Trifecta: Creating P2P Software that Enables Fair Use

William J. French
M.S. Candidate
Class of 2004
School of Information Management & Systems
University of California, Berkeley
french@sims.berkeley.edu

M. Parker Thompson
M.S. Candidate
Class of 2004
School of Information Management & Systems
University of California, Berkeley
parkert@sims.berkeley.edu

Abstract

In this paper we discuss P2P software called Trifecta that enables users to make fair use of copyrighted sound recordings encoded in computer media files (e.g. MP3). Copyright has traditionally served as both an economic incentive to encourage the creation and dissemination of literary and artistic works, and a regulatory structure enabling the public to gain access to the results of authors’ original work. Maintaining such a delicate balance between authors and the public helps to promote the advance of knowledge and culture by stimulating its pursuit. Digital media, networked computers and P2P file sharing applications have posed new dilemmas to copyright because reproducing and distributing copyrighted works in digital formats are such trivial tasks for average users, as demonstrated by the recent popularity of P2P software used by millions to download music. However, it is possible to develop software that allows users to harness the convenience of P2P file sharing while still remaining within the boundaries of copyright law. Trifecta allows users to lend and stream sound recordings to friends and other personal acquaintances, two uses that we maintain are fair because private, noncommercial sharing and performance are consistent with the rights afforded to consumers by the first sale doctrine and the right of private performance.

I. Introduction

Since Napster made its debut in June 1999, millions of people have used peer-to-peer (P2P) networks to trade digital representations of copyrighted music and sound recordings. Napster and its successors, like Gnutella, Morpheus, and KaZaA, have contributed to an environment in which a massive amount of content is, more or less, constantly and freely available to users of global digital networks. The report *How Much Information? 2003* states that KaZaA users alone “share almost 5,000 terabytes of information, including over 600 million files shared by an average 3 million users active at any given time.”¹ At the time of the study, the sample data suggested that MP3s accounted for 60.06% of all files shared on KaZaA.² Unfortunately, because existing P2P software makes it easy and essentially free to share one’s entire music collection with anyone else connected to the Internet, copyright owners derive no reward from these forums. In response, P2P network watchdogs, funded and operated by the Recording Industry Association of America (RIAA), work tirelessly to expose and file lawsuits

---

² Ibid, p. 104.
against the operators of P2P super-peers\textsuperscript{3} and the developers of P2P software. The battle has prompted big media companies to lobby Congress for greater control over the rights once afforded to consumers by copyright law. Should the media firms get what they want, consumers would have to make micropayments at every point of contact with copyrighted materials. Currently, there seems to be no middle ground in this conflict; copyright holders demand stronger protection of their materials and investments, while consumers demand the convenience and ease of use that P2P networks offer.

The Trifecta project reintroduces balance between copyright holders and consumers by approximating the status quo of physical media usage and sharing in the online world. The first sale doctrine allows consumers to lend their copies to others without first transferring ownership. Less formally, if one owns a sound recording (or a book, a movie, and so forth), then one has the right to lend it to another party. Secondly, the exclusive right of public performance granted to rights holders implicitly protects the rights of consumers to perform and enjoy copyrighted works privately – provided no financial gain results. In other words, if one throws a party and invites his friends, copyrighted sound recordings can pour from the stereo all night, the host free from worry of infringing copyright. These two legal principles form the cornerstone of Trifecta.

By codifying the usage scenarios mentioned previously (with a computer program, not statutes), we will demonstrate that it is possible to create technologies facilitating fair\textsuperscript{4} uses of digital media that minimize the potential for infringement. First, Trifecta allows users to define and maintain lists of friends, family members and other acquaintances to whom they would feel comfortable lending parts of their music collection. Second, Trifecta allows its user base to lend media to their acquaintances for limited periods, using digital rights management (DRM) technology to disable the original copy until the “loan” is returned. Such an approach accurately models traditional uses for physical media, because the owner is unable to listen to his copy if he has previously lent it to someone else. Third, Trifecta allows users to stream audio to those immediately within their personal network. This also realistically models situations in which hosts play music at social gatherings of their peers.

Trifecta does not aim to distill all fair uses into a tractable set of legal or illegal domains. Fox and LaMacchia noted:

[It] seems fairly certain that no one can mathematically model fair use... However, this limitation should not stop us from attempting to identify a useful subset we might approximate in code.\textsuperscript{5}

By using software to enforce the traditional status quo of private lending and performance, we assert that Trifecta will preserve balance between copyright holders and

\textsuperscript{3} Super-peers fulfill the role of both a server (providing peers with less power and/or bandwidth with file discovery information), and a client (they perform the same file sharing tasks as their less powerful brethren).

\textsuperscript{4} Our use of the term fair includes but does not specifically refer to the fair use doctrine. Instead, we use fair to indicate uses exempted from control of copyright owners (e.g. lending purchased albums to friends), unregulated uses (e.g. playing an album for a house full of guests), and the many other personal uses allowed by the Fair Use Doctrine itself.

\textsuperscript{5} Fox and LaMacchia, 2003, p. 63.
II. The Traditional Role of Copyright: A Balancing Act Between Rights Holders and the Public

The framers of the U.S. Constitution conceived of copyright as a means by which Congress could “promote the progress of science and the useful arts, by securing for limited times to authors… the exclusive right to their… writings.” Lawmakers have, at least up until very recently, carefully formulated copyright law as a means to maintain equilibrium between authors’ and the public’s interests. On one side of the bargain, authors are granted exclusive rights to reproduce and distribute their works for limited periods of time in order to motivate investment in the production of creative works, which once created, will add to the store of human knowledge and culture. In exchange, the public gets access to these works and the scope of exclusive rights is limited so that beneficial uses are exempt or unregulated. Some exemptions are explicit – defined by the letter of the law, while others are implicit – defined by their exclusion from statutory definition.7 Further, once copyright terms expire, works move into the public domain so that anyone can use them in any way they see fit.

Copyright has thus sought to benefit both sides: authors have been able to profit8 from creating original works, while the public has been able to enjoy and build upon a constantly growing set of culturally enriching materials. Though rights holders sometimes argue differently, lawmakers originally intended copyright as a regulatory structure to balance the interests of both authors and the public, not as a construct to protect solely the rights of authors.9 U.S. Supreme Court Chief Justice Hughes wrote more eloquently, “the sole interest of the United States and the primary objective in conferring the monopoly [of exclusive rights] lie in the general benefits derived by the public from the labors of authors.”10

A. The Rights of Authors

The copyright statute grants authors exclusive rights to control five activities: reproduction of works in copies, distribution of works to the public, preparation of derivative works, public performances, and public displays.11 Among the works protected by copyright are musical works, sound recordings, computer programs, architectural works, motion pictures and other audiovisual works such as television

---

7 “Copyright law is silent of a host of uses of copyrighted works... Unregulated uses... are defined by their absence from the regulatory structure, rather than their affirmation or explicit allocation to the public.” Mulligan, Han, and Burstein, 2003, p. 78.
8 Mark Lemley writes, "The goal of intellectual property is only to provide the 'optimal incentive,' not the largest incentive possible." p. 123.
9 See Samuelson, Fair Use for Computer Programs and Other Copyrightable Works in Digital Form: The Implications of Sony, Galoob and Sega, p. 2.
11 For exacting language, see 17 U.S.C. § 106.
programs.\textsuperscript{12} Copyright lasts for the author’s life – plus 70 years.

**B. Checks and Balances on Rights Holders**

The copyright statute and the courts provide checks and balances to authors’ exclusive rights by employing different approaches. First, the statute unambiguously defines exemptions to exclusive rights, such as the doctrines of fair use and first sale. Courts and commentators generally believe that fair use allows for reasonable personal uses even if copyright holders might object.\textsuperscript{13} First sale permits consumers to sell or lend their copyrighted materials to whomever they please – without first securing permission from rights holders. Second, the statute is mute about a variety of uses, such as private performance, leaving it unregulated (which is why a motorist stopped next to you at a red light pays no royalties for singing along to Journey’s *Don’t Stop Believin’*). Finally, courts have typically shown reluctance to construe statutory provisions as imposing controls over new copying technologies, like photocopiers, VCRs, or computers, believing that Congress, not the courts, should extend the law if necessary. The combination of explicit exemptions, implied rights, and the tendency for courts to shy away from imposing arbitrary, one-time solutions for new copying technologies all serve to balance authors’ rights with those of the consumer.

