me. I highly recommend those who wish

to promote web hosting to join the 1&1 affiliate program."

Victor P. Russia

"Although I'm not a professional affiliate marketer, by giving my 1&1 affiliate link to my friends who also wanted websites, I have been able to pay for my own hosting. I like getting my site for free."

Yuri M. California

"I'm a full time student but I design websites on the side for extra money. I always use my 1&1 affiliate link when creating new hosting accounts for my clients. The extra money as a student definitely helps."

Steven J. Georgia

Subject: Check out our TV ad and earn your October reward
From: 1&1 Refer A Friend <noreply@1and1.com>
Date: Tue, 11 Oct 2011 17:12:06 +0200 (CEST)
To: and[redacted]@[redacted].com

Andrew Cromarty,

At 1&1 we believe that one good turn deserves another. That's why we want to reward you for recommending us to others. If you're happy with what we do, spread the word this October and you can earn up to $110 for referring friends, family or business associates to 1&1 MyWebsite!*

As a result of our current print and TV advertising, an ever-growing number of people recognize 1&1 as a brand. 1&1 MyWebsite is also gaining recognition as THE customized website solution for companies, associations and professionals. Check out our TV ad!

Just refer a friend by e-mail and follow the 3 steps below or click here for other ways to refer someone you know. Earn your reward today!

Best regards,
Your 1&1 Refer A Friend Team

Hi,

I just got this fantastic offer from 1&1, my web hosting company, and I immediately thought of you.

It's great- 1&1 makes it easy to design and launch your business website so you can be up and running online in under an hour. Just choose a web design for your business type- content and images are automatically included and can be changed at any time. No programming or design background necessary. You can even try it free for 30 days!

I'm very satisfied with my website and 1&1's services, and I think you'll like them too.

As a result of current print and TV advertising, an ever-growing number of people recognize 1&1 MyWebsite as THE customized website solution. Check out their TV ad:
http://mywebsite.1and1.com/xml/order/popupTVspot

Just click the link below to get started:
http://mybusiness.1and1.com/xml/order/diyselect?k_id=6[redacted]

Kind regards,
Andrew

3. When your friends use your personal tracking link to make a purchase, through your e-mail or another referral tool, you get paid!

For more details, check out our Commission structure below.*

LET'S BREAK IT DOWN:

Products	1&1 MyWebsite (Basic package)*	1&1 MyWebsite (Plus package)*	1&1 MyWebsite (Premium package)*
	30-day FREE TRIAL*		
Your Friend Pays (monthly fee)	then just $9.99	then just $19.99	then just $29.99
You earn (When your friends use your affiliate tracking link to make a purchase, you'll get a commission.)	$40	$55	$110

Find us on:

Your customer ID:
6[redacted]

Click here for 1&1's commission structure.
When your friends use your affiliate tracking link to make a purchase, you'll get a commission.

Click here for more information on the 1&1 Affiliate Program Terms and Conditions

* 1&1 MyWebsite offer valid through October 31, 2011. 1&1 MyWebsite will receive a 30 day free trial. After the 30 day free trial, regular prices apply: 1&1 MyWebsite, regularly $9.99/month; 1&1 MyWebsite PLUS, regularly $19.99/month; 1&1 MyWebsite Premium, regularly $29.99/month. A 12 month minimum contract term applies. 12 month minimum contract term begins after 30 day free trial. Click here for full promotional offer details. Program and pricing specifications and availability subject to change without notice.

If you have any questions regarding referrals or commissions, contact our referral team at refer-a-friend@1and1.com.

If you would like to unsubscribe to this newsletter, please log into your 1&1 Control Panel to adjust your preferences under My Data > User Settings > Settings.

1&1 Internet Inc., 701 Lee Road, Chesterbrook, PA 19087.

