

# Exploring The World Of Collaborative Sharing Over The Internet Through The Use Of A Peer-To-Peer Network Protocol

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**Abstract** - P2P downloads represent a large portion of today's Internet traffic. Millions of users operate BitTorrent and generate more than 30% of the total Internet traffic. This paper mainly examines the working of the BitTorrent P2P protocol explaining the Terminology involved in the BitTorrent community, its advantages over other file sharing protocols, the various popular BitTorrent clients, and the best torrent sites for searching torrents. It also focuses on the privacy, security and legal aspects related to its usage, and the future technologies - Magnet Links, DHT, and PeX which will increase its effectiveness and popularity.

**Index Terms**— BitTorrent, DHT, P2P, PeX, Torrent

## I. INTRODUCTION

The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW), the infrastructure to support email, and peer-to-peer networks.

Overall Internet usage has seen tremendous growth. From 2000 to 2009, the number of Internet users globally rose from 394 million to 1.858 billion[1]. By 2010, 22 percent of the world's population had access to computers with 1 billion Google searches every day, 300 million Internet users reading blogs, and 2 billion videos viewed daily on YouTube[2]. According to Euromonitor, by 2020 43.7% of the world's population will be users of the Internet.

File sharing( the practice of distributing or providing access to digitally stored information, such as computer programs, multimedia(audio, images and video), documents or electronic books) is an example of transferring large amounts of data across the Internet. A computer file can be emailed to customers, colleagues and friends as an attachment. It can be uploaded to a website or FTP server for easy download by others. It can be put into a "shared location" or onto a file server for instant use by others. The load of bulk downloads to many users can be eased by the use of "mirror" servers or peer-to-peer networks.

A peer-to-peer (P2P) network is a type of decentralized and distributed network architecture in

which individual nodes in the network (called "peers") act as both suppliers and consumers of resources, in contrast to the centralized client-server model where client nodes request access to resources provided by central servers. In a peer-to-peer network, tasks (such as searching for files or streaming audio/video) are shared amongst multiple interconnected peers who each make a portion of their resources (such as processing power, disk storage or network bandwidth) directly available to other network participants, without the need for centralized coordination by servers[3].

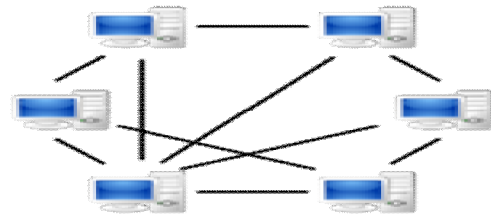


Fig. 1: A peer-to-peer (P2P) network in which interconnected nodes ("peers") share resources amongst each other without the use of a centralized administrative system

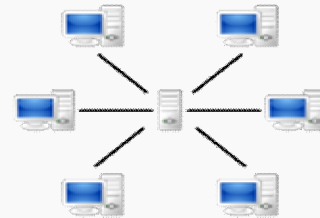


Fig. 2: A network based on the client-server model, where individual clients request services and resources from centralized servers

Another characteristic of a P2P network is its capability in terms of fault-tolerance. When a peer goes down or is disconnected from the network, the P2P application will continue by using other peers. For

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## Test Cases Optimization Evaluation Using Efficient Algorithm with UML

example, in a BitTorrent system, any client downloading a certain file is also serving as server. When a client finds that one of the peers is not responding, it searches for other peers, picks up parts of the file where the old peer was, and continues the download process. Compared to a client-server model, where all communication will stop if the server is down, a P2P network is more fault-tolerant.

### II. TRENDS AND IMPACT

The first appearance of open source systems such as Napster in 1999 radically changed file-sharing mechanisms. The traditional client-server file sharing and distribution approach using protocols like FTP (File Transfer Protocol) was supplemented with a new alternative — P2P networks. At the time, Napster was used extensively for the sharing of music files. Napster was shut down in mid-2001[4] due to legal action by the major record labels.

The shutting of Napster did not stop the growth of P2P applications. A number of publicly available P2P systems have appeared in the past few years, including Gnutella, KaZaA, WinMX and BitTorrent, to name but a few. From analysis of P2P traffic, BitTorrent is still the most popular file sharing protocol. As of February 2013, BitTorrent was responsible for 3.35% of all worldwide bandwidth, more than half of the 6% of total bandwidth dedicated to file sharing [5].

