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A Survey of BitTorrent File Sharing Protocol

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Abstract: *There are many P2P file-sharing models that exist; BitTorrent in a very short span of time has been able to attract millions of users. BitTorrent is not a sole entity and is dependent on other existing global components for locating a file, provides a moderator system to guarantee data integrity, and uses a bartering technique for downloading in order to ensure users do not enjoy the perks at no cost. In this paper we carry out the study of BitTorrent in which we would also understand the working of a P2P mechanism and also have a deep insight into the Legal & Security issues related to the use of Torrents. The purpose of this paper is to aid the understanding as to why more and more users are switching to implement the BitTorrent Protocol as a way of Faster file sharing.*

I. INTRODUCTION

BitTorrent is a protocol designed for file sharing in a faster way than the traditional file sharing mechanisms. It identifies content by URL and is designed to integrate seamlessly with the web. Its advantage over traditional client-server download is that when multiple downloads of the same file happen at the same time, the downloaders upload to each other, making it possible for the file source to cater to many downloaders with only a small amount of growth in its load. In traditional client-server download, if many users are simultaneously downloading the same file from the same server, that server becomes clogged with requests and the bandwidth for that server is stretched. The result to which is that every person trying to download that file has to face very slow download speeds, or get denied eventually. Plus, the owner of that server could be dealing with enormous bandwidth costs. BitTorrent is designed to distribute the load. The term BitTorrent is used to refer to the original program used to take advantage of this, however it is also used to refer to the protocol itself. So, if you download a BitTorrent client, that client software is itself capable of downloading as well as serving those and the other files. It takes you on a peer-to-peer network where you, as a user of the torrent software, act as part of the file distribution network. BitTorrent achieves distributed load by downloading from multiple peers on the network.

II. AN OVERVIEW OF PEER TO PEER FILE SHARING

Peer-to-peer file(P2P) sharing is different from the traditional client-server downloading. In p2p sharing, we use a software program and not the web browser to locate computers that have the file we want to download. As these are normal Personal Computers, and not Servers, they are called **peers**. The process goes like this:

- 1) We run peer-to-peer file-sharing software and send out a request for the file we want to download.
- 2) To locate the file, the file-sharing software queries other computers that are running the file-sharing software and connected to the Internet.
- 3) When the software locates a computer having the file you want in its system, the download begins.
- 4) Not only us but other systems using the file-sharing software can download files they want from our computer.
- 5) In order to prevent other systems from downloading files from our computer we can disconnect immediately after we are done with our download.

It is true that the file-transfer load is distributed between the computers exchanging files, but file searches and transfers from our computer to others can cause bottlenecks.

III. BitTorrent PROTOCOL

BitTorrent protocol provides a mechanism that enables fast download of large files using a very low Internet bandwidth. The main difference between BitTorrent and other downloading mechanisms is that, using BitTorrent protocol one can maximize the transfer speed by collecting the pieces of the file one wants i.e. downloading these pieces at once from people who already have the pieces of the file. So instead of downloading the entire file from a single source it capitalizes by downloading pieces of the file from different faster resources and then compiles all the resources into one complete file.

The BitTorrent protocol enables personal computers to replace large servers while efficiently distributing files to many recipients. Also due to the lower bandwidth usage it prevent large spikes in network traffic in the given area, allowing high internet speeds for all users, irrespective of the fact that they use the BitTorrent protocol or not.

It uses a tactic called **tit-for-tat**. This means that in order to receive files, you have to give them files in return.

IV. THE BitTorrent FILE SHARING SYSTEM

The BitTorrent protocol offloads some of the file tracking work to a central server (called a tracker). A BitTorrent tracker is a special type of server that assists the communication between peers using the BitTorrent protocol.

Here's a step-wise view of the working of BitTorrent file sharing system:

- A. We open a Web page and click on a link for the file we want.
- B. BitTorrent client software communicates with a tracker to find other computers running BitTorrent that have the complete file (seed computers) and those with a portion of the file (peers that are usually in the process of downloading the file).
- C. The tracker identifies the swarm, which is the connected computers that have all of or a portion of the file and are in the process of sending or receiving it.
- D. The tracker helps the client software trade pieces of the file we want with other computers in the swarm. Our computer receives multiple pieces of the file simultaneously.
- E. If we continue to run the BitTorrent client software after our download is complete, others can receive .torrent files from our computer; our future download rates improve because we are ranked higher in the "tit-for-tat" system.

V. TORRENT FILE, LEECHERS & SEEDERS

A torrent file is just another file in the system only the torrent file contains the metadata about files and folders to be distributed, which are computers that help participants in the system find each other and form efficient distribution groups called **swarms**. A torrent file does not contain the content to be distributed; it only contains information about those files, such as their names, sizes, folder structure, and cryptographic hash values for verifying file integrity.