**The Fair Use Doctrine**

As defined by 17 U.S.C § 107, the fair use doctrine provides a flexible set of guidelines for determining whether uses that may appear infringing at first glance are actually within the scope of the principles that copyright attempts to serve – balancing authors’ interests with those of the public.\textsuperscript{14} For example, fair use allows teachers to copy excerpts of works for use in the classroom, critics to quote liberally from works in order to make their points, and television owners to make “time shift” videotapes of programs for later viewing. But the statutory language defines fair use so broadly that it is difficult, if not impossible, to precisely articulate a definition using the statute alone. In fact, because of the intentional vagueness, fair use has been described, “with some justification, [as] ‘the most troublesome in the whole law of copyright.’”\textsuperscript{15} Thus, typically only when courts rule on specific issues are decisive lines drawn as to what uses are or are not fair.

\textsuperscript{12} 17 U.S.C. § 107 defines the subject matter of copyright law as, “literary works, musical works, including any accompanying words, dramatic works, including any accompanying music, pantomimes and choreographic works, pictorial, graphic, and sculptural works, motion pictures and other audiovisual works, sound recordings, and architectural works” are all covered under copyright. The U.S. Copyright Office’s circular *Circular 1 – Copyright Basics* further notes that “[t]hese categories should be viewed broadly. For example, computer programs and most ‘compilations’ may be registered as ‘literary works’; maps and architectural plans may be registered as ‘pictorial, graphic, and sculptural works.’”

\textsuperscript{13} For example, in *Iowa State Univ. Research Found., Inc. v. American Broadcasting Cos.*, 621 F.2d 57 (2d Cir. 1980), the court held, “fair use permits courts to avoid rigid application of the copyright statute when, on occasion, it would stifle the very creativity which that law is designed to foster.” In *Narell v. Freeman*, 872 F.2d 907, 913 (9th Cir. 1989), the court ruled, “fair use allows a holder of the privilege to use copyrighted material in a reasonable manner without the consent of the copyright owner.” Both statements appear many times in U.S. case law, from district to Supreme Court rulings.

\textsuperscript{14} Whether the fair use doctrine defines an affirmative right or a defense against an infringement suit is a hotly contested topic.

\textsuperscript{15} *Sony v. Universal*, 464 U.S. 417, at 475 (citation omitted).
For example, in 1984, the U.S. Supreme Court held in *Sony Corporation of America v. Universal City Studios, Inc.*, that “time-shifting” of copyrighted television broadcasts via video taping for private use within viewers’ homes is, and should be presumed, fair use. That is, consumers may make copies of television programs so they can watch them at another time, despite the fact that this necessarily involves making a copy. In their analysis, the Court used the “four factors” test to weigh the potential benefits and harm caused by consumers making copies using VCRs. In this case, because copies made by tape machine owners were of a non-commercial nature and deemed unlikely to hurt the market for television broadcasts, time shifting was found to be fair use.

It is also important to note in light of the current discussion involving file sharing technology that in their decision, the Supreme Court acknowledged that home recording devices did not prevent infringing uses. Bootleggers could use Sony Betamax machines to make illegal copies of copyrighted works. However, in weighing the costs and benefits of this technology they argued that “whatever the future percentage of legal versus illegal home-use recording might be, an injunction which seeks to deprive the public of the very tool or article of commerce capable of some non-infringing use would be an extremely harsh remedy, as well as one unprecedented in copyright law.” In other words, copyright law is meant to give rights holders a way to pursue those making illegal copies of their works; it does not authorize courts to rule technologies illegal just because some may use them to infringe copyright. “The sale of copying equipment,” wrote Justice Stevens in *Sony*, “does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes. Indeed, it need merely be capable of substantial non-infringing uses.”

The courts have ruled fair other personal and noncommercial uses over objections of copyright owners. In *Recording Industry Association of America v. Diamond Multimedia Systems, Inc.*, the Ninth Circuit ruled that copying legally acquired sound recordings to devices such as the Diamond Rio MP3 player was a fair use, citing both *Sony* and The Audio Home Recording Act to support their argument. As the court observed, “the Rio’s operation is entirely consistent with the [Home Audio Recording] Act’s main purpose – the facilitation of personal use... The Act... protects all non-commercial copying by consumers of digital and analog musical recordings.” In *Lewis Galoob Toys, Inc. v. Nintendo of America, Inc.*, the court decided that consumers had made derivative works of Nintendo’s copyrighted games when using the Galoob Game Genie to alter game characteristics. But since the derivative works were created for private and non-commercial uses, the court deemed them fair uses. The opinion states, “Game Genie users are engaged in a non-profit activity. Their use of the Game Genie to create

---

16 The four factors are: “(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.”

17 *Sony v. Universal*, 464 U.S. 417, at 468.

18 Ibid, at 442.

derivative works therefore is presumptively fair.”

To summarize, a fair use, in the strict sense, is one that arguably violates one or more exclusive rights of copyright owners, but is allowed because the courts determine it to ultimately benefit society more than harm it. Time-shifting television programs so that viewers may watch broadcasts on tape, space shifting sound recordings from one fixed medium to another, and creating derivative works in one’s own home have all been ruled fair uses by the courts. And the fact that all these uses were of a private, non-commercial nature was an important factor in these rulings.

Unregulated Uses

In addition to the exclusive right of reproduction, copyright grants rights holders the right to control some uses of their works. For example, musicians may not publicly perform works by other songwriters without paying for that privilege. This means that radio stations must pay royalties to artists in exchange for broadcasting their songs. By contrast, copyright also explicitly and implicitly allows some uses without regulation. These uses are deemed outside the scope of copyright protection and may be made without the permission or knowledge of anyone, including rights holders.

The right to dispose of legally acquired copies is among the many uses explicitly allowed by copyright. The first sale doctrine, codified in 17 U.S.C §109, allows owners of lawfully made copies of copyrighted works the right to sell, lend, or even destroy them — without first asking permission from rights holders. For example, someone may purchase a book and lend it to a friend or family member without violating the author’s exclusive rights. Further, when this person finds that his bookshelves have become overstuffed, he may sell, throw away, or even burn the book. First sale makes it possible for proprietors to run used bookstores, video rental stores, as well as public and private libraries.

There is an important limitation on first sale rights as to sound recordings. Congress amended the first sale doctrine in the early eighties, after record stores began renting records to patrons while also selling audio cassettes. Customers renting records for several days used their home cassette recorders to copy albums in their entirety during the rental period. “Indeed, one record store was so bold as to advertise: ‘Never, ever buy another record.’” The law put an end to this practice, rendering commercial lending of phonorecords an infringement of copyright. Owners of phonorecords may not, “for the
purposes of direct or indirect commercial advantage, dispose of, or authorize the disposal of, the possession of that phonorecord... by rental, lease, or lending.”

However, expressly forbidding commercial lending does not affect doing so privately or noncommercially. That is, when someone buys a record, he is still free to dispose of it in any way he deems fit, provided that all lending is of a noncommercial nature.

While the public must refrain from commercially lending audio recordings, radio stations must pay artists if they wish to perform their works over the airwaves, an example of public performance regulation. By contrast, performing works in a private setting, say, on one’s stereo system for a group of friends, falls outside the scope of copyright regulation. Instead of defining private performance of a copyrighted work, the statute describes the public counterpart: “[performing or displaying]... at a place open to the public or at any place where a substantial number of persons outside of a normal circle of a family and its social acquaintances is gathered.” Thus, if a public performance occurs when "a substantial number of persons outside of a normal circle of a family and its social acquaintances is gathered," then a private performance occurs at gatherings where only a small proportion of the guests, if any, are outside that circle.