P2P technology is not just used for media file sharing. For example, in the bioinformatics research community, a P2P service called Chinook[6] has been developed to facilitate exchange of analysis techniques. The technology is also used in other areas including IP-based telephone networks, such as Skype[7], and television networks, such as PPLive[8]. Skype allows people to chat, make phone calls or make video calls. When launched, each Skype client acts as a peer, building and refreshing a table of reachable nodes[9] in order to communicate for chat, making phone calls or video calls. PPLive shares live television content. Each peer downloads and redistributes live television content from and to other peers[10].

### III. EXPLORING THE BITTORRENT P2P PROTOCOL

#### A. Basics Of Bittorrent

BitTorrent (often abbreviated as BT) is a peer-to-peer (P2P) protocol (a description and set of rules on how to do things) that enables fast downloading of large files using minimum Internet bandwidth. Bram Cohen, designed the protocol in April 2001. Cohen's idea was to "break" the file being transferred into smaller segments called pieces. To save bandwidth, each person downloading (more commonly referred to as peers in the BitTorrent community) would have the pieces that they acquired available for upload to other peers in the swarm (the entire network of people connected to a single torrent).

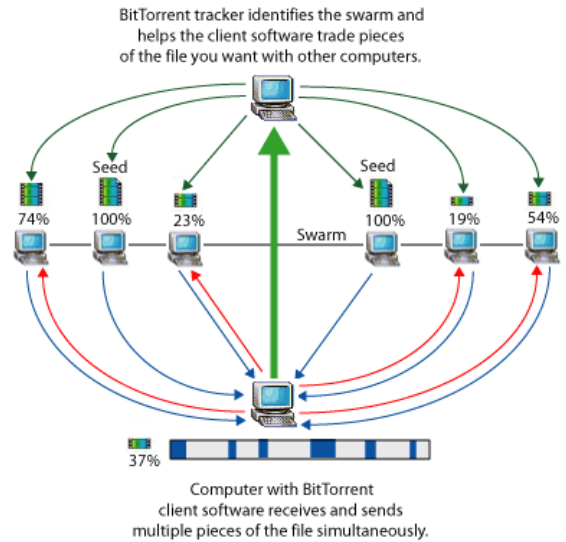


Fig. 3: Functioning of BitTorrent protocol

In this way, much of the load of sharing the file to every peer interested in it is offloaded to the peers. Note that a seed is basically a peer with every piece, so when a peer successfully attains all data in the torrent contents that peer becomes a seed as well. See Fig. 3 [11].

The most important factor for determining whether a swarm can continue to allow peers to complete a torrent is the availability. The availability of a torrent is the number of complete copies of the torrent contents there are distributed in the part of the swarm you're connected to, including the data you have. In most cases, if there is an availability of 1.0 or greater, then even if one single person does not have all the pieces, they are all still distributed across the entire swarm and can be acquired to form the complete file.

In order for everyone to be able to locate one another, there needs to be some centralized location that peers could connect to in order to obtain the other peers' IP addresses. BitTorrent trackers serve as this centralized location. In the most basic explanation, for each given swarm, a tracker only needs to collect a peer's IP address and port number to share with other peers connecting to that same swarm.

Because of the very nature of BitTorrent, speeds are not guaranteed for any given torrent swarm. While you may get great speeds in one swarm, you might not in another. This is due to the fact that BitTorrent is a P2P protocol, so it depends on the upload speeds of the other peers you are connected to to generate your download speeds. A common misconception held by many people is that torrent swarms that contain more seeds and peers are faster than those with less. This is not always the case. There can be a swarm with only a few seeds and/or peers on fast Internet connections, and you'll be able to get great speeds from them, while a swarm with many more seeds and/or peers might contain mostly people with slow, dial-up Internet connections, will get you terrible speeds from them. In the same vein, *connecting* to more seeds and/or peers does not equate

to greater speeds, and seeds don't necessarily give better speeds than normal peers.

BitTorrent was designed with relatively basic system requirements in mind. Machines running any Microsoft Windows operating system from Windows 2000 and newer are able to run BitTorrent as well. Support for operating systems older than Windows 2000 has been dropped since BitTorrent v2.0.

### **B. Terminology**

Here is a glossary of the terms that are mostly used in the BitTorrent community.

#### **Availability**

(Also known as distributed copies.) The number of full copies of a file (or set of files and directories) directly available to the client. Each seed adds 1.0 to this number, as they have one complete copy of the file. A connected peer with a fraction of the file available adds that fraction to the availability, if no other peer has this part of the file.

