

Liam Kelly  
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**Distributed Responsibility:  
Network File Sharing and Democratization of Technology**

**Abstract**

In *Questioning Technology*, Andrew Feenberg argues for a “deep democratization” of technology – a new approach to technological development in which the non-technocrat has an active participatory role in technological development (Feenberg 1999). In this paper, I intend to look at the development of computer network file sharing software as an example of such democratization. In so doing, I shall identify three distinct participant groups involved in the social and developmental interactions of three different software products, and shall discuss the participants’ interests and motivations with regard to “democratization.” I shall conclude that, in this instance, increased de-centralization served to increase the autonomy of the end-users, at the expense of corporate interests, thus providing us with an object lesson in Feenberg’ s model of democratization. I shall then go on to evaluate the prospects for long-term sustainability of that democracy.

**Introduction: A New Class of Software**

Much fuss has been made in science and technology studies of the Internet as a potentially democratizing technology. Indeed, it seems to be exactly the sort of thing that

lends itself well to Andrew Feenberg's "Deep Democratization" – the Internet is a primarily de-centralized network in which redundancy and fail-over have been intentionally included in the design, such that the flow of traffic over the network cannot easily be interrupted by a single “choke point”. The very hardware and software protocols on which it operates were (for the most part) designed to be distributed, not centralized. While the original inclusion of such fail-over was intended to serve military purposes (no single command center could be targeted in order to effectively disrupt the network), this decentralized aspect of the Internet has since proven to be a powerful ally to those who would seek to elude governmental and corporate controls. During the course of this paper, I plan to trace a particular class of protocols – those used for networked "peer to peer" (P2P) file sharing, and to demonstrate how increasing decentralization has led to increasing autonomy (and immunity from corporate and government interference) on the part of the users.

File sharing on the Internet is of course nothing new. The original military and university networks were utilized to make files available to the networks' users. “Traditional” protocols such as GOPHER, FTP, and HTTP have long been used as client-server protocols in which users may connect to a central server in order to upload or download files. However, due in large part to the popularization of personal computers and the increasing availability of permanent, high-bandwidth network connections (such as cable and DSL), a new breed of file sharing protocols has emerged over the last few years. What sets this particular class of protocols apart is the “peer-to-peer” aspect of them.

Simply put, files are not uploaded to a centralized file server for users to access. Instead, the users' machines connect to one another directly, and each personal computer acts as a file server for each of the others. Superficially, the personal computers connected to the Internet (and the users who operate them) have become active participants in the spread of information, rather than passive consumers. On a deeper level, this participation has had a democratizing effect on the world-wide spread of culture, at the expense of the traditional commodity model of corporate profit. In particular, the commercial music industry has had tremendous difficulty in coping with this technological decentralization. It is this industry on which I wish to focus.

### **What This Paper Is *Not***

To date, a majority of the discussion of the effects of file-sharing software on the music industry has focused on the legal, economic, ethical, and technical issues involved. I plan to focus on none of these – not because they aren't important or interesting (they certainly are), but because I wish instead to address the intersection of technical design and the political, particularly with respect to Feenberg's conception of how technology ought to be democratized. To make such an evaluation requires a certain peripheral glance at the economic and the technical; however, I intend to address these only in so far as they pertain to the sustainability of democratization. I shall particularly avoid making normative ethical claims about whether democratization is actually ethically desirable in this case – not because I am neutral with regard to the question (I am not), but only because I believe it to be expedient to feign objectivity long enough to draw a

comparison to Feenberg for the case at hand, and to make conjectures about its long-term prospects for success.

### **Participant Interests**

As with any large-scale technological network, the participants in peer-to-peer file sharing come from a broad variety of backgrounds, and bring with them a broad variety of motivations. However, for the sake of discussing democratization, I think it fair to isolate several specific groups, as to draw out the contrasts between them. My discussion of the participant groups shall be in no means exhaustive, but shall instead serve to set three distinct reference points by which to orient ourselves in the study of the software design.

