FTC Public Workshop: Peer-to-Peer File Sharing Technology

Response to the Questions Posed

Alex Valentine
Software Developer
Pennsylvania State University
[redacted]

## A. Use of P2P File Sharing Technology

*1. What are the differences between P2P file-sharing technologies and technologies that use central server or other models?*

The three real differences between most P2P models and pre-P2P models for file distribution (FTP, IRC, HTTP) are:

- The P2P model requires minimal technical knowledge. With previous models there was a learning curve, users had to know how to install and configure servers in order to share files. In the P2P model, the only user requirement is a desktop software install.
- Search is integrated in to the P2P model by default. With previous file sharing tools, there was no built-in way to find content shared on machines without someone manually sending an IP address to browse. Almost all P2P protocols have a search mechanism built-in to the protocol.
- By default, downloaded files are shared. In previous models, users would have to manually share a file.

*2. What are the different models of P2P file-sharing technology? Please describe the differences between the models and the applications that use each model.*

While there are a variety of P2P models that exist, most can be separated in to the following three categories.

- **Centralized:** The model where a central server acts as a matchmaker for peers on the network. The best example of a centralized P2P network is the original Napster model.
- **Decentralized:** A model where the P2P network exists without a central server or rigid hierarchy. The original Gnutella protocol is a good example.
- **Hybrid:** The hybrid P2P network is a combination of centralized and decentralized topologies. The FastTrack protocol and the latest version of the Gnutella protocol are good examples of a

decentralized P2P file sharing network with a sense of hierarchy. Instead of a messy network of peers with all the same capabilities, peers on connections that meet certain criteria are used as gateways to the network for slower peers.

Bit torrent is a different example of a hybrid P2P protocol. Bittorrent has many unique characteristics that make it possible for users to create an independent, distributed P2P network with an Internet connection and basic computer knowledge.

*3. Who uses P2P file sharing technology and programs?*

P2P file sharing users are a diverse group, but the largest demographic would have to be the 16- 28 year old range. The primary user demographics to tend to mirror the popular content type distributed on each network. So if the primary content on a particular network happens to be music, the primary user demographic will match the average music buyer. Other networks designed for specific communities, such as legal UNIX software and Linux operating system distribution, tend to have wide user demographics that reflect the diversity of the community.

*4. What must customers do to uninstall P2P programs?*

The large majority of P2P programs in circulation today are easily uninstallable using the typical operating system method, such as the "add and remove" programs menu in Microsoft windows. There may be some difficulties in removing components of P2P software from specific companies, but on average, P2P software is no more difficult to uninstall than a typical shareware/freeware program available for download on the Internet.

**B. The Role of P2P File- Sharing Technology in the Economy**

*1. What are the current commercial, scientific, and/or industrial uses for P2P file- sharing technology?*

P2P file sharing technology is used in multiple industries around the globe. P2P is great solution for people who need to collaborate electronically and share files. There are many open source and commercial products designed to aid collaboration through the use of P2P file sharing technology. A good example of a commercial project is Groove, which is even used by many organizations, including the federal government, to securely collaborate and share files.

*2. Can current P2P file- sharing technology enhance business and industrial efficiency? How are the benefits different from the central*

*server model?*

P2P file sharing technology can enhance efficiency in almost all sectors of the economy in which electronic collaboration takes place. Wit the role of e-mail, cell phones, and the Internet in business today, current P2P technologies can be used to bring people together. P2P file sharing is viable solution for both user-to-user file sharing, but also file publication to large communities.

The future of P2P file sharing is providing a secure platform for individual users and groups to collaborate. P2P has a lot of advantages over the classic client server model. A P2P model empowers users and usually requires very little in the way of technical knowledge. Traditional server file sharing technologies require a good of technical knowledge and permission to be granted by a system administrator.

P2P technologies are great for small businesses that don't have a large IT budget. P2P is a good solution B2B collaboration too, since the client/server model usually requires accounts from an organization's centralized authentication service. Most IT directors are very reluctant to give people outside the organization access to internal authentication services.