C. Maintaining Balance Between Both Sides

By frequently revisiting copyright law, Congress has sought to maintain a construct that balances the rights of authors against the public good, one that both entices authors to produce and encourages consumers to use and build upon existing works. As technology becomes more sophisticated, lawmakers must sometimes introduce new regulations to retain equilibrium. In fact, the invention of the printing press led to the creation of copyright law in the first place, because it significantly reduced the costs associated with transcribing copies by hand (a practice so inefficient that it was not even worth regulating). At the same time, courts are typically reluctant to define new legal constructs that attempt to keep pace with the development of new methods of copying that technological breakthroughs afford. Thus, both Congress and the courts are faced with the challenge of ensuring that copyright’s balance does not tilt too far in the direction of either rights holders or consumers.

Courts cannot respond to rapid technological progress with temporary quick fixes, so they must turn instead to first principles for guidance when no existing precedent offers a clear explanation on how to proceed. This was the case with Sony. The opinion states, “when technological change has rendered literal terms ambiguous, the Copyright Act must be construed in light of [its] basic purpose.” But due to recent developments in digital technology, rights holders, technology developers, and even lawmakers appear to be losing sight of copyright’s fundamental objective.

Copyright states, "Phonorecords thus include phonograph discs, open-reel tapes, cartridges, cassettes, and player piano rolls" (2-8 Nimmer on Copyright § 8.05).


28 Sony v. Universal, 464 U.S. 417, at 429. A footnote explains that, “the fortunes of the law of copyright have always been closely connected with freedom of expression, on the one hand, and with technological improvements in means of dissemination, on the other.”

29 Ibid, at 432 (citation omitted).
III. P2P Technology Upsets the Balance Struck by Copyright Law

Since the advent of Napster, millions of people worldwide have used P2P software to share their music collections with complete strangers. In A&M v. Napster, the first of several high profile cases brought by record companies against P2P software developers, A&M Records et al sought and were granted a court-ordered injunction against Napster that enjoined the service from providing the “site and facilities”\(^{30}\) that users exploited to exchange copyrighted sound recordings. The recording industry recognized that the sheer number of infringing users made it impossible to target individuals, and instead chose to cut infringing activities off at the source. Napster asserted that many of its members engaged in uses that were fair, like the time-shifting found fair by the Supreme Court in Sony. Napster argued that their software was both capable and actually used for substantial non-infringing uses such as sampling and space-shifting, and thus were not responsible for user copyright infringement. But the court ruled that the majority of Napster uses infringed copyright, including those contended fair by Napster, and held them liable for contributory copyright infringement.

In Sony v. Universal, the Court determined that private, noncommercial time shifting of television broadcasts by consumers must be presumed fair use, even though the works in question were copied in their entirety. It also rejected plaintiffs’ claims that time shifting television programs had an adverse affect on the market for broadcast television programming. Similarly, while consumers have long made personal, noncommercial, but complete, copies of LPs, cassette tapes, and CDs using home audio recording equipment, such activities were considered fair in light of Sony, and were later exempted by the Audio Home Recording Act of 1992. Like time shifting broadcast TV, space shifting audio recordings did not threaten the viability of rights holders’ markets, because most consumers were unlikely to buy more than one copy of an album. Further, since the quality of copies degraded with each successive degree of separation from the source, consumers found perpetual copying impractical and unrewarding – the copies they made did not supplant most consumers’ desire to buy originals. In addition, taking legal action against individuals making small numbers of infringing copies, say, for their friends, presented entertainment companies with an economic barrier – it was simply not worthwhile to target individuals for relatively minor infringement.

The Sony decision was handed down in 1984, well before cheap, but powerful, personal computers in homes and offices became the norm. Technologies like audio and videotaping devices had begun to worry copyright owners, but the law allowed consumers to create private, noncommercial copies for their own personal enjoyment. As digital technology has become more sophisticated, copyright owners have become more worried about its ramifications to their businesses. A report published in 1986 by the federal Office of Technology Assessment presciently states, “decreasing prices and increasing capabilities of information systems will permit more people to make use of more works. Consequently, enforcement efforts will have to reckon with a much larger

\(^{30}\) A&M v. Napster, 239 F.3d 1004, at 1022.
volume of potential infringements than exists today.”

A. Digital Formats, Devices and Networks Introduce New Hurdles for Copyright

More than any other technological innovation, digital devices in combination with the Internet jeopardize businesses whose revenue depends on exploiting the value of intellectual property. Computer hardware makes it fast and efficient to copy large amounts of data in small periods of time. Modern throughput rates on networks allow tremendous quantities of data to move efficiently around the globe in seconds. And copyright law defines exclusive rights of authors that, if interpreted literally, closely resemble what computers and networks do in order to function correctly – reproduce and distribute data.

The entertainment industry encodes sound recordings and other works in digital formats like CDs and DVDs, and as a result, their own products become launching pads from which consumers can create endless numbers of perfect copies, with few time, quality, or cost-related limitations. Older analog copying equipment forced those making copies to monitor progress while they made reproductions, usually spending the length of the album to ensure synchronization and elimination of long, silent gaps in the finished product. Analog taping technology also meant that reproductions made by consumers were imperfect, and that copying a copy introduced a further decrease in fidelity. In contrast, using a computer to duplicate sound recordings encoded in CDs takes several minutes, and requires only a blank CD\textsuperscript{32} and hardware that ships standard in most consumer grade PC configurations. Should one choose instead to copy an album into a compressed file format like MP3, the process takes even less time, requiring minimal, if any, supervision by computer users, and costs less because of smaller physical storage requirements. Finally, copies of works encoded in digital formats are as good as originals\textsuperscript{33}, so each copy acts as a potential source for more reproductions. “One consequence [of digital technology] is an erosion of what were once the natural barriers to infringement.”\textsuperscript{34} There is virtually no cost to digital copying, provided one has access to a computer. In the book \textit{Digital Dilemma}, the authors point out “given the widespread availability of computers, many people now have the ability to casually reproduce vast amounts of information.”\textsuperscript{35} If the recent P2P-induced upheaval in the music industry is any indicator, people not only have the ability, but do in fact casually reproduce vast


\textsuperscript{32} Blank CDs are capable of storing about 800 MB of data and are very cheap. The authors found quotes for as little as $0.29 per disc at http://store.yahoo.com/cdndvdmedia/cdwr.html. Hard disk storage is also very cheap, and allows much more efficient access to data. The authors found new hard drive quotes for as little as $0.58 per GB at http://www.bizrate.com/buy/browse.xpml?rf=ggl&mkt_id=669169&cat_id=410&url_id=171323&lp=1.

\textsuperscript{33} MP3s are not perfect copies because they employ a “lossy” compression algorthm that introduces artifacts upon playback. However, once MP3s are created, they a sources for additional perfect copies of themselves. For simplicity’s sake, we will dispense with the notion of lost fidelity in compressed digital recordings, and assume that all copies are perfect.

\textsuperscript{34} \textit{Digital Dilemma}, p. 4.

\textsuperscript{35} \textit{Ibid}, p. 23.
amounts of information, of which sound recordings are one type.

While computers and other electronic devices make it trivial and inexpensive to copy works stored in digital form, networks, and especially the Internet, introduce ease and affordability to their distribution. Network throughput rates are getting cheaper and faster simultaneously. According to Nua.com, an online resource for Internet usage statistics, 605.60 million people are online\(^\text{36}\), 27% of which connect from the United States.\(^\text{37}\) The protocols governing the global Internet also do not guarantee the paths that packets traverse, so snooping Internet traffic for infringing works encoded in bits is not possible. While recent attempts to filter infringing media downloads on local networks have succeeded,\(^\text{38}\) in order for such an approach to work everywhere, all local network administrators would find it necessary to install the filters. The increase in inexpensive, fast Internet access, the number of worldwide Internet users, and the fact that it is difficult if not impossible to determine the nature of IP packets’ contents presents the entertainment industry with fresh problems, and introduces new hurdles to copyright. But computers and networks on their own are only part of the predicament.