Example: a peer with 65.3% of the file downloaded increases the availability by 0.653. However, if two peers both have the same portion of the file downloaded - say 50% - and there is only one seeder, the availability is 1.5.

Sometimes "distributed copies" is considered to be "availability minus 1". So if the availability is 1.6, the distributed copies will be 0.6 because it is only counting the "copies" of the file.

#### **Choked**

Describes a peer to which the client refuses to send file pieces. A client chokes another client in several situations:

- The second client is a seed, in which case it does not want any pieces (i.e., it is completely uninterested)
- The client is already uploading at its full capacity (it has reached the value of max\_uploads)
- The second client has been blacklisted for being abusive or is using a blacklisted BitTorrent client.

#### **Client**

The program that enables p2p file sharing via the BitTorrent protocol. Examples of clients include µTorrent and Vuze.

#### **Downloader**

A downloader is any peer that does not have the entire file and is downloading the file. This term, used in Bram Cohen's Python implementation, lacks the negative connotation attributed to leech. Bram prefers downloader to leech because BitTorrent's tit-for-tat ensures downloaders also upload and thus do not unfairly qualify as leeches.

#### **Fake**

A fake torrent is a torrent that does not contain what is specified in its name or description (e.g. a torrent is said to contain a video, but it contains only a snapshot of a moment in the video, or in some cases a virus).

Hash

The hash is a string of alphanumeric characters (typically hexadecimal) in the .torrent file that the client uses to verify the data that is being transferred. Hash is the shorter form of the word Hashsum.

Torrent files contain information like the file list, sizes, pieces, etc. Every piece received is first checked against the hash. If it fails verification, the data is discarded and requested again. The Hash Fails field in the torrent's General tab shows the number of these hash fails.

Hash checks greatly reduce the chance that invalid data is incorrectly identified as valid by the BitTorrent client, but it is still possible for invalid data to have the same hash value as the valid data and be treated as such. This is known as a hash collision. Torrent and p2p files typically use 160 bit hashes that are reasonably free from hash collision problems, so the probability of bad data being received and passed on is very small.

#### **Index**

An index is a list of .torrent files (usually including descriptions and other information) managed by a website and available for searches. An index website can also be a tracker.

#### **Leech**

The term leech refers to a peer (or peers) that have a negative effect on the swarm by having a very poor share ratio, downloading much more than they upload. Leeches may be on asymmetric Internet connections or do not leave their BitTorrent client open to seed the file after their download has completed. However, some leeches intentionally avoid uploading by using modified clients or excessively limiting their upload speed.

#### **Lurker**

A lurker is a user that only downloads files from the group but does not add new content. It does not necessarily mean that the lurker will not seed. Not to be confused with a leecher.

#### **Overseeded**

A torrent is overseeded when its availability is so high that seeders have difficulty finding downloaders.

#### **p2p**

Stands for "peer to peer", which is the technology used for file sharing among computer users over the Internet. In a p2p network, each node (or computer on the network) acts as both a client and a server. In other words, each computer is capable of both responding to requests for data and requesting data itself.

#### **Peer**

A peer is one instance of a BitTorrent client running on a computer on the Internet to which other clients connect and transfer data. Usually a peer does not have the complete file, but only parts of it. However, in the colloquial definition, "peer" can be used to refer to any participant in the swarm (in this case, it's synonymous with "client").

#### **Piece**

This refers to the torrented files being divided up into equal specific sized pieces (e.g. 64kB, 128kB, 512KB, 1MB,

2MB or 4MB). The pieces are distributed in a random fashion among peers in order to optimize trading efficiency.

### **Ratio credit**

A ratio credit, also known as upload credit or ratio economy, is a currency system used on a number of private trackers to provide an incentive for higher upload/download ratios among member file-sharers. In such a system, those users with greater amounts of bandwidth, hard drive space (particularly seedboxes) or idle computer uptime are at a greater advantage to accumulate ratio credits versus those lacking in any one or more of the same resources.

### **Seed**

A seed refers to a machine possessing 100% of the data. A downloader that obtains 100% of the data becomes a seed.

Seeding refers to leaving a peer's connection available for downloaders to download from. Normally, a peer should seed more data than download. However, whether to seed or not, or how much to seed, is dependent on the availability of downloaders and the choice of the peer at the seeding end.