3. *What are the future commercial, scientific, and/or industrial uses for P2P file sharing technology?*

P2P file sharing technologies, like any disruptive technology, are going through the process of maturation. We are starting to see variety of "grown up" tools designed for the commercial, educational, and industrial marketplaces. In the commercial sector there are quite a few tools designed to enable secure file sharing between organizational users. In the academic world, researchers are working on authenticated file sharing systems that use centralized services and let users specify access control rules. In the industrial world, people are using techniques from P2P file sharing protocols to enable smart sensing and messaging technologies for diagnostic information.

*4. How will these future uses of P2P file sharing technology enhance business and industrial efficiency?*

P2P file sharing technologies will increase efficiency by enabling users and groups to share files with each other in a seamless manner, letting users collaborate with others across the globe. At the same time, these technologies will reduce the stress on existing systems that have been misused for years.

A classic example is the e-mail server. In most e-mail servers, the predominant traffic in terms of bandwidth, besides unsolicited bulk email, is file attachments. E-mail has been misused for years as a file transfer method. P2P technologies designed for user-to-user file sharing will eventually take a great deal of stress off corporate and education e-mail systems.

5. *If P2P file sharing will enhance business and industrial efficiency, what effect will that have on the nature and extent of competition in the economy?*

I am not an economist by trade, but my best guess is that P2P would encourage competition, not only in the computer software market, but by empowering smaller organizations by providing a collaborative platform without a large scale price tag.

6. *What are the current business models for P2P file sharing companies?*

Here are a few business models in current use:

- **Commercial:** A company sells proprietary software to individuals and/or institutions.
- **3rd Party:** A company gives away software and bundles third party components. The bundled components are usually a combination of spyware and adware. The company is paid by it's partners for the information and/or advertising referrals.
- **Advertising:** Advertisements appear inside the P2P software, in some cases popups or affiliate links as a result of third party software, typically installed without the user's knowledge.
- **Open Source:** Most of the real innovative file sharing technologies and networks are not controlled by any one organization or business, but are the result of individuals and groups developing free non-commercial software.

7. *What is the likely future competitive and/or impact of P2P file sharing technology across the economy as the technology improves?*

While there is no shortage of lobbyists from the Movie and Music industry who will claim that the sky is falling and that P2P file sharing technologies are to blame. There is quite a bit of evidence that points the finger of blame towards the content industries themselves.

8. *To what extent does P2P file-sharing technology have the promise to impact the manufacture, inventorying, and delivery of goods and services?*

P2P file sharing will have a minor impact on the sales of movies, music, books, and software. The sharing of copyrighted content through the Internet is not a new concept, but never before has it been so accessible to such a large audience.

The affected industries have been aware of this problem for quite some time but have failed to provide the services that consumers are demanding. The best way to minimize the effect of P2P file sharing networks is by providing value added services that consumers will prefer over the illicit sharing of copyrighter materials.

## C Identification of P2P File-Sharing Software Program Risks

*1. What are the risks to consumers caused by the downloading and use of P2P file-sharing software?*

P2P file sharing software has the same risks associated with any other binary application that is downloaded over the Internet. From a security standpoint, P2P file sharing applications do not have any higher risks associated with them when compared to other network services.

The main risk associated with all software programs downloaded from the Internet is the potential for inadvertent security vulnerabilities, 3rd party software (spyware), and the potential for virus infection. However, P2P file sharing programs do not have an elevated risk level when compared to other software categories.

*2. Does the use of P2P file sharing software pose a security risk to the personal information of consumers?*

P2P file sharing does pose a risk to consumer personal information. In the first generation of P2P file sharing applications, there were many cases of consumers inadvertently sharing private files. This risk has been addressed in many of the widely used file sharing applications. While it is still possible to inadvertently share sensitive information, users would have to be oblivious to the security safeguards that are now in place.

The primary risk consumers face is with commercial P2P file sharing applications such as KaZaA, which contain 3rd party applications that monitor and report consumer activity on their personal computer. The risk of spyware is not exclusive to P2P file sharing networks, many commercial freeware and shareware applications rely on a spyware oriented business model.