QUS11ZN003_1EV

- Links & Banners▼Product Links
  Banner Links
  Link to Any Page
  Quick Linker
  Link Checker
- Widgets
- aStore
- Product Advertising API
- Affiliate Programs▼Amazon Wireless Associates
  Endless Associates
  Small Parts Associates
- Reports▼Earnings Report
  Orders Report
  Misc. Referrals
  Link-Type Report
  Daily Trends
  Tracking ID Summary Report

Email address

Password

Sign In Need help?

Don't have an account?

Join now for FREE!

Holiday Offers

- Holiday Offers

Stay Connected

- Discussion Boards
- Associates Blog

Customer Support

- Help
- Performance Tips
- Glossary
- Operating Agreement

Special Programs

- Sell on Amazon
- Kindle for Associates
- Product Advertising API
- Vendors & Publishers
- Amazon WebStore
- Amazon Product Ads

Other Affiliate Programs

- Audible.com
- AbeBooks.com

Associates Program Advertising Fee Schedule

This Associates Program Advertising Fee Schedule (**"Schedule"**) is part of the Operating Agreement that governs your participation in the Amazon Services LLC Associates Program. This Schedule describes the advertising fee rates you may earn as a participant in the Program. It also describes the limitations that apply to earning advertising fees on certain Products. From time to time, we may modify this Schedule in accordance with the Operating Agreement. All capitalized terms used below that are not defined on this page have the meanings given to them in the Operating Agreement.

During each calendar month, you may earn advertising fees for Qualifying Purchases. Most advertising fees are calculated as a percentage of Qualifying Revenues based on the tables below and are subject to the limitations described in the "Limitations on Advertising Fee Rates for Certain Products" section below. We also may offer advertising fees in the form of bounties or other special offers as described in the "Special Offers and Promotions" section below. **"Qualifying Revenues"** mean amounts we receive from customers' Qualifying Purchases, excluding shipping, handling, and gift-wrapping fees, taxes, and service charges, and less any rebates, credit card processing fees, returns, and bad debt.

The Program's standard advertising fee structure is described in Tables 1 and 2 below. The advertising fee rates you may earn will vary depending on the number and category of Products that are shipped, streamed, or downloaded (as applicable) in a given calendar month that constitute Qualifying Purchases. We will determine

the classification of Products in each category set forth in Table 1 below or otherwise described on this page.

TABLE 1 – Fixed Advertising Fee Rates for Specific Product Categories

US – Fixed Advertising Fee Rates for Specific Product Categories

Product Category	Fixed Advertising Fee Rates
Electronics Products	4.00%
Amazon MP3 Products	10.00%
Amazon Instant Video	10.00%
Game Downloads Products	10.00%
Endless.com and smallparts.com Products	15.00%
Myhabit.com products	15.00%
Gift Cards Redeemable on the Amazon Site	6.00%
Gift Cards Not Redeemable on the Amazon Site	4.00%

TABLE 2 – Volume-Based Advertising Fee Rates for General Products*

Number of Products Shipped/Downloaded in a Given Month**	Volume–Based Advertising Fee Rates for General Products
1–6	4.00%
7–30	6.00%
31–110	6.50%
111–320	7.00%
321–630	7.50%
631–1570	8.00%
1571–3130	8.25%
3131+	8.50%

* **“General Products”** are any Products other than those for which we pay a fixed advertising fee rate as described in Table 1.

** For purposes of calculating the number of Products shipped or downloaded in a given month, we will include Products included in categories in Table 1, except gift cards (whether redeemable on the Amazon Site or not) and any Products expressly excluded in accordance with the “Special Offers and Promotions” section below or otherwise under the Operating Agreement.

If you enrolled in the Program under our “Classic Fee Structure” and are earning a

4% advertising fee rate for any number and category of Products, then that rate will continue to apply to you unless you select the standard advertising fee structure. You may change your account to the standard advertising fee structure described above by clicking here, in which event the change will be effective on the first day of the next month.