### **Share ratio**

A user's share ratio for any individual torrent is a number determined by dividing the amount of data that user has uploaded by the amount of data they have downloaded. Final share ratios over 1.0 carry a positive connotation in the BitTorrent community, because they indicate that the user has sent more data to other users than they received. Likewise, share ratios under 1 have negative connotation.

### **Snubbed**

An uploading client is displayed as snubbed if the downloading client has not received any data from it in over 60 seconds.

### **Super-seeding**

When a file is new, much time can be wasted because the seeding client might send the same file piece to many different peers, while other pieces have not yet been downloaded at all. Some clients, like ABC, Vuze, BitTornado, TorrentStorm, and µTorrent have a "super-seed" mode, where they try to only send out pieces that have never been sent out before, theoretically making the initial propagation of the file much faster. However the super-seeding becomes less effective and may even reduce performance compared to the normal "rarest first" model in cases where some peers have poor or limited connectivity. This mode is generally used only for a new torrent, or one which must be re-seeded because no other seeds are available.

### **Swarm**

Together, all peers (including seeds) sharing a torrent are called a swarm. For example, six ordinary peers and two seeds make a swarm of eight.

### **Torrent**

The small metadata file you receive from the web server (the one that ends in .torrent.) Metadata here means that the file contains information about the data you want to download, not the data itself. This is what is sent to your

computer when you click on a download link on a website. You can also save the torrent file to your local system, and then click on it to open the BitTorrent download. This is useful if you want to be able to re-open the torrent later on without having to find the link again.

### **Tracker**

A tracker is a server that keeps track of which seeds and peers are in the swarm. Clients report information to the tracker periodically and in exchange, receive information about other clients to which they can connect. The tracker is not directly involved in the data transfer and does not have a copy of the file.

### **C. Advantages**

Traditional P2P programs such as Napster, Kazaa and Limewire have a bottleneck, because uploading and downloading does not happen at equal speed. If you, therefore, want to download a specific file with traditional P2P programs, your download rate depends on the upload speed of the person you are downloading from. With BitTorrent, you are downloading tiny parts from a large number of people, and as many hands make light work, BitTorrent reaches much faster downloading rates. With BitTorrent, the more popular a file, the more uploaders there are (because more people are downloading), and the faster downloading gets[12]. Torrents can achieve download speeds over 1.5 megabits per second.

- Torrents enforce 99% quality control by filtering out corrupted and dummy files, ensuring that downloads contain only what they claim to contain. There is still some abuse of the system, but if you use a community torrent searcher like [www.isohunt.com](http://www.isohunt.com), users will warn you when a torrent is a fake or dummy file.
- Torrents actively encourage users to share ("seed") their complete files, while simultaneously penalizing users who "leech".
- Torrent code is open-source, advertising-free, and adware/spyware-free. This means that no single person profits from torrent success.

### **D. Torrent Download Process**

The torrent download process goes like this:

Use special torrent search engines to find .torrent text files around the Net. A .torrent text file functions as a special pointer to locate a specific file and the swarm of people currently sharing that file. These .torrent files vary from 15kb to 150kb file size, and are published by serious Torrent sharers around the world.

- Download the desired .torrent file to your drive.
- Open the .torrent file into your torrent software. Usually, this is as simple as a double-click on the .torrent file icon, and the client software auto-launches. In other cases, this software will even open the torrent file for you.
- The torrent client software will now talk to a tracker server for 2 to 10 minutes, while it examines the Internet for people to swarm with. Specifically, the client and tracker server will search for other users who have the same exact .torrent file as you.

- d) As the tracker locates torrent users to swarm with, each user will be automatically labeled as either a "leech/peer" or as a "seed" (users who have only part of the target file, versus users who have the complete target file). The more seeds you connect to, the faster your download will be. Commonly, 10 peers/leeches and 3 seeders is a good swarm for downloading a single song/movie.
- e) The client software then begins the transfer. As the name "sharing" implies, every transfer will happen in both directions, "down" and "up" (leech and share).
- f) Once the transfer is complete, leave your torrent client software running for at least two hours. This is called "seeding", where you share your complete files to other users.

Suggestion: do your downloads just before you go to sleep at night. This way, you will seed your complete files, you will increase your upload/download ratio, and you will have complete downloaded files by the time you wake up!