*3. Does the use of P2P file-sharing software inadvertently expose consumers to pornographic and other inappropriate content?*

The primary purpose of most public P2P file sharing applications is to search, retrieve, and share. Consumers are not exposed to content unless they execute a search and download content based on the search result. While it is possible for pornographic and other inappropriate content on P2P networks to mislabeled as appropriate content, this is risk is no greater than using a search engine on the world wide web. Many file sharing applications have parental filtering built-in.

4. *Does the distribution and use of P2P file-sharing software pose a risk to consumers for installing spyware?*

Commercial, closed source, P2P networks have embraced the spyware business model. However, the risk is no greater than the thousands of other freeware or shareware applications, which use spyware as a revenue generator. The current situation is much better today that it was a few years ago.

The availability of spy ware removal tools and the knowledge level of consumers has increased in the past two years. The use of open source software and open source P2P file sharing software has forced many commercial P2P file sharing companies to reduce or eliminate the use of 3rd party applications as a business model. The market conditions, boosted by the use of open source applications and removal tools, has forced many companies to reevaluate their business models.

5. *Does the distribution and use of P2P file sharing software cause consumers to install adware?*

Many commercial P2P file sharing applications include 3rd party adware components. As in the case of spyware, this is not a P2P specific issue, but a problem that has plagued the software industry with the popularity of applications that appear to be free but are really infiltrating a user's desktop. As in the case of spyware, the war against adware has turned positive, thanks to the abundance of removal tools and the migration towards open source software.

6. *Does the use of P2P file-sharing software expose consumers to viruses and/or malicious code?*

P2P file-sharing applications can expose users to viruses. Most modern P2P networks have security features in place to prevent users from downloading malicious software. However, it is important to realize that file retrieval on a P2P file-sharing application is the same as file retrieval from a client/server method such as downloading a file from a web, FTP, or e-mail server. The transport mechanism does not increase or decrease

the risk to users. E-mail is the number one transport mechanism for viruses.

*7. Does the installation and use of P2P file sharing impair computer functionality?*

The resounding answer is no, P2P file sharing applications tend to use few resources on a user's machine. The average P2P file sharing application uses less resources than your basic word processor. One threat, which is not P2P specific, is the amount of resources used by 3rd party applications such as spyware and adware. Again, spyware and adware are not a P2P specific problem.

**D. Disclosure of P2P File-Sharing Software Risks**

*1. What do studies, surveys, or other empirical research reveal about the extent to which users of P2P file-sharing software programs are aware of the risks?*

In general, most users have a limited understanding of software security risks. The fact is, that there is not an elevated risk associated with P2P file sharing programs, compared to the security risks of other network applications. Security risks associated with the much more common Internet services, such as e-mail and the World Wide Web, pose a much greater risk to users.

*2. To the extent that users are unaware of the risks associated with P2P file-sharing software programs, would disclosure requirements be an effective method for educating consumers about these risks?*

As mentioned before, there is very little in the way of risks associated with P2P file-sharing programs that are not applicable to any other network application. In many cases, other applications pose more of a risk. If disclosure requirements were mandated for P2P file sharing applications, they should also be required for hundreds of other network applications.

Disclosure requirements seem to be a solution in search of a problem. Software security is not something that can be regulated, and in this case, spending government resources to regulate P2P file sharing applications under the umbrella of “software security” would be great misuse of government power.

*3. Do P2P file sharing applications currently disclose risks adequately to users?*

P2P applications pose no greater risk to users than any other common network application. In general, the requirement of software developers is that they work hard to write secure applications. It is impossible for software developers to predict what the potential risks are. If problems are found, they should be fixed in a timely manner. The real security threat to most users are the result of poorly designed operating systems. If the federal government wants to inform users of software risks, it should start with the most widely used, highest- risk software.

*4. What methods, other than risk disclosures, can be used to educate consumers about potential risks associated with file- sharing software?*

As mentioned before, there are no elevated risks concerning P2P file sharing applications when compared to other networked applications. The one aspect of all freeware/shareware applications, that should be addressed by the federal government, is the use of spyware and adware. It would be helpful to require uniform disclosure for software applications that bundle spyware and adware.