Example Calculation of Advertising Fees

The following example demonstrates how advertising fee rate calculations work under Tables 1 and 2. If, in a given month, 6 General Products, 9 Amazon Instant Video Products, 14 Electronics Products, and 2 gift card Products redeemable on the Amazon Site were shipped or downloaded (as applicable) as a result of orders placed by customers during Sessions initiated through Special Links on your site, then the total number of Products would be 31. The volume-based advertising fee rate for a monthly volume of 7-30 Products would be used to determine your advertising fee rate for General Products because the 2 gift card Product units are not included in calculating the applicable advertising fee tier in Table 2. In this example, an advertising fee rate of 6.00% would apply to Qualifying Revenues from the 6 General Products, an advertising fee rate of 10.00% would apply to Qualifying Revenues from the 9 Amazon Instant Video Products, an advertising fee rate of 4.00% would apply to Qualifying Revenues from the 14 Electronics Products, and an advertising fee rate of 6.00% would apply to Qualifying Revenues from the 2 gift card Products (redeemable on the Amazon site).

Limitations on Advertising Fee Rates for Certain Products

Notwithstanding the advertising fee rates described on this page, the following limitations apply: (a) advertising fees for all Qualifying Purchases of Products that are personal computers (including without limitation desktops, laptops, notebooks, tablets, and netbooks) are limited to a maximum of $25 per personal computer, regardless of the Qualifying Revenues received from the sale of that Product; and (b) advertising fees for all Qualifying Purchases of Products that are Amazon Instant Video Products or Amazon MP3 Products are limited to a maximum of $1.50 per unit, regardless of the Qualifying Revenues received from the sale of that Product.

Special Offers and Promotions

From time to time, we may run special or limited time offers or promotions under which you may earn advertising fees on Products or categories of Products that were previously excluded from earning advertising fees, or you may earn increased advertising fee rates from those set forth above. We may notify you about special offers or promotions by updating this page or through emails, blog posts, or other means.

The following special offers and promotions are currently available to all Associates:

- **AmazonWireless Cell Phone with Wireless Service Plan Promotion:**

For each Qualifying Purchase from the wireless.amazon.com site, you may earn a $50 bounty instead of, and you will not be eligible to earn, the advertising fee rates set forth in the tables above.

- **Amazon Product Ads Program Promotion:**

  In connection with referrals to the Amazon Product Ads Program, you may earn a bounty solely as follows: (a) for each new Amazon Product Ads Advertiser Registration you refer, you may earn a $5 bounty; and (b) for each Amazon Product Ads Advertiser Launch, you may earn an additional $150 bounty.

  The **"Amazon Product Ads Program"** means the advertising program designed to provide Amazon Site customers access to products available on external Web sites, described in more detail here.
  An **"Amazon Product Ads Advertiser Registration"** means an advertiser's registration in the Amazon Product Ads Program to advertise products in at least one of the open categories listed here, where that registration was initiated and successfully completed (as determined by us) by the advertiser during the Registration Period and the advertiser has not previously completed registration in the Amazon Product Ads Program.
  The "**Registration Period**" means the period beginning when an advertiser follows a Special Link from your site to the Amazon Product Ads homepage and ending on the earlier of: (i) 30 days later and (ii) any time that advertiser follows a Special Link from the site of another participant in the Program to the Amazon Product Ads homepage. Special Links to the Amazon Product Ads homepage are permitted in connection with this promotion, notwithstanding Section 19 of the Associates Program Participation Requirements.
  An **"Amazon Product Ads Advertiser Launch"** means the occurrence of the first click by a natural person on a Product Ads advertisement that is displayed for the advertiser whose Amazon Product Ad Advertiser Registration you referred. An Amazon Product Ads Advertiser Launch must occur within the first 30 days following the date of that advertiser's Amazon Product Ads Advertiser Registration in order for you to be eligible to earn the additional $150 bounty. For the avoidance of doubt, if the Amazon Product Ads Advertiser Launch occurs later than 30 days following the applicable Amazon Product Ads Advertiser Registration, you will not be eligible to earn the additional $150 bounty. Clicks are measured solely by us.

What do you think?

Do you have a suggestion or comment about Associates Central website? Let us know.

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