The first important group on which I wish to focus is comprised of the members of the corporate entertainment industry. Represented by groups such as the Record Industry Association of America (RIAA) and the Motion Picture Association of America (MPAA), the entertainment industry has vast amounts of intellectual property and corresponding revenue at stake. Their “participant interest” is quite clear – to maintain control over their sources of income. Through litigation, legislative lobbying, and economic pressure, organizations such as the RIAA have fought hard to remain the sole sources for entertainment media, with varying degrees of success (as we shall see.) Put in Feenberg's political terms, the recording industry has a deeply entrenched interest in

opposing democratization of the media, and in ensuring that the music industry remains a commodity market with a top-down distribution system. This is done, in part, by attempting to foil the legal and illegal usage of peer-to-peer file sharing software.

Next, we must consider the participant interests of the software developers. Here, our consideration must split into (at least) two branches: commercial and open-source developers. As with the recording industry, commercial software vendors necessarily have an eye on profit margins. Their interests include providing an attractive service to end users, providing an attractive venue for advertisers, and avoiding litigation and legal restriction, all with the goal of creating and maintaining revenue. Their relationships with the recording industry are varied; some companies have forged agreements with organizations such as the RIAA, while others have taken a more adversarial stance and sought legal protection from the recording industry.

On the other side of software development are the open source development projects. These are primarily non-corporate, non-profit individuals or teams of developers who create file-sharing software for reasons including personal use/personal interest, status or recognition within the open-source community, or to specifically protest the goals and tactics of organizations like the RIAA. The attitude among the open-source community toward corporate industry (both the recording industry and commercial software vendors) is overwhelmingly negative. As with the commercial vendors, the open-source developers have an interest in avoiding litigation at the hands of the RIAA; however, they

tend to do so through de-centralization of the development team, rather than through contractual agreements or teams of lawyers.

Finally, we must recognize those participants without whom the others need not exist – the end users/consumers. While it is certainly a gross generalization to claim any single participant interest, I do think it fair to identify one clear interest in the case of peer-to-peer sharing of music: the consumers are interested in obtaining the music they want at as little cost and legal risk as possible. I would venture that the majority of users of P2P software are largely ambivalent about both the recording and software industries. They care little about the development model used to create file-sharing software; they do care whether they can get the songs they want as easily and cheaply as possible. It is, ultimately, this participant group to whom the others must be accountable. Without consumers or end-users, there can be no recording or software industries.

Naturally, there are countless other participant groups which I have intentionally left out of my discussion. Most notably, government, the mass media, and the musicians themselves certainly play vastly important roles in the interactions between the three groups upon which I have chosen to focus. A complete analysis of all of the participant interests is of course impossible: it would have to include national governments, Internet service providers, universities, record labels, privacy activists, copyright lawyers, etc. However, I believe that an interesting case for democratization can be made in their intentional absence, without severely altering the direction of the argument.

## **The Democracy of Software and the Software of Democracy**

As with the participant interests, a complete analysis of the various file sharing software programs would be impossible. However, as with the participant interests, I believe that three carefully-selected archetypes expose a great deal about the subtleties of the “deep democratization” of software. For the purposes of this paper, I shall highlight differences between three pieces of software: Napster, KaZaA, and Gnutella.

Napster is undoubtedly the best known of the three. Written originally as a hobby project by Shawn Fanning in 1999 (Marcus 2001), Napster quickly became the de facto standard for peer-to-peer file sharing. The software's design was devilishly simple: when users launched the Napster client program, two things would happen. First, the software on the client machine would open a “listener” for incoming connections. This listener granted other users direct access to the files selected by the computer's owner to be shared on that machine. Second, the program would connect to the central index server hosted by Napster, and upload a list of its files available for download. None of these files themselves were stored on the Napster server; the server stored only the index lists for each of the clients connected to it. Users could then request particular files from the Napster server, and it would scan through its stored indexes, and return to the user a list of client machines that hosted the desired file. The user could then connect directly to a listener on one of the other users' computers, in order to download the file directly from

them.