**E. Technological Solutions to Protect Consumers From the Risks Associated with P2P File- Sharing Software Programs**

*1. What types of blocking and filtering technology exist to protect users..?*

Since its been established that there is no elevated security risk, why would a user need install an additional application? The simple answer is use a secure application. The logic of installing blocking and filtering software for an application at the desktop level, that the user wants to execute is flawed. In the case of a corporate/institutional environment, there are a variety of methods and products for blocking specific applications.

*2. Are the existing blocking and filtering programs effective.*

The existing network level firewalls and appliances are effective.

*3. What future changes to blocking and filtering technologies might enhance the protections from risks associated with P2P technologies?*

Given that there are very few P2P specific risks, there are no enhancements needed.

*4. What changes to the architecture of P2P file- sharing software programs might reduce the risks associated with P2P file- sharing software programs for users?*

Modern P2P file sharing applications have made great strides in preventing inadvertent sharing and increasing security. As with all software, the marketplace will move towards P2P software that has more features and better security.

**F. P2P File- Sharing and Music Distribution**

1. What are the economic models of music distribution that use P2P file sharing technology?

P2P file sharing is designed for user and group sharing. While some form of P2P file distribution could be viable way to reduce bandwidth costs associated with large media files, the client/server model seems to be a much more viable way for companies to distribute pay- per- download music. There have been a few alternative suggestions, including a flat fee "official" P2P network, but there doesn't seem to be an alternative model that is compatible with the current compensation structure of the music industry.

2. How is P2P file- sharing technology different from single server downloading sources?

P2P file sharing networks have many advantages over current industry supported download services. The biggest advantage is control. The recording industry has mandated that all major music services must user some form of digital rights management. This gives the industry control over what users can do with the music they purchase, virtually eliminating format shifting and other fair use freedoms. Consumers have shown time and time again that they need to have the ability to control content they purchase.

The typical industry response is that piracy would be even more widespread if music services did not use proprietary "drmed" file formats. This shows a complete lack of understanding of P2P file sharing applications. While they protect digital downloads with an insecure protection model (software based digital rights management), the industry simultaneously releases lossless quality music on an unsecured format. (Compact Discs)

The nature of P2P file distribution is that one source, i.e. one person taking two minutes to rip and share CD on the Internet, is the only requirement for worldwide distribution within a matter of days. The nature of P2P file sharing, in which downloaded files are shared by default, is that increased demand for a particular file increases the amount of sources sharing that file.

Current industry download offerings fail to offer any sense of community, with the notable exception of iTunes playlist publication feature. P2P file sharing users don't just download and share files, users form small communities around particular interests. Most P2P file sharing applications allow users to browse each other's collections, chat in groups, and use instant messaging. The music industry has failed to recognize the social aspect of Internet file sharing.

3. *To what extent do P2P file-sharing programs currently compete with pay-per-download service?*

The reason why pay-per-download services can compete with free downloads, is that a service like iTunes provides value. Users can find files quicker, download faster, and the integrated approach with iTunes and the iPod makes it easier for users to enjoy their purchases. Unfortunately even the best service in the market today does not come close to meeting consumer expectations.

The best way for the record industry to reduce P2P file sharing usage, is by offering more features with digital download services. There are quite a few ways in which the music industry can reduce P2P usage by adding value and feature to pay-per-download services:

- Provide a service that allows users to pick multiple non-drm file formats
- Give users a variety of quality options including high-bitrate and loseless file formats
- Provide community enabling features such as user reviews, ratings, chat, group chat, community forums, and playlist sharing.

If the industry wants to get serious about music download services, it should provide the features that are so obvious to music enthusiasts. Basic e-commerce features, popularized with Amazon.com, such as reviews and ratings, existed for many years. Yet no industry blessed music service provides even the simplest of community feedback systems.

Its not that the industry isn't aware of such features, the problem is that record industry has failed to make the the paradigm shift from entrenched oligarchy protectionist to nimble e-commerce innovator.

*4. Does P2P file sharing technology lowers the cost of music dissemination?*

P2P file sharing can significantly lower the bandwidth costs associated with music distribution. As far as overall costs are concerned, bandwidth

is only a small fraction of the costs associated with running a large scale commercial music distribution site. Large media files such as high definition video content, is where some form of P2P file distribution could lead to significant cost savings.