#### **IV. BEST BITTORRENT CLIENTS**

Here is a list of top 5 best torrent clients around.

##### **A. uTorrent**

Despite being compact and extremely lightweight, uTorrent still comes packed with support for all the standards you'll need (DHT, SSL, SSL, UDP, protocol encryption, UPnP and more), along with plenty of extras (RSS feed reading, and a Boss key to hide the program quickly).

None of this power gets in your way, though. Various tweaks and advanced options are on offer if you need them, but if you prefer a simple life then the default settings are generally fine, and simply clicking a torrent link is usually enough to download it.

While this mix of power and simplicity has helped to make uTorrent the most popular torrent tool around, ads and bundled adware have also earned it plenty of criticism. The program makes multiple attempts to install toolbars and other unnecessary extras during setup, for instance: pay close attention during installation if you want to avoid this.

##### **B. qBittorrent**

QBittorrent is a capable tool which aims to provide a free, open source alternative to uTorrent. For the most part it does very well, too, and provides builds which can run on Windows, Linux, Mac and more.

The program is relatively lightweight and straightforward, a well-designed interface making it easy to find your way around. The built-in search engine helps find you what you need, a click or two will start the download, and a few minutes of exploring the program tabs and right-clicking various items will get you up to speed with the basics.

You don't always get the extras available elsewhere; there's no mass of scrolling graphs to highlight current download performance, for instance. QBittorrent delivers the core functionality you need, though, and more (DHT, PeX, encryption, UPnP, RSS reading, IP filtering, torrent

creation), and it's a great choice for more experienced torrent users.

##### **C. MediaGet**

There's a lot of jargon surrounding torrents, but if the regular clients seem a little intimidating then you do have alternatives. MediaGet, for instance, focuses so much on its integrated search engine that initially at least you may not realise it's a torrent client at all: it's all very simple and straightforward.

Once you're downloading, the program presents a more familiar screen, with tracker details, peer lists, your file status and more. You can access a few more advanced features, too, setting upload and download speed limits or creating new torrents of your own.

##### **D. BitTorrent Free**

Should BitTorrent Free be in this list? It's certainly a capable torrent client, lightweight, fast, easy to use, with convenient features like the ability to play media files before they're fully downloaded.

It's hard to get too excited about any of this, though, because essentially it's just a rebranded version of uTorrent. The same code, from the same team, just with a different colour scheme.

##### **E. Vuze**

While most torrent clients concentrate simply on finding and downloading files just as quickly as they can, Vuze (the program formerly known as Azureus) is a little more ambitious.

You can play HD video, for instance, and integrate the program with iTunes. A host of plugins allow you to add all kinds of advanced features, from scheduling tools to RSS feed readers and generators, all kinds of remote control options, even a Sudoku game. Pay £19.90 a year for Vuze Plus and you can even get antivirus and DVD burning (as well as the removal of all ads).

This does help to make Vuze one of the more heavyweight torrent clients, of course, even if you do manage to avoid the unnecessary software it wants to install during setup. But if you like the extensibility its plugin system provides than Vuze could be very appealing.

#### **V. BEST TORRENT SEARCH SITES**

Here is the list of Top 5 most popular Torrent sites of 2013

##### **A. The Pirate Bay**

To many people The Pirate Bay is the equivalent to BitTorrent. The site was founded in 2003 and is still expanding, despite the various legal troubles and new blockades in the UK and the Netherlands. The Pirate Bay currently has well over a billion page views a month. Alexa Rank: 74 / Compete Rank: 398 / Last year #1

##### **B. KickassTorrents**

KickassTorrents was founded in 2009 and has moved up in the top-10 year after year. Responding to increasing worries

over domain seizures, the site moved from its kickasstorrents.com domain to kat.ph in 2012. This year the site continued to grow, despite being blocked by Italian Internet providers.

Alexa Rank: 116 / Compete Rank: 719 / Last year #3

### **C. Torrentz**

Torrentz has been the leading BitTorrent meta-search engine for many years. Unlike the other sites featured in the list Torrentz does not host any torrent files, it merely redirects visitors to other places on the web. The site uses several domain names with the .eu being the most popular.

Alexa Rank: 166 / Compete Rank: 882 / Last year #2

### **D. IsoHunt**

Two years ago isoHunt became the first search engine forced to implement a keyword filter provided by the MPAA. Despite this setback, isoHunt continues to be listed among the world's top torrent sites. isoHunt is currently trying to get rid of the filter through the Appeals Court.