Even once Napster incorporated later in 1999, the client software itself remained available free of charge. Napster, Inc. operated on capital investment dollars, and began to make money back by bundling advertising with the client software. The protocol by which the clients made requests to the server and to one another was proprietary, meaning that Napster intended to maintain autonomous control over its network by remaining the sole source for Napster client programs. (The protocol was actually eventually reverse-engineered, and Napster “clones” came into existence, but never gained prevalence, due in part to periodic protocol changes within the official software, which then had to be reverse-engineered all over again.) The software design itself was both clever and technically elegant; by having clients connect to one another directly for downloads, Napster sought to minimize network bandwidth requirements for themselves, and also to avoid legal issues by not hosting potentially-copyrighted files on their own servers. By serving advertisements to their millions of end-users in between file downloads, Napster, Inc. intended to secure profits for themselves without directly engaging in the distribution of copyrighted material.

Or so they thought. The vengeance of the RIAA was swift and terrible. By December of 1999, the RIAA began intense litigation against Napster, in an effort to regain control of their music distribution (Roy 2001). Several failed appeals later, Napster had lost all legal viability. The terms of the legal settlement stated that Napster had to remove 100%

of the copyrighted material from their index servers, or face stiff legal penalties (including the prohibition of all file transfers through the service.) Given that the indexes were essentially user-submitted, and not moderated by Napster employees, Napster was left with little choice but to shut down the service. Other “pirate” servers have since sprung up, but their disconnection from one another means that the number of files searchable through any one server is small, and the protocol has since fallen into disuse.

In the wake of Napster's legal woes, KaZaA emerged as the new P2P file-sharing standard. Eager to avoid Napster's fate, the Dutch-based company structured their file-sharing protocol (known as “FastTrack”) quite differently. The FastTrack protocol does not rely upon a centralized index server, the way that Napster's does (Appleton 2002). Instead, each KaZaA client program comes with a list of “supernodes” pre-installed. These supernodes serve a similar purpose to Napster's index server, but with a significant difference – the supernode computers are not owned or operated by KaZaA's corporate holder, but by the network's end users. When a user downloads the free KaZaA client and signs on to the network, the software submits its index list and sends its queries to the nearest supernode. Queries which fail at the nearest supernode are passed along to the next specified supernode, etc. What the supernode returns to the client machine is not only the location of the desired file, but also an updated list of current supernodes, such that defunct nodes are automatically removed from the search list. To add yet another twist, KaZaA client computers which are determined by the program to have adequate processing power and fast enough Internet connections may themselves be automatically

promoted to supernode status, without even requiring the knowledge or consent of the computer's owner. (Legally, the user does give consent when she clicks through the legal agreement bundled with KaZaA's installer program. In practice, of course, few users read such agreements.)

One of the primary purposes behind FastTrack's design was to avoid legal responsibility for the material distributed across the network. The organizational structure of the backing corporation serves a similar purpose. When KaZaA was successfully litigated by the Dutch recording industry in November 2001, their response was unorthodox (*Information Anarchy* 2003). Rather than complying with the terms of the court, an offshore company named Sharman Networks was formed, which purchased FastTrack. The KaZaA software itself become the property of a holding company in Australia, and the legal silver bullet was successfully dodged – the Dutch company successfully prosecuted by a Dutch court no longer existed, and two other offshore companies had taken its place.

While it may seem like KaZaA and FastTrack are the epitome of “democratic” software, the reality is not nearly so rosy, and serves as a stark reminder of the corporate revenue goals of KaZaA. In January 2002 (after KaZaA was transferred to Sharman Networks), additional third-party “spyware” was added to KaZaA. Various software packages were bundled with the client that served “pop-up” ads to users, tracked their web usage, and opened the users' unused bandwidth and processing power to perform distributed

computing tasks for Brilliant Digital Entertainment (a subsidiary of Sharman Networks). The FastTrack protocol itself has always been proprietary and sent over an encrypted connection, making reverse engineering (or even monitoring Brilliant Digital's actual usage of its newly-formed network) extremely difficult. “Clone” development projects such as KaZaA Lite did eventually succeed in reverse-engineering most parts of the FastTrack protocol, but frequent changes to it make such reverse-engineering an ongoing task. Just as the RIAA has an interest in protecting its revenue stream by eliminating competing means of obtaining its goods, KaZaA has a similar interest in protecting its own revenue, which is ultimately generated by “hidden” features of the software to which their users legally – but not typically consciously – agree to comply.