Audio files stored on disk must first be copied into RAM before computers can make any use of them. File transfer protocols like HTTP and FTP do not move files from one computer to another; instead, they enable inter-computer copying. If the statutory definitions set forth in §101 of the copyright statute are interpreted literally, then networked computers, which make and send copies in order to operate properly, can be construed (or perhaps misconstrued) as the most efficient infringement machines ever created, making photocopiers and home audio and video recording devices look as impotent as the Gutenberg press. For example, in MAI Systems Corp. v. Peak Computer Inc., the ninth circuit court of appeals held that since a “copy created in the RAM can be ‘perceived, reproduced, or otherwise communicated’ … loading of software into the RAM creates a copy under the Copyright Act.”\(^\text{39}\) Jessica Litman observed that, based on such an interpretation, “for all works encoded in digital form, any act of reading or viewing the work would require the use of a computer, and would... involve an actionable reproduction.”\(^\text{40}\)

From the MAI v. Peak perspective, computer users arguably infringe copyright every time they utilize their machines to listen to copyrighted music or read copyrighted books, because computer hardware must reproduce works in order to display them, and rights holders enjoy the exclusive right of reproduction. Second, digital transmission of a work implies distribution, since a copy of what resides on the server is transferred to the client, in violation of the author’s exclusive right to distribution. Third, because digital transmissions are effectively the same thing as distribution, rights holders’ exclusive

---


\(\text{39}\) MAI Systems Corp. v. Peak Computer Inc., 991 F.2d 511, at 519.

rights arguably envelop consumers’ rights to private performance. Fourth, first sale is arguably unavailable because rights holders have no way to determine whether a consumer who wishes to sell their work will actually delete their own copy upon completing the transaction. And finally, the fair use doctrine arguably becomes irrelevant in the digital landscape, because rights holders maintain that they will soon be able to negotiate the terms under which consumers make use of their works, employing brokering software charges consumers based on the extent of use, no matter how insignificant.\textsuperscript{41} Law professors submitting a brief in the Napster case argued, “the nature of digital technology means that many activities analogous to non-infringing acts in the offline world become at least technical infringements when conducted over the Internet.”\textsuperscript{42}

This view of copyright is unbalanced, and we argue neither a proper nor constructive interpretation. If it were, the preservation of balance between creators and consumers will tilt too far in the direction of rights holders and undermine the fundamental purpose of copyright. If copyright was meant to serve the public, then it must not hinder access to copyrighted works – online or off. At this point, it is worth restating a passage from Justice Stevens’ opinion in Sony:

“The sole interest of the United States and the primary object in conferring the monopoly,” this Court has said, “lie in the general benefits derived by the public from the labors of authors.” When technological change has rendered its literal terms ambiguous, the Copyright Act must be construed in light of this basic purpose.\textsuperscript{43}

There is room for fair use, first sale, and private performance rights in the digital realm, as we will show below.

**B. The Challenge of P2P File Sharing and Software**

Napster, and P2P file sharing applications in general are the ultimate examples of digital technologies that facilitate inexpensive reproduction and distribution. As such, P2P software poses challenges to businesses founded on intellectual property because it offers users access to enormous quantities of works, many of them copyrighted, and costs essentially nothing to use. It so effectively simplifies browsing and searching remotely located content that using P2P software resembles browsing local file systems, an activity in which even minutely experienced computer users are comfortable. As network throughput rates increase and further innovations in distributed systems continue unchecked, the difference between opening files locally and fetching them from the Internet will continually decrease. Further, without the help of ISPs who hand over personally identifying information to the RIAA on subpoena, such activities take place without rights holders’ knowledge.

\textsuperscript{41} See, for example, Tom W. Bell’s article *Fair Use Vs. Fared Use: The Impact of Automated Rights Management on Copyright's Fair Use Doctrine*, where he paints a “dystopian” view of the future of fair use. He writes, “the advent of convenient and cheap means of making licensing payments forecloses… claim[s] that paying for… use would have proven too burdensome. In short, as automated rights management has grown in scope, [the] fair use defense has shrunk.


\textsuperscript{43} *Sony v. Universal*, at 432 (citation omitted).
While Apple’s iTunes Music Store and other music sites charging fees for audio file downloads are becoming more popular, file sharing networks hosting copyrighted sound recordings are still the norm. In record industry lawsuits against Napster and Aimster, those arguing in favor of P2P software said that file sharing should be legal because it is fair use. They maintained that sharing over P2P networks is noncommercial and personal. Second, they claimed that their applications were capable of enabling substantial non-infringing uses. Their positions formed the basis for past assertions that P2P software is neither subject to the scrutiny of law enforcement, nor within rights holders’ legal ability to control. Those on the other side argue that the scope of infringing activity far supercedes any notion of fair use and even that the law must be changed in light of recent innovations in P2P software. The issues are numerous and will be elaborated upon in the case analysis below.

It is important to note that people shared infringing reproductions of copyrighted materials via the Internet well before Sean Fanning unleashed Napster in 1999. Though early Internet piracy posed a bigger dilemma than analog copying, the scale was still small enough so that record industry legal departments could deal with copyright infringers on a case-by-case basis. They largely ignored insubstantial infringement, and used cease and desist letters or lawsuits against individuals in particularly blatant cases. The introduction of Napster, the first widely used P2P file sharing software, created the current environment in which users rely mostly, if not completely, on each other instead of central servers to provide access to files that may infringe copyright. Because of the decentralized nature of P2P networks, music companies found that it was no longer cost effective to go after individuals and instead were faced with the task of indicting software companies whose wares made infringement possible.

Napster, by introducing the notion of decentralized music distribution, forever changed the norms of delivering music to consumers. Upon login to the service, the Napster client uploaded metadata, such as track and artist name, for all MP3 files residing in a certain folder on the user’s computer. Napster supplied to users a central, searchable store of all tracks available on their network at any given time, but relied on their users to provide the actual files and network bandwidth. Though the Big Five record companies (Sony, Universal, EMI, BMG, and Warner) tried to stop illegal file sharing by filing suit against Napster, new users continued to sign up for the service, trading millions of copyrighted works freely amongst themselves. Instead of discouraging adoption, the music industry’s lawsuit and the resulting press fueled a revolution – Napster’s user base exploded in size. But the service’s popularity led to its eventual fate: early in 2001, the ninth circuit court of appeals upheld the district court's opinion – that Napster users, and by proxy, Napster,

44 According to an Apple press release, as of March 15, 2004, “music fans have purchased and downloaded over 50 million songs from Apple’s iTunes Music Store... iTunes users are now downloading 2.5 million songs per week, which is an annual run rate of 130 million songs per year.” Apple.com, March 15, 2004 [online], accessed April 21, 2004. Available: http://www.apple.com/pr/library/2004/mar/15itunes.html
45 Napster and Aimster both hosted central indexing mechanisms to aid users in searching for their downloadable material of choice. Later innovations, like those seen in Morpheus and KaZaA, operate independent of any central authority.
grossly infringed copyright. Napster argued that its users made fair uses of copyrighted materials, and that its software was capable of enabling substantial non-infringing uses, but their position did not pass the court’s muster. The opinion states, “we agree that plaintiffs have shown that Napster users infringe at least two of the copyright holders’ exclusive rights: the rights of reproduction; and distribution.”

The Fair Use Argument

Napster asserted that its users made fair use of copyrighted materials, and as such, did not infringe copyright. They presented two fair uses in which users engaged, sampling, that is, trying before buying, and space shifting. Their fair use argument largely hinged upon the Sony ruling, in which the Supreme Court stated that private, noncommercial uses must be presumed fair, and that the practices of sampling and space shifting, instead of harming plaintiffs’ market in sound recordings, actually increased music sales.