*5. Are record labels willing to distribute music through P2P file-sharing?*

My best guess would be no, given the record industry's record concerning emerging technologies.

*6. Is there empirical support for P2P file-sharing technology increasing music sales?*

http://www.eecs.harvard.edu/p2pecon/confman/papers/s1p2.pdf
http://www.billboard.com/bb/biz/newsroom/digital/article_display.jsp?vnu_content_id=1000513020

http://www.washingtonpost.com/ac2/wp-dyn/A34300-2004Mar29?language=printer

*7. Are music files on P2P file sharing networks being intentionally polluted or corrupted?*

The large majority of music files available on P2P file sharing networks are not “corrupted” or “polluted.” While there may be a few cases of industry or individuals attempting to purposely share corrupted content on file sharing networks. By design, the networks tend to weed out corrupted files by popularity. Files that do not meet a user's standards are deleted and unshared. When given a choice of potential downloads in a query result list, most users will pick the file that is shared by the largest amount of users.

## G. P2P File-Sharing and Its Impact on Copyright Holders

*1. What is the impact of P2P file-sharing on copyright holders?*

P2P file-sharing technologies have had an enormous impact on the music industry. In the true spirit of a disruptive technologies, P2P file-sharing has forced an a slow moving oligopolistic industry to change. As with most disruptive technologies, the initial reaction has been to fight change. Hopefully, the music industry and others like it, will come to embrace change and provide consumers the formats, music, and services that they are demanding.

*2. Is it possible to measure downloading of copyrighted materials by users of P2P file-sharing programs?*

The short answer is no, while a few years ago, monitoring one or two of the larger file sharing networks would produce accurate data, the model for P2P file sharing networks has changed. Instead of a handful of large networks, users are moving to smaller "content specific" communities.

3. *Can P2P file-sharing program providers effectively protect against copying in violation of copyright laws?*

Given the distributed nature of P2P file sharing, it would be impossible for a service provider to realistically prevent the sharing of copyrighted material in a scalable manner. It is also important to realize that most P2P file sharing networks and protocols are not under the control of one service provider. Even the term "service provider" is misleading, P2P file sharing companies simply provide a client side application, they do not control the infrastructure in a decentralized P2P network.

4. *Is there technological capability for the P2P file sharing technology industry to implement a system that either prevents the unauthorized sharing of content or only permits the sharing of content when there is compensation to the copyright holder?*

While it is technically feasible for an individual company to create such a network in cooperation with copyright holders, it is a mistake to think that the majority of file sharing networks are controlled by commercial companies. The fact is, most networks are simply protocol standards that application developers adhere to and many of these applications are non-commercial efforts.

5. *Will technological changes allow providers to protect their copyrighted materials from infringement* by P2P file sharing users?

While copyright holders have devised a number of schemes to prevent the redistribution of content, the simple fact is that as long as somewhere in the process, content is viewed and/or heard, duplication and redistribution can and will take place. Regardless of what steps are taken to prevent redistribution, people will find ways take control of purchased content.

A 100% secure method for content protection does not and will not exist. The best way to prevent users from sharing files via P2P, FTP, IRC, HTTP, CDR, or any other distribution medium is to provide value added services.

6. *Would consumers benefit or be harmed by industry-wide standards for the protection of copyrighted materials?*

Any way you approach the problem, content and copy protection in any form, removes a user's fair use- rights. So who in the end would be affected by industry- wide content protection? Commercial pirates and file sharing users would be able to bypass any content protection technology put in place.

At the end of the day, the only people who would be affected are law abiding consumers who want to practice their fair use right to back up and format shift. The media industries are pushing for widespread DRM to prevent users from exercising their fair user right to format shift. So every time a new media format comes along, users will be forced to re-purchase their collections.

7. *Are their licensing proposals available that would address the impact of P2P file- sharing on copyright holders?*

While there are a few licensing proposals that call for a widespread change in the way copyright holders receive royalties. Many of the proposals suggest government regulation, subsidization, and taxation.

While the current licensing structure has many flaws, it is not to blame for the widespread use of electronic file- sharing. Content providers need to distribute their content in the file formats and channels that their customers are demanding. Providing services that meet the needs of consumers, at a fair price.