Finally, I wish to consider a third file-sharing protocol called Gnutella. While the origin of the Gnutella protocol actually pre-dates FastTrack, it is somewhat less well-known and lesser-used. Originally developed by Justin Frankel of Nullsoft (an America OnLine-owned company), Gnutella is similar to FastTrack in its decentralized network architecture (“GTK Gnutella FAQ” 2003). When AOL ordered Nullsoft to cease development on Gnutella in 2002, the authors released the protocol details as open-source software in the public domain. Unlike the proprietary FastTrack protocol, the open-sourcing of Gnutella means that anyone can develop client programs for it, without the blessing of the original author.

The results of this were both positive and negative. On the positive side, dozens of

Gnutella client programs for various computer operating systems have been developed, meaning that users are free to choose those programs with which they are most comfortable. Because these programs all operate on a shared protocol base, interoperability is generally not a problem, despite the fact the client programs themselves have different interfaces and different low-level designs. Additionally, because Gnutella itself is open-sourced, most of the client programs for it have been developed by programmers sympathetic to the open-source development model, meaning that voluntary collaboration and code sharing is common, and the clients themselves are frequently released as open-source software. One benefit of this is that, unlike KaZaA, there are no “hidden features” in the open-sourced Gnutella clients (by definition). With so many participants involved in the development of so many different clients, corporate control of the Gnutella network – either for the purposes of dismantling it or turning it into an advertising vehicle – is extremely difficult.

However, decentralization has its disadvantages, as well. Despite its openness, the variety of available client programs, and its earlier origin, the Gnutella network still enjoys fewer users than FastTrack (Spring 2001). Several likely reasons exist. First of all, Gnutella was orphaned by AOL (and the source was opened) while the project was still under development. Not only was the protocol still buggy and unreliable at the time, but it also had not had all of its operating details finalized. This meant that the early Gnutella clients were developed upon an unreliable and still-shifting protocol. Additionally, most of the client programs were little more than hobby projects for

interested developers, and lacked the capital, organizational support, and marketing resources of products like Napster and KaZaA. As a result, many end-users' first impressions of Gnutella were of crude interfaces to a semi-reliable network. As more users discovered the polish and stability of KaZaA, the number of files available on the FastTrack network multiplied rapidly, causing FastTrack to gain momentum at the expense of competing protocols such as Gnutella. While Gnutella has since stabilized (and, according to many, become technically superior to FastTrack), it has not yet caught up in either number of users nor number of available files.

### **Lessons Learned**

I believe that the case of peer-to-peer file sharing software raises some interesting issues with regard to Feenberg's ideal of "deep democratization" of technology. One obvious point of contrast is the role played by technology itself in this story. Feenberg pits his theoretical democracy in opposition to "technocracy", which he defines as "the use of technical delegations to conserve and legitimate an expanding system of hierarchical control" (103). However, in the file-sharing story, the foe to democracy is not a technocracy, but rather a more traditionally conceived bureaucracy, in which the system of control is maintained not through technical assertion, but rather through legal and economic assertion. In this case, it is technology that acts as a liberating (rather than oppressing) force in helping the "common" participants to meet their implicit goals. Feenberg chooses to focus his discussion primarily upon instances in which the populace

appropriates a technological tool from the technocrats; he pays significantly less attention to the cases in which the populace *creates* such tools themselves.