By commissioning a report on the use of Napster by 300 college students, Napster presented the court with evidence that close to one third of those surveyed used its software to sample music. They argued that since sampling is a noncommercial and personal use, that it must be presumed fair because of Sony’s direction. Napster also attempted to prove that sampling posed a threat neither to the non-existent market for samples, nor to the market for sound recordings, instead showing that music sales had improved as a result of making use of its service to sample. But sampling, as Napster called it, actually equated to downloading perfect replicas of entire works with no embedded constraints. The court reasoned that sampling amounted to a commercial use, noting that record companies typically offer only 30 to 60 second clips, not entire tracks, and that the offerings of record companies usually timed out after a short period of time, so that users could no longer listen to them. In contrast, audio files shared on Napster contained no such built in limitations, but were “full, free and permanent [copies] of [recordings].”

Napster also attempted to show that its users employed the service for space shifting music they already owned, a use ruled personal and noncommercial, and thus fair, in RIAA v. Diamond Multimedia. One report entered by Napster as evidence to the trial court showed that the majority of Napster’s users space shifted music using the application: “70% of… users ‘sometimes, frequently or always’ downloaded music they already owned.” In contrast, one of the record industry’s expert reports showed that “almost half of college student survey respondents previously owned less than ten percent of the songs they have downloaded.” Napster also argued that space shifting would not harm the market for sound recordings, because consumers were highly unlikely to buy music they already owned solely for the sake of convenience, or for owning the same

48 17 U.S.C. § 107 states, “The fair use of a copyrighted work… is not an infringement of copyright.”
51 Ibid.
52 A&M Records, Inc. v. Napster, Inc. 239 F. 3d 1004, at 1018.
album on different formats. However, space shifting for one’s own personal use and making the contents of one’s hard drive available to an anonymous, and gigantic, group of strangers are very different activities. While consumers should feel free to make copies of CDs they already own so that they may take them elsewhere, they cannot make unlimited numbers of copies and put them in boxes outside their homes with attached signs reading, “Free CDs.” The court decided that space shifting did not “involve distribution of the copyrighted material to the general public,” and subsequently rejected that claim as well.

Like the Sony Court, the appellate court in Napster used the four factors test to determine whether or not Napster users engaged in fair uses, and the opinion contrasted sharply with that in Sony. In that case, time shifting, fundamentally the practice in question, was a noncommercial use; neither side disputed that fact. In contrast, the court found in Napster that because service users both saved themselves the cost of actually buying music shared on the network, and traded with others for the purposes of accessing more materials for themselves, the activities taking place on the network were largely commercial in nature. Second, the fact that works shared on Napster were largely creative rather than factual weighed against them. Third, in Sony, the Court found that because time shifting allowed viewers to watch shows that were available free of charge anyway, “the fact that the entire work is reproduced does not have its ordinary effect on militating against a finding of fair use.” On the other hand, the district court found that Napster users engaged themselves in “wholesale copying” of music because they found little utility in files consisting of merely short samples. Finally, the majority ruled in Sony that Universal et al did not adequately show that time shifting harmed the market for broadcast programming. The court found a different situation in Napster, arguing that the parties bringing legal action demonstrated adverse effects on the market: lost sales to college students, and a raised barrier “to plaintiffs’ entry into the market for digital downloading.” In summary, the court disagreed entirely with Napster’s fair use defense.

Aimster, another P2P application resting its service atop the already well-established AOL Instant Messenger network, varied from Napster in several interesting, but only superficial, ways. Unsurprisingly, the recording industry raised issue with Aimster’s service, and filed suit. Aimster posited that in light of Sony, plaintiff record companies were required to demonstrate Aimster’s contribution to displaced sales. Sony said that copying for “commercial or profit making purposes” was presumptively unfair, and that

56 “Works that are creative in nature are ‘closer to the core if intended copyright protection’ than are more fact-based works.” Ibid, at 1016.
60 While Napster used clear text to store metadata about files residing on users’ systems, Aimster encrypted all communication occurring between peers, attempting to blind itself from the infringing activities taking place. “Willful blindness,” states the opinion, “is knowledge, in copyright law (where indeed it may be enough that the defendant should have known about the direct infringement)” [emphasis in the original]. In Re: Aimster Copyright Litigation. Appeal of: John Deep, Defendant, 334 F.3d 643, at 650.
61 Sony v. Universal, at 449.
if “the intended use is for commercial gain, that likelihood [of market harm] may be presumed. But if it is for a noncommercial purpose, the likelihood must be demonstrated.” Further, Napster ruled that P2P file sharing was of a commercial nature. By this logic, “a copyright owner who can prove infringement need not show that the infringement caused him a financial loss.” The seventh circuit’s opinion ruled against Aimster, but Circuit Judge Posner’s opinion tempered the ninth circuit ruling in Napster, writing that using P2P software to space shift copyrighted works that one already owned was arguably a fair use. He wrote:

Someone might own a… CD that he was particularly fond of, but he had not downloaded it into his computer and now he finds himself out of town… and he wants to listen to the CD, so he uses Aimster’s service to download a copy. This might be a fair use rather than a copyright infringement, by analogy to the time shifting approved as fair use in the Sony case.

The court found in Napster that users primarily infringed copyright to a great degree, did not engage in fair uses of copyrighted works, and held the company liable for its users’ actions. Since Napster maintained a central, searchable data store that tracked the availability of content available on its network in real time, the court decided that Napster, to a large degree, was able to determine if the majority of files available on its network infringed copyright without imposing undue burden. On one side of the argument, the Sony decision mandates that personal, not-for-profit uses of works are fair, and to some degree, both space shifting and sampling do fall into the category of fair use. For example, one can make personal copies, or borrow CDs from others in order to determine whether or not to buy a copy for oneself. Conversely, Napster’s functionality allowed perfect strangers to swap reproductions of copyrighted works, regardless of physical location, with great ease and efficiency. Moreover, any fair uses, in this case, to space shift or sample paled in comparison with the scale and scope of infringing activities occurring with the Napster service.

**Significant Non-infringing Uses**

Napster also sought to invoke the Sony ruling in presenting the court with evidence of both current and future substantial, non-infringing uses of its service. Sony mandated that “the sale of copying equipment… does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes. Indeed, it need merely be capable of substantial noninfringing uses.” First, Napster showed that over 17,000 recording artists used its software to distribute their recordings without major label support. Second, they argued that users would likely increase their use of Napster for new artist promotion and discovery in the future. “Under Sony,” they argued, “it is enough that Napster has a single potential non-infringing use of social or commercial

---

64 Ibid, at 652.
65 Sony v. Universal, at 442.
66 “As of July 3, 2000 more than 17,000 artists had expressly authorized Napster users to share their music. By contrast, the major labels together released a total of only 2,600 albums last year, and only 150 of those songs were played on the radio on a regular basis.” Appellant Napster’s Opening Brief, p. 25.
importance.”

Many unsigned artists used Napster’s New Artist Program for promoting and distributing their music. Both the court and the recording industry raised no issue with Napster’s attempt to give new artists a means of promoting themselves through the use of the service. However, while Napster claimed to support tens of thousands of new and emerging artists by offering such assistance, a study commissioned by the recording industry largely refuted the evidence. In a random sampling of 1150 files from a total of 550,000 downloaded from Napster, a statistician showed that only 1% of the files represented musical recordings by artists listed in the New Artist Program. Further, the briefs entered by Napster only pointed to how many artists the program supported; Napster presented no hard data comparing the number of authorized versus unauthorized downloads. Instead, they argued that non-infringing uses were likely to increase in the future and pointed out that plaintiffs had planned to share secured recordings virally via P2P mechanisms.

While Napster may have supported great numbers of fledgling musicians, the court determined that while this use was non-infringing, it was not substantial enough to counter the adverse effects of the infringing ones. The seventh circuit also rejected Aimster’s similar claim to capability of substantial non-infringing uses, noting that the Sony decision was unlikely to give credence to any technology that merely allows for a non-infringing use. Posner wrote that if that were the intent of Sony, “the seller or a product used solely to facilitate copyright infringement, though it was capable in principle of noninfringing uses, would be immune from liability for the contributory infringement.”