Users downloading from a BitTorrent swarm are commonly referred to as Leechers or peers. Users that remain connected to a BitTorrent swarm even after they've downloaded the complete file, contributing more of their upload bandwidth so other people can continue to download the file, are referred to as Seeders. For a torrent to be downloadable, one seeder who has a complete copy of all the files in the torrent must initially join the swarm so other users can download the data. If a torrent has no seeders, it won't be possible to download no connected user has the complete file.

Swarm - A swarm is just a group of people, including us, that own a particular file or pieces of the file. Each swarm is per torrent. When you open a torrent, it tells your client to log into a tracker and get a list of IP addresses of other users in the swarm for that particular torrent file/pack. Then we connect to those users directly to exchange pieces of the file until it's been fully downloaded.

VI. GROWING ATTRACTION TOWARDS THE USE OF TORRENTS

BitTorrent is now very widely used it is rapidly heading towards the mainstream users and being regarded as the quickest and most convenient way to download large files while sharing the bandwidth capacity needed to do it.

Take an existing example where Blizzard Entertainment have gone to the extent of creating games like World of Warcraft, Starcraft II and Diablo III in which they have adopted the torrent technology and integrated it into the online versions of their games making it the default way in which their games are downloaded. Another feature of this comes from the P2P nature of torrenting and asks players if they'd also like to contribute any of their bandwidth to help speed up the download for others too.

The UK government and NASA have adopted the file sharing technology. The UK government uses it to share huge amount of data files and NASA uses it to enhance extremely high-quality 2.9GB images of the Earth taken from space easily downloadable. This ensures the safety of data while sharing the data as compared to the upload of all information to a hard drive and sending it through the post which is one of the current methods of sharing large files. On a daily basis, many businesses have begun to use the services of torrenting to share files due to the security it has to offer. VPN providers have offered a helping hand by ensuring that there are specific VPN's available for this use, making this technique common. Although VPNs provide an additional layer of encryption onto traffic, which has significantly had a negative impact on speed, which is essential for the higher download speeds. Ensuring a VPN is "Torrent Friendly" allows for quicker download speeds.

Site	Alexa Rank	Torrent files in Database
YTS.AM	175	7500+
The Pirate Bay	228	4 million+
1337x	253	2.5 million+

(a) Top 3 Torrent sites according to their Alexa Rank.

VII. RISKS AND SECURITY ISSUES WHILE TORRENTING

An assumption is made about BitTorrent that it is a platform used to [pirate](#) movies, games, and other copyrighted content. The ISPs are always awake and regularly send warning letters and anti-piracy educational materials to their respective BitTorrent users. Repetitive offenders have to face consequences such as reduced bandwidth or their accounts suspended. ISPs might not be able to differentiate between legitimate BitTorrent sites distributing material with Creative Commons licenses from those sharing pirated content. Hackers often use free content as a lure to create a havoc on user's computer by attaching a malware-laden file along with the user's desired file and launch attacks on user's system.

Visibility is another danger. The ISP addresses of users and the content they transmit are visible to all BitTorrent users and this information is often tracked by copyright holders, law enforcement, advertisers, and hackers. It's important for torrent users to maintain [complete internet security](#) by using internet security software, keeping malware definitions up to date, and installing operating system patches as soon as they become available. Encrypting an internet connection by using a virtual private network (VPN) to mask the IP address also helps, but it isn't full proof.

Latest and most trending releases are watched more closely by copyright trolls as compared to other torrents. One simple rule of thumb is movies or any web content during the first 60 days of their DVD and Blu-Ray release are strictly monitored. As during this time period movies and TV shows make the majority of their profit. Popular torrents give copyright trolls a greater range of IP addresses to target, so they're a better hunting ground for victims. It is only in your best interest not to join the parade of downloading the most popular torrents.

VIII. LEGAL ISSUES WITH BitTorrent

The use of BitTorrent with subject to copyrighted content might turn the *issuers* of the BitTorrent file, link or metadata liable into an infringing party under some copyright laws. As is the use of BitTorrent to obtain illegal content might possibly turn the end users as an accomplice. Court decisions in different jurisdictions have deemed some BitTorrent files illegal.

Legal regimes vary from country to country. Primarily metafiles don't contain copyrighted data and are usually inoffensive. Some accused parties have argued that BitTorrent trackers are legal even if sharing the copyrighted data in question was a copyright violation. Despite these arguments, there has been tremendous legal pressure to shut down BitTorrent trackers.

The Pirate Bay torrent website, formed by a Swedish anti-copyright group, is notorious for the "legal threats" section of its website in which letters and replies on the subject of alleged copyright infringements are publicly displayed. On 31 May 2006, their servers in Sweden were raided by Swedish police on allegations by the MPAA of copyright infringement. The site was back online in less than 72 hours, and returned to Sweden, accompanied by public and media backlash against the government's actions. In 2012, to minimize legal exposure and save computer resources, The Pirate Bay entirely switched to providing plaintext magnet links instead of traditional torrent files. As the most popular and well-known facilitator of copyright infringement, The Pirate Bay continues to shift between different hosting facilities and domain registrars in the face of legal prosecution and shutdown threats.

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