If there is any technocracy to be found in my example, it is perhaps in the proprietary software developers such as Napster and KaZaA, and not in the RIAA. Part of Napster's failed legal defense was that it was not technically possible for them to monitor traffic moving through their network. In the case of KaZaA, the protocol was intentionally engineered so that such monitoring would not be possible. Both Napster and KaZaA play the technocrat's gambit in opposition to the dominant hierarchy: "It's not technically feasible." While they do seek to grant their users more autonomy in confronting a hierarchical bureaucracy, they do so at the expense of threatening to establish an alternative technocracy – which may ultimately fare no better in serving the participant interests of the general populace.

On the other hand, I propose that Gnutella does offer the possibility of the type of democracy to which Feenberg would assent. Its design (and particularly the openness of the protocol) is intentionally such that no single technocracy could easily gain technical control of it. Even legal control would be difficult, and would require not only legislation, but also the willingness and means to enforce it. (This would most likely take the form of a law requiring Internet service providers to strictly monitor their users, a move to which most ISPs have been extremely resistant) (McGuire 2003). The non-corporate creation and distribution of Gnutella also makes it resistant to litigation – there

is no single company or individual to sue.<sup>1</sup> As such, I contend that the technical design of the Gnutella network is such that it has remarkable resilience to “de-democratization” by outside forces.

However, is it also sustainable, or are there internal forces that may lead to its self-destruction? This question, I think, is both more complicated and more interesting. Feenberg would probably like to believe that “deep democratization”, once achieved, would become the preferable mode for the participants, and would thus be maintained by those participants. I think that the answer may not be so clear. As I believe Feenberg would concede, the achievement of deep democratization is bound to be a slow and non-painless process that initially meets with tremendous momentum to the contrary. Taking a page from Thomas Hughes, Feenberg describes this momentum as “a quasi-deterministic power to perpetuate [systems] and to force other institutions to conform to their requirements” (186). I believe that this is an apt description of the current dominance of KaZaA over Gnutella. Because KaZaA has the “market share” of the users, it has a greater variety of material available on its network, and therefore greater ability to attract new users. Changing this momentum would require either the dissolution of the dominant technology (as in the case of KaZaA succeeding Napster), or a willingness on the part of enough users to settle for a smaller variety of music in the

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<sup>1</sup> Interestingly, this has not prevented the RIAA from trying. Earlier this week, a California court ruled against the RIAA in a lawsuit against Grokster and Morpheus, two corporate versions of P2P clients. The judge determined that what the software companies were doing was, in principle, no different from manufacturing a VCR or any other tool potentially capable of reproducing copyrighted material (Richtel 2003).

sort term, with the hopes of “re-routing” the current momentum to the Gnutella network, and potentially reaping greater long-term rewards.

However, even if we grant that Gnutella may eventually achieve market dominance, that would still be no guarantee of sustainability. One problem is that in shifting the legal burden away from an easily litigated company, that burden instead becomes distributed across the network's user base. Already this has resulted in the RIAA changing its legal tactics. Instead of suing companies, the RIAA has recently begun pressing criminal and civil charges against individual users (Newman 2003). Clearly they cannot reasonably prosecute an entire network comprised of over one million users, but they can hope to publicly prosecute enough scapegoats to be able to scare other users away. Such cases are currently pending; it remains to be seen whether they will have any long-term impact upon file-sharing services in the aggregate. Already, the Gnutella network is burdened with “free riders” – users who download files, but choose not to share any of their own. If the RIAA is successful in frightening enough participants to get a significant portion of the Gnutella community to stop contributing, it could very well threaten the collapse of the currently democratic system.

In this case, there is also the interesting question of “too much success.” In its current incarnation, P2P sharing of music is a case of a democracy that is parasitic upon a bureaucracy. The *distribution* of the material may become democratized, but what of its production? It is conceivable that if the democratization of the distribution were so

successful that the production of the distributed material were no longer profitable, the member organizations of the RIAA would no longer have reason to exist. If their participant interest (revenue) were no longer satisfied, and they ceased participating, then the participant interest of the consumer (unrestricted access to a wide variety of music) would quite possibly also cease to be satisfied. A strong argument could be made that such a parasitic democracy could not possibly be sustainable – or at least that it would have to monitor the health of its host carefully in order to assure its own continued existence.