The court also held Napster accountable for contributory copyright infringement because of its architecture. While Napster clients supplied the computational power and network bandwidth necessary to copy files from one peer to another, Napster itself maintained extensive indexes of all files available on the network at any given time that users employed to aid in searching and quickly locating specific tracks. The court determined that Napster could have significantly decreased the amount of infringing activity had they supervised their indexing system, purging entries for infringing files. “Napster had the right and ability to police its system and failed to exercise that right to prevent the exchange of copyrighted material.” Further, the court found that Napster had “actual knowledge that specific infringing material [was] available using its system,” yet did nothing to stop the users who were exchanging copyrighted works. The court decided both that Napster users engaged in primarily infringing uses of copyrighted materials and that Napster provided its users with a means by which they could more easily infringe, and thus held them liable for contributory infringement.

The Napster decision caused P2P software developers to rethink their architectures, and

---

70 In Re: Aimster Copyright Litigation. Appeal of: John Deep, Defendant, at 651.
72 Ibid, at 1022.
responded by introducing a new breed of P2P applications, including Grokster, KaZaA, and Morpheus. Unlike Napster and Aimster, the defendant’s software in this case relied on no central indexing mechanism, a feature that allowed the software developers to flatly deny any ability whatsoever to police the network for infringing behavior on the part of its users. Again, the recording industry filed suit, charging the developers with contributory liability for copyright infringement. However, in 2003, the trial court found the recording industry’s claims baseless given the current state of relevant technology, because defendants had neither specific knowledge of infringing activity as it occurred, nor the ability to act on that information.\footnote{MGM v. Grokster, 259 F. Supp. 2d, at 1036.}

The court also declared that such technology was capable of substantial non-infringing uses, stating that defendant Streamcast’s software was regularly used to distribute, “public domain materials, government documents, media content for which distribution is authorized, media content as to which the rights owners do not object to distribution, and computer software for which distribution is permitted.”\footnote{Ibid, at 1035.} Defendant Grokster also presented evidence of substantial non-infringing activity, a “partnership with GigAmerica, a company which claimed to host music from 6,000 independent bands and musicians as of May 2002.”\footnote{Ibid, at 1036.} Further, neither side disputed that the software could in the future be used for substantial non-infringing activity.

Even if these technologies escape liability because of their decentralized nature, and even if they are capable of significant non-infringing uses, they still do nothing to protect against substantial infringing uses. The response of the P2P community to the recording industry’s lawsuits against Napster has been to design technology in such a way as to escape liability, not to prevent infringing use, or even to expressly allow fair use.

**C. Polarization of Sides Obscures Potential Middle Ground**

Copyright owners want maximum control over their works so as to protect them against digital piracy, and are using various means to achieve their goal. On the other hand, P2P advocates believe that information must be freed from the confines of physical media, and that music is simply a subset of humankind’s knowledge that should flow across the Internet unimpeded. Between these two opposite extremes lies a tenable middle ground. Even Cary Sherman, the president of the RIAA, said in an interview, “[In the Betamax case] the Supreme Court was faced with either allowing or disallowing a technology. Now the choice is not nearly so binary. It's a question of allowing non-infringing uses but prohibiting blatant infringements.”\footnote{The Man Who "Convinced" You to Stop Downloading, interview with Cary Sherman, president of the RIAA, by Kathy Gilsinan, Columbia Spectator Online Edition, March 24, 2004 [online]. Available: http://www.columbiaspectator.com/vnews/display.v/ART/2004/03/24/406145e08ec80}

P2P software has made an instrumental and beneficial impact on the dissemination of countless numbers of works, whether popular, out of print, or arcane and obscure, and whether copyrighted or not. At the same time, if the public can simply use software to access musical works free of charge, incentives for recording artists to create sound
recordings will likely decrease. While such an outcome would not necessarily stop musicians from creating records, it could certainly contribute to their inability to make a living by selling them. The *Aimster* opinion states, “to the recording industry, a single known infringing use brands the facilitator as a contributory infringer. To the Aimsters of this world, a single non-infringing use provides complete immunity from liability. Neither is correct.”77

The entertainment industry has responded to the threat posed by the ease of copying in digitally networked environments both internally and externally. From within their own organizations, big media firms have begun to explore two strategies for protecting their media in the digital era. First, they have started to license content to users on their own terms of use rather than those embodied in copyright law. Second, they have set about wrapping their works in DRM technology, effectively producing their own interpretation (with computer programs, not statutes) of what uses are or are not allowed. Outside the confines of their offices, big media, represented by the RIAA and MPAA, files lawsuits against those sharing copyrighted materials on P2P networks, using subpoenas to compel ISPs to hand over names. Cary Sherman defended the RIAA’s actions in a recent interview, saying, “We felt we could not stand by and watch while an entire industry – the most vibrant music industry in the world – was being downloaded to death.”78

Responding to the RIAA’s pursuit of P2P copyright infringers, P2P developers continue to innovate, allowing users of the latest P2P clients to remain hidden from pursuers. Sophisticated P2P clients piggyback on secure network connections in order to deter snooping and intrusion.79 For example, the Free Network Project supports an “entirely decentralized” network within which both “publishers and consumers of information are anonymous.”80 As another illustration, Robert Kaye of MusicBrainz, in an abstract for a talk at the 2004 O’Reilly Emerging Technology Conference, proposes a file sharing application whose

“The primary goal... is to keep the RIAA and MPAA out of your social network in order to avoid detection... the file-sharing application should use common off-the-shelf technology to avoid detection by the bad guys. All connections should be tunneled over SSH and port numbers should change frequently. Using these techniques, the bad guys won’t be able to tell the difference between a legit VPN session and a Britney Spears track being swapped.”81

Kaye’s abstract demonstrates the wide rift between consumers’ and copyright holders’ intents. P2P client users have begun to escape to digital foxholes and may disappear from sight entirely unless the entertainment industry lets up on their hunt. On the other side, organizations like the RIAA will continue to develop more sophisticated approaches to infringement detection. Whether the tactics of both sides are cops-and-robber or cat-and-mouse matters not; both media consumers and companies have spoken.

---

is so convenient that network users are willing to break the law so they can reliably gain access to music on the Internet. Conversely, media companies see file sharing as an egregious activity that they must stop at all costs, lest their businesses evaporate. In a situation like this, big media companies will perpetually lobby Congress to further restrict copyright exemptions, nullify the precedent set in Sony, and intensify the sentences imposed upon guilty parties. The end result is a negative sum game: legitimate media will heavily restrict fair uses, media no longer tethered by DRM will be available only from illicit online cabals, and copyright law will suffer repeated below-the-belt blows.

4. Trifecta Shows that it is Possible to Code for Fair Use

The court’s determinations in Napster and Aimster do not prevent developers from creating P2P technologies designed specifically to allow fair uses to occur, especially if technology designers make their best efforts to prevent infringing ones. In the cyber environment, P2P developers arguing that unrestricted online music sharing constitutes fair use have not convinced the courts of their position, because the majority of P2P users download copies of entire files that in turn serve as source material for additional rounds of reproduction. While the court ruled in Grokster, the latest P2P case, that it is enough for an application to be capable of significant non-infringing uses (provided the developer has no knowledge of infringing activity at a time when he can actually do something about it), we decided to create an application that specifically facilitates fair uses of digital sound recordings while doing our best to prohibit infringing ones. The music industry wants P2P application developers to use complicated means to achieve this end goal, one that would largely undermine P2P software’s totally decentralized nature. Our solution employs a much simpler method.

Trifecta, the prototype P2P application that we designed, allows for fair uses while disallowing infringing ones by making peer interactions occur solely between acquaintances. Upon defining buddy lists of other Trifecta peers, users may request loans from and lend audio files to their friends, as well as tune into their friends’ streams. These uses approximate the purposes of first sale and private performance in the online setting, uses that we maintain are fair whether online or off. For example, in the real world, if someone wants to hear an album, he asks a friend who already owns the recording to borrow it for some predetermined duration. During the period of the loan, the lender cannot listen to the music, but the borrower can. When the borrower returns the loaned copy, the rightful owner once again possesses his sound recording, his friend turned either on or off by the music he borrowed. Furthermore, if someone decides to throw a party to which he invites his friends, he can play his batch of copyrighted sound recordings all night long without ever once infringing copyright. The copyright statute makes provisions for these uses in the real world. We see no reason why approximations of these uses should not be allowed under in the online setting.