Alexa Rank: 213 / Compete Rank: 1,935 / Last year #4

### **E. ExtraTorrent**

ExtraTorrent continues to gain more traffic and has moved up again in the top 10, now being the 5th most visited torrent site. This success didn't go unnoticed to rightsholders groups such as the RIAA and MPAA who have called out ExtraTorrent as one of the top pirate sites recently.

Alexa Rank: 279 / Compete Rank: 1,973 / Last year #6

## **VI. SECURITY & COPYRIGHT ISSUES**

### **A. Privacy and Security**

Those Internet users who use the BitTorrent protocol to share files are perhaps more aware of security and privacy issues than others. Many government agencies, special interest groups, corporations, and hackers with malicious intentions monitor torrent downloads and look for people to catch, sue, or attack.

Because of this reality, it is important for torrent file sharers to find ways to protect themselves from litigation, prosecution, bandwidth shaping, and malware. The following tips should help you make your torrent experience safer, private, and more secure.

#### **a) Port Forwarding**

Every modern router has some form of port forwarding that you can use for your bittorrent client. With it, you can circumvent ISPs that may block common torrent ports or limit their bandwidth usage. Using port forwarding, you could, for example, forward your BitTorrent traffic through the standard web port (80). Some torrent clients also support randomizing of ports so that they will use a different one every time you start them.

#### **b) Limit Downloads and Uploads**

Since many ISPs now limit the amount of bandwidth you can consume within a month (or even at certain times of the day), it is important to not let your torrent downloading and uploading go unchecked. Torrent clients

like qBittorrent have features that allow you to limit the number, speed, and even time of day that downloads are allowed.

#### **c) Encryption**

Encryption is all about privacy. There is no reason for anyone, even your ISP to know exactly what sites you are visiting or what files you are downloading. Most torrent clients support some type of encryption for the data and/or header information. It is important to note that encryption will not mask your IP address, so anyone spying on the torrent (i.e. actively connected to the tracker) will still know you are downloading it, but anyone trying to spy on your Internet traffic in general will not be able to see what you are doing.

#### **d) Filter Lists**

There are plenty of organizations that are known for their snooping or malicious intent. With an IP filter list, you can completely block them from connecting to you as peers, thereby eliminating any chance of them monitoring you and catching you in the act of downloading something. This may also help reduce the chance that you will connect to a peer that sends out harmful data or malware.

#### **e) Proxy or VPN**

Of all of the security measures on the list, this is by far the most effective. By routing your torrent traffic through a proxy or VPN, you can completely hide yourself from the outside world. Used in combination with the other tools on this list, your torrent downloading will be virtually covert. Proxy providers usually charge a subscription fee, and they will require you to either download a specially configured bittorrent client or reconfigure yours to use their proxy (often utilizing a SOCKS5 protocol).

Your privacy, however, is only as secure as the company offering the service. If they are under investigation or are willing to sell your information, using their services may not help you at all. Therefore, it is a good idea to ask around and do your research before using a proxy or VPN service.

The media often associates BitTorrent with illegal file sharing, but there are numerous legitimate organizations, from Linux distribution developers to content delivery networks (CDN), that make use of bittorrent technology. Furthermore, many free media distributors who use open licenses, such as Creative Commons, use bittorrent to help reduce their bandwidth costs.

With a little effort, one can use the above-mentioned ways to download and share legitimate content and software, while also maintaining the privacy and security.

### **B. Copyright Issues**

There has been much controversy over the use of BitTorrent trackers. BitTorrent trackers have been subjected to raids and shutdowns due to claims of copyright infringement. BitTorrent metafiles do not store copyrighted data, so it has been claimed that BitTorrent trackers, which only store and track the metafiles, must therefore be legal even if sharing the data in question would be considered a violation of copyright. Despite this claim, there has been tremendous legal pressure, usually on behalf of the MPAA

and RIAA, and similar organizations around the world to shut down numerous BitTorrent trackers.

Various jurisdictions have pursued legal action against websites that host BitTorrent trackers. High-profile examples include the closing of Suprnova.org, TorrentSpy, LokiTorrent, BTJunkie, Mininova, Demonoid and Oink's Pink Palace. The Pirate Bay's servers in Sweden were raided by Swedish police on allegations by the MPAA of copyright infringement[12] however, the tracker was up and running again three days later.