### **Two Possible Worlds**

It seems to me that there are two possible outcomes to the current democratization occurring in the music file-sharing world. One is that the corporate music industry alters its business model such that it absorbs the role currently played by the software developers. The other is that the corporate recording industry fails, and production itself becomes a decentralized enterprise. In either case, the consumers will have gained something, although perhaps not what they intended.

There is at least some precedent for both possibilities. Earlier this week, the RIAA announced a partnership with Apple computer to provide an online music service intended to compete with the current file-sharing networks (Richtel 2003). The business model is such that users pay a subscription fee, and in return gain access to download

music at a nominal fee (currently 99 cents per song) from an Apple-hosted web site. The hope is that the service will be attractive to users because it would eliminate the problems with “hunting down” desired files across a complex network, it would be legal and sanctioned by the music industry, and it would provide an even greater variety of material than the current distributed networks, all at a price that users would (hopefully) be willing to pay.

The alternative possibility, in which the corporate music industry fails entirely, would be quite a different world. If the means of production became as democratic and decentralized as the means of distribution, then it is quite likely that today's Pepsi-sponsored pop stars would become a thing of the past. Already sites such as mp3.com allow musicians to make their own music available directly to consumers; several major recording artists, disgruntled with the record industry, have begun to follow this trend. Whether this model of distribution is ultimately to the benefit of consumers is far from clear. What is clear is that it would most likely fail to satisfy consumer demand in its current guise: consumers still want pop stars. The price of true democratization – in which corporate control of music production was neither possible nor desired – would likely be that musicians themselves would cease to be professionals, and their art would cease to be a commodity. Whether such an outcome would be the apocalypse or the promised land is largely a matter of perspective and personal taste.

## Bibliography

Appleton, Randy. "The KaZaA Protocol." Course notes for CS442, Northern Michigan University <[http://cs.nmu.edu/~randy/Classes/CS442/The\\_Kazaa\\_Protocol.html](http://cs.nmu.edu/~randy/Classes/CS442/The_Kazaa_Protocol.html)>.

*Information Anarchy Project*. 19 Mar. 2003 <<http://www.infoanarchy.org/>>.

Feenberg, Andrew. *Questioning Technology*. New York: Routledge 1999.

"GTK Gnutella FAQ." *GTK Gnutella Project*. 2002 <<http://gtk-gnutella.sourceforge.net/index.php?page=faq>>.

Marcus, Sandra. "The History of Napster." 6 Dec. 2001 <<http://web.utk.edu/~smarcus/History.html>>.

McGuire, David. "Privacy Ruling Goes Against Verizon." *The Washington Post*. 24 Apr. 2003 <<http://www.washingtonpost.com/wp-dyn/articles/A33972-2003Apr24.html>>.

Newman, Heather. "Recording Industry Has Warning: File-Sharers Have To Face The Music." *The Detroit Free Press*. 5 April, 2003 <[http://www.freep.com/money/tech/newman5\\_20030405.htm](http://www.freep.com/money/tech/newman5_20030405.htm)>.

Richtel, Matt. "Entertainment Industry Loses In Web Case." *New York Times on the Web*. 25 Apr. 2003 <<http://www.nytimes.com/2003/04/26/technology/26MUSI.html>>.

Richtel, Matt. "Apple Said To Be Entering E-Music Fray With Pay Service." *New York Times on the Web*. 25 Apr. 2003 <<http://www.nytimes.com/2003/04/28/technology/28APPL.html>>.

Roy, Danielle. "Napster Timeline." *IDG News Service* 2 Apr. 2001 <[http://www.idg.net/english/crd\\_napster\\_497926.html](http://www.idg.net/english/crd_napster_497926.html)>.

Spring, Tom. "Napster Fans Find Lively Alternative – For Now." *PC World*. 12 Jul. 2001 <<http://www.pcworld.com/resource/printable/article/0,aid,55006,00.asp>>.