Coding for fair use is difficult, and may appear daunting to technologists with little or no legal experience. Copyright law contains many necessary ambiguities, for Congress designed it keeping in mind that courts would exercise discretion in their interpretations – but sometimes even courts make mistakes. If judges are incapable of always deciphering the law correctly, then computer programs will have much greater difficulty. Given the
difficulty of the problem, it is understandable that technologists have largely chosen to avoid coding for fair use. The consequences for incorrectly guessing fair use’s reach could result in substantial legal predicaments. However, for more clearly defined uses, it is possible to engineer systems that permit traditionally non-infringing uses while also taking reasonable precautions to prevent actions that egregiously infringe copyright.

A. Technical Discussion of Trifecta

Trifecta allows users to play music files on their computers or other Java-enabled devices, manage their digital music collection, and interact with other peers concurrently connected to the Trifecta P2P network. Trifecta’s music management capabilities resemble applications such as Apple iTunes and MusicMatch Jukebox. Users can browse their music collections, define play lists, and listen to locally stored digital audio files. Trifecta also allows users to specify groups of friends within the Trifecta network. However, unlike earlier P2P software like Napster, or recent clients such as KaZaA, users can only browse and make use of resources owned by themselves and their friends. In this respect, Trifecta echoes the architectures of messaging services such as ICQ and AOL Instant Messenger more than it does P2P file-sharing applications.

To use Trifecta’s P2P features, users supply the application with their friends’ email addresses, with which the application generates unique identifiers that Trifecta employs during bootstrapping to locate other peers on the network. Using such a scheme implies that users can only locate peers whose email addresses they already know. Once Trifecta users connect to the network and locate other online peers, clients exchange information about the files stored in their respective music libraries, as well as their current play lists. Trifecta users may then choose to listen to music stored in their own libraries, to tune into a real time streams of friends’ current play lists, or to issue requests to friends for loans, for which the default period is one week. When browsing remote play lists, users can determine the song currently playing on their friend’s computers, and also songs queued for later playback. Users can access remote streams of any peer specified on their buddy list, so long as that peer is connected to the network and using Trifecta to listen to music from their own library. When users listen to remote streams from their friends, they do not rebroadcast them to other users.

---

82 We wanted to build an application capable of running on a wide variety of platforms and devices. By using Java and the JXTA framework, Trifecta maintains both platform and transport agnosticism, which means that one could use it on any device containing a Java Virtual Machine (e.g. cell phones and PDAs) over protocols such as TCP, HTTP, Bluetooth, and so on. However, for the purposes of this project we only tested Trifecta using standard computer hardware (PCs and Apple Macintoshes) using HTTP and TCP as transport protocols.

83 More information on JXTA can be found at http://www.jxta.org/.

84 More precisely, users configure Trifecta with FOAF files that store information about their friends. Clients are identified on the network by SHA1 hashes of their email addresses. See http://www.foaf-project.org/ for more details.

85 The network has no mechanism for searching for users, and email addresses cannot be derived from network identifiers. This was a conscious design decision meant to support the argument that performances (streaming media) within the Trifecta network are generally likely to occur between "normal circle of a family and its social acquaintances."
Users can also request to borrow files from friends for limited periods of time.\textsuperscript{86} If a friend accepts a loan proposal, then the lender’s Trifecta instance locks the original file,\textsuperscript{87} disallowing playback or other loans until the loan times out, the borrower opts to return the loan early, or the lender explicitly chooses to retake ownership before the loan terms expire. Users can play borrowed files locally, and can also include them in their own personal play lists of music they stream to other peers, but they cannot lend or copy files that they have borrowed from others. This assures that only one usable copy of a file exists on the network at any given time. In the future, we envision more extensive loaning features for Trifecta, in which borrowers may lend borrowed files to other friends, while the owner can still retake the loan at any time. This still does not fall outside the scope of the first sale doctrine.

**Coding for Lending and Borrowing**

The first sale doctrine explicitly allows lending and borrowing, using precise language to define the boundaries of such uses, especially for musical works. Consumers can lend their music to anyone they want for any period of time, provided they do not turn a profit from doing so. We designed our application to allow a similar set of uses defined by the doctrine of first sale – users can lend music to anyone defined in their buddy list, for fixed periods of time. Because the law defines these concepts so well, they can be adequately translated into computer languages.

In order to understand why Congress sought to explicitly protect noncommercial lending with law, one must explore the reasons that led them to make such uses fair in the first place. A personal loan of a sound recording is an agreement between two parties. One party agrees to temporarily relinquish his right to make use of his sound recording so that the other party may enjoy it. Due to physical limitations, only one party, the lender or the borrower, can make use of the recording at any given time, prohibiting concurrent use by both parties. In other words, the lender cannot listen to his sound recording while the terms of the loan are still in effect, a constraint that provides a check on indiscriminate lending, and moreover, an incentive for the lender to recover his music. Further, loans do not result in an increased number of available copies, which serves to protect the market for works.

Trifecta models the constraints on physical media by enforcing restrictions on file usage consistent with physical loans. Like the physical world, when a user lends a copy to a friend using Trifecta, he cannot make use of it. Further, like the real world, during the period of the loan, only one copy exists at one time. Trifecta also controls the use of lent files – users can listen to them without limitation for the duration of the loan and stream them to their friends, but they cannot make copies or lend them to other peers. Because these assumptions result in an accurate portrayal of real world physical and legal

\textsuperscript{86} Currently loans must have an expiration date, by default one week, however the logical extension of this protocol would be to have null expirations. This would allow users to gift or resell legally acquired digital media as they do books and other physical works.

\textsuperscript{87} Trifecta enforces file locking through the application interface, meaning there is nothing to prevent users from using other applications to circumvent protection. In designing Trifecta, we opted to avoid implementing a DRM system because we believe current DRM models are inadequate for allowing the kinds of uses we advocate – and designing one is a project all its own.
restrictions in software, using Trifecta to borrow music from friends is fair.

**Coding for Streaming to Friends**

In addition to loaning and borrowing, we designed Trifecta to approximate the private performance allowance implied by the copyright statute’s explicit prohibition on public performance by consumers. Like loans, private gatherings exhibit well-defined characteristics and can therefore be expressed in source code. To determine whether a performance is of private or public scope depends on whether the audience consists primarily of the performer’s friends and acquaintances, or mostly of people outside that domain.

Someone who invites all his friends over for drinks and music on the stereo surely does not infringe copyright. By forbidding public performance, Congress sought to disallow people from playing copyrighted works to large audiences for profit’s sake without artist remuneration, not to deny the public from playing music to their friends in the privacy of their own homes. Trifecta’s streaming functionality approximates private performance by allowing users to let their friends tune in to what they are listening to locally. Like no-show party invitees, Trifecta users not tuned into friends’ streams cannot hear the music their friends are playing. Further, like the real world (depending on what kind of parties one frequents), Trifecta users cannot manipulate friends’ play lists or arbitrarily choose what song comes next, and thus must be content with either listening to selections from their own library, or succumbing to the taste of their friends. Again, since these design choices accurately model real world restrictions, streaming music to friends using Trifecta should be considered fair.

We placed no arbitrary limits on the number of friends and acquaintances a user can specify\(^8\), but the network and application discourage users from streaming music to users with whom they are not acquainted. Trifecta provides no mechanism for searching the network for other users. To locate other peers, users must generate configuration files containing one-way hashes of their friends’ email addresses that serve as unique network identifiers. While this does not prevent the addition of random Trifecta users to users’ buddy lists, it does present a barrier to such behavior, because users must know the email addresses of other users in order to participate in P2P interaction. Further, Trifecta does not implement multicasting, which means that the number of friends tuned into a user’s stream and the bandwidth consumed by the peer uploading stream data is positively correlated. Moreover, users cannot choose which friends can or cannot tune into their stream, so they must instead selectively specify their friends, because of the significant negative impact on their own computers’ and networks’ performance (particularly if they have good taste in music). In the future, it would be desirable to let users specify a subset of friends to whom they are willing to stream, while allowing lending across all users.