In the study used to value NBC Universal in its merger with Comcast, Envisional examined the 10,000 torrent swarms managed by PublicBT which had the most active downloaders. After excluding pornographic and unidentifiable content, it was found that only one swarm offered legitimate content [13].

Between 2010 and 2012, 200,000 people have been sued for uploading and downloading copyrighted content through BitTorrent [14].

In 2011, 18.8% of North American internet traffic was used by peer-to-peer networks which equates to 132 billion music file transfers and 11 billion movie file transfers on the BitTorrent network[15].

On April 30, 2012 the UK High Court ordered five ISPs to block BitTorrent search engine The Pirate Bay[16].

In June 2011, the Malaysian Communications and Multimedia Commission has ordered the blocking of several websites including The Pirate Bay and several file-hosting websites for violating Section 41 of the Copyright Act 1987, which deals with pirated content[17].

The *Motion Picture Association of America (MPAA)*, The *Recording Industry Association of America (RIAA)*, and the governments of England and Australia have taken several thousand users to court, demanding that they pay thousands of dollars in copyright infringement penalties.

Edonkey (the p2p client that was huge in popularity) was taken off it's services recently and Metamachine the company behind Edonkey has agreed to pay 30 million dollars to the RIAA with regard to copyrights violation. In some countries it is legal to download copyright protected content using P2P software under private copy exceptions. As long as P2P users don't upload, they are not liable for copyright infringement. But with BitTorrent, it is not possible to just download, as the idea behind BitTorrent is that users all download small pieces of the file, and then start uploading these small pieces to each other.

So before you download a file make sure that you are not infringing any copy right laws.

## **VII. FUTURE SCOPE**

BitTorrent's Future: DHT, PEX, and Magnet Links.

The Pirate Bay's confirmation that they had closed down their tracker since DHT and Peer Exchange have matured enough to take over, was coupled with the news that they had added Magnet links to the site. This news has achieved

its aim of stimulating discussion, but has also revealed that there is much confusion over how these technologies work. The key thing to understand is that nobody is being forced to use Magnet links or trackerless torrents. While these long-standing technologies may prove to be the future, they will co-exist with tracker-enabled torrenting for quite some time. For now, nobody will be forced to immediately change their existing downloading habits, although it may be wise to switch to a BitTorrent client that is compatible with these technologies.

### **A. DHT (Distributed Hash Table)**

Using DHT instead of trackers is one of the things The Pirate Bay is now trying to encourage, and torrent downloads that rely solely on this technology are often referred to as "trackerless torrents." DHT is used to find the IP addresses of peers, mostly in addition to a tracker. It is enabled by default in clients such as uTorrent and Vuze and millions of people are already using it without knowing. DHT's function is to find peers who are downloading the same files, but without communicating with a central BitTorrent tracker such as that previously operated by The Pirate Bay.

### **B. Peer Exchange ("PEX")**

Peer Exchange is yet another means of finding IP addresses. Rather than acting like a tracker, it leverages the knowledge of peers you are connected to, by asking them in turn for the addresses of peers they are connected to. Although it requires a "kick start", PEX will often uncover more genuine peers than DHT or a tracker.

### **C. Magnet links**

Traditionally, .torrent files are downloaded from torrent sites. A torrent client then calculates a torrent hash (a kind of fingerprint) based on the files it relates to, and seeks the addresses of peers from a tracker (or the DHT network) before connecting to those peers and downloading the desired content.

## **VIII. CONCLUSION**

While P2P networks open a new channel for efficient downloading and sharing of files and data, users need to be fully aware of the security threats associated with this technology. Security measures and adequate prevention should be implemented to avoid any potential leakage of sensitive and/or personal information, and other security breaches. Before deciding to open firewall ports to allow for peer-to-peer traffic, system administrators should ensure that each request complies with the corporate security policy and should only open a minimal set of firewall ports needed to fulfill P2P needs. For end users, including home users, care must be taken to avoid any possible spread of viruses over the peer-to-peer network.

The BitTorrent specification is free to use and many clients are open source, so BitTorrent clients have been created for all commonoperating systems using a variety

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of programming languages. The official BitTorrent client, uTorrent, Xunlei, Transmission, Vuze and BitComet are some of the most popular clients[18, 19]. The popularity of the torrent downloading has moved down to the mobile operating systems like Android and iOS. Several apps are available for torrent downloading.

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