---

\(^8\) This design decision was debated at length. In *Grooming, Gossip and the Evolution of Language*, author Robin Dunbar argues that the number of friends and acquaintances with whom one stays in regular contact typically does not exceed 150. It seems reasonable to such a number as a basis for imposing a limit on the number of friends in a user’s network, rather than using bandwidth constraints as a way of regulating behavior. However, unless a user is connected via a T3 link, bandwidth constraints will limit users’ behavior well before the size of their social networks becomes an issue.
defined in users’ buddy lists.

B. Three Principles for Designing Fair Use Enabling Software

Unfortunately, no computer science treatise prescribes exacting rules for designing software that allows for fair uses while simultaneously preventing contribution to copyright infringement. However, when system architectures begin to raise intellectual property concerns, engineers can follow three principles to help shape their design decisions. First, software developers should choose to translate well-defined constructs from copyright, rather than forcefully applying deterministic rules to necessarily ambiguous legal principles. Second, designers should heed the wisdom of the Sony opinion and return to copyright’s first principles for guidance when considering software designs that could potentially lead to severely infringing uses. Third, software developers should use consistent metaphors to guide design decisions, because they provide a base to which designers can return when new questions pertaining to copyright arise. By incorporating these three principles into the software design process, software developers can build finished products that are consistent with the ultimate goal of copyright.

Clearly Articulated Bounds in Law Make Programming Easier

Copyright law, unlike a rule fixed in computer code, is not deterministic, and presents programmers attempting to translate law into software with difficult, if not entirely unsolvable, problems. Programmers who design software that allows for fair uses should be realistic about what can be expressed in code and what cannot. For example, our approximation of first sale and private performance in code resulted in a finished prototype, but had we tried to write a program that allowed for fair use as defined by 17 U.S.C § 107 while preventing infringing uses, we would have surely failed. The law clearly articulates what uses are allowed by first sale and private performance, but does not conclude exactly what constitutes fair use. Case law provides some insight as to the bounds of the fair use doctrine, but there is no unifying theory – the differing district, appellate, and Supreme Court decisions in Sony illustrate that courts interpret fair use inconsistently. Further, The Court’s decision in Sony was split 5-4, even though justices of both the majority and dissenting opinions relied on the same four factors test in explaining their rationales. David Nimmer wrote: “it is largely a fairy tale to conclude that the four factors determine resolution of concrete fair use cases.”

Programmers should either try to write code that emulates clearly articulated exemptions granted to the public by copyright, like the right of private performance and the first sale doctrine, or design software that specifically allows uses determined fair by the courts. For example, copyright law allows libraries to make copies for archival purposes, so courts would be less likely to find that software intended for use by archival librarians to make copies contributes to copyright infringement. As another illustration, developers could write programs allowing users to generate transformative works based on

---

90 17 U.S.C. § 108 states, “it is not an infringement of copyright for a library or archives, or any of its employees acting within the scope of their employment, to reproduce no more than one copy or phonorecord of a work…”
previously copyrighted photographs, so long as the new works differed substantially from the original. However, it would be impossible to write a program that attempts to guess whether samples taken from copyrighted recordings for inclusion in transformative works infringe copyright or not. In such situations, courts usually try to determine whether the sample taken represents the heart of the work, in which case courts usually do not find fair use. Making such determinations depends mostly on the intuition of judges, something that cannot be programmed.

**Return to First Principles**

When designing software that enables fair use, it is critical that programmers understand the principles upon which copyright bases itself. In the absence of statutory guidance, such as was the case in *Sony*, courts return to the Constitutional definition of copyright to determine whether new technologies contribute to copyright infringement or allow consumers to make use of copyrighted works in new, but still fair, ways. Since the advent of the personal computer, technology has far outpaced copyright law’s ability to keep up with it, so often both case and statutory law provide little insight for developers on how to proceed when intellectual property conflicts arise. It is sometimes up to software developers to determine whether their products enable substantial non-infringing uses or merely serve to enable flagrant infringement.

The U.S. Constitution grants Congress the power to create copyright laws that provide both economic incentives to authors and exemptions that ensure the ability of the public to access creative works in diverse ways. Technologies that inhibit the public’s ability to make fair use of copyrighted works do not help to maintain the balance that copyright serves to protect. Additionally, technologies that do not respect the exclusive rights of authors also undermine copyright’s intent. Technologists should realize that tilting the balance too far in either direction ultimately inflicts harm to rights holders and consumers both. Developers must consider the effects of their design decisions on markets for the works their software will manipulate, whether music, movies or texts. Software developers should be encouraged to make works more useful to the general public, so long as they do not destroy the markets that give authors an incentive to continue creating.

**Design to Metaphors**

Court decisions often rest on metaphors. Plaintiffs and defendants employ metaphors to explain their positions to judges and juries using them, and judges use them to clarify their opinions. In the 1990s, the battle over Internet service provider (ISP) liability for subscriber copyright infringement hinged on whether ISPs resembled dance halls or landlords.\(^9\) When dance halls charge admission, they are required by law to pay

---

\(^9\) *In Religious Technology Center v. Netcom On-Line Communication Services, Inc.*, 907 F. Supp. 1361, the court held, “Plaintiffs must further prove that Netcom receives a direct financial benefit from the infringing activities of its users. For example, a landlord who has the right and ability to supervise the tenant's activities is vicariously liable for the infringements of the tenant where the rental amount is proportional to the proceeds of the tenant's sales. Shapiro, Bernstein, 316 F.2d at 306. However, where a defendant rents space or services on a fixed rental fee that does not depend on the nature of the activity of
royalties on sound recordings performed within their establishments, but no similar burden exists for landlords whose tenants charge a cover for entry. Had courts determined ISPs similar to dance halls, they could be held liable for contributory infringement when subscribers posted copyrighted works. In the end, ISPs were able to avoid liability largely because the landlord-tenant metaphor was more plausible to the court.

Designers of computing technologies facilitate literal copying, but can argue that their technologies resemble well-established and legal uses. In our case, we chose to model real-world activities, lending and private performance, and used them as a guide to inform our design decisions. Application features should be consistent with the metaphor, and developers should continually reevaluate their design decisions in light of the chosen analogy. Of course, it may be appropriate to include functionality that does not directly support the metaphor. For example, someone who lends a CD to a friend cannot guarantee that they will ever see the album again, an inherent risk to loaning that we easily eliminated by ensuring that our software automatically returns lent files to their rightful owners. While this is inconsistent with the metaphor of loaning physical media, it is still consistent with the principles of copyright’s intent. In short, stick to the metaphor to inform decisions about anything that might raise intellectual property issues, but continue to make software that does useful things.

5. Conclusion

In horseracing, bettors placing trifecta wagers must pick the first, second, and third place horses (win, place, and show), in order of arrival at the finish line. We initially sought to propose a solution to the superlatively contentious P2P debate, and more generally, to explore ways to allow for fair uses of digital media. We set about building our software in a series of three ordered subprojects, and thus chose the name Trifecta to describe the finished products in concert with one another. First, we carved out a relatively deterministic portion of copyright law that addresses noncommercial lending, borrowing, and private performance, so that we could model it using a computer language. Second, we wrote an application based on the rules that we derived from the first step, P2P software that approximates some of the rights afforded to users by the first sale doctrine and the right of private performance. Third, based on our experiences in the first two stages, we devised a set of recommendations that application developers can use in the future should they find themselves wanting to write software allowing for fair use of digital media. Software developers engaged in similar projects would be well advised to follow this three stage approach so they can gain a more detailed appreciation for the complexities of copyright law in the beginning of the project, and contribute to a body of best for encoding some fair uses into software upon completing their programs. We feel that following such an approach will ultimately serve to maintain the balance of copyright law, rather than to undermine it.

the lessee, courts usually find no vicarious liability because there is no direct financial benefit from the infringement.”

25
Bibliography