BitTorrent: a peer-to-peer file sharing protocol

BitTorrent is a peer-to-peer file sharing protocol used for distributing large amounts of data over the Internet. BitTorrent is one of the most common protocols for transferring large files, and it has been estimated that it accounted for roughly 43% to 70% of all Internet traffic (depending on geographical location) as of February 2009.[1]

Programmer Bram Cohen designed the protocol in April 2001 and released a first implementation on July 2, 2001.[2] It is now maintained by Cohen's company BitTorrent, Inc. There are numerous BitTorrent clients available for a variety of computing platforms.

As of January 2011 BitTorrent has 100 million users and a greater share of network bandwidth than Netflix and Hulu combined.[3][4]
At any given instant of time BitTorrent has, on average, more active users than YouTube and Facebook combined. (This refers to the number of active users at any instant and not to the total number of unique users.)

The BitTorrent protocol can be used to reduce the server and network impact of distributing large files. Rather than downloading a file from a single source server, the BitTorrent protocol allows users to join a "swarm" of hosts to download and upload from each other simultaneously. The protocol is an alternative to the older single source, multiple mirror sources technique for distributing data, and can work over networks with lower bandwidth so many small computers, like mobile phones, are able to efficiently distribute files to many recipients.

A user who wants to upload a file first creates a small *torrent* descriptor file that they distribute by conventional means (web, email, etc.). They then make the file itself available through a BitTorrent node acting as a *seed*. Those with the torrent descriptor file can give it to their own BitTorrent nodes which, acting as *peers* or *leechers*, download it by connecting to the seed and/or other peers.

The file being distributed is divided into segments called *pieces*. As each peer receives a new piece of the file it becomes a source of that piece to other peers, relieving the original seed from having to send a copy to every computer or user wishing for a copy. With BitTorrent, the task of distributing the file is shared by those who want it; it is entirely possible for the seed to send only a single copy of the file itself and eventually distribute to an unlimited number of peers.

Each piece is protected by a cryptographic hash contained in the torrent descriptor.[7] This ensures that any modification of the piece can be reliably detected, and thus prevents both accidental and malicious modifications of any of the pieces received at other nodes. If a node starts with an authentic copy of the torrent descriptor, it can verify the authenticity of the entire file it receives.

When a peer completely downloads a file, it becomes an additional seed. This eventual shift from peers to seeders determines the overall "health" of the file (as determined by the number of times a file is available in its complete form).

The distributed nature of BitTorrent leads to a flood like spreading of a file throughout many peer computer nodes. As more peers join the swarm, the likelihood of a complete successful download by any particular node increases. Relative to traditional Internet distribution schemes, this permits a significant reduction in the original distributor's hardware and bandwidth resource costs. It also provides redundancy against system problems, reduces dependence on the original distributor[8] and provides sources for the file which are generally transient and therefore harder to trace by those who would block distribution compared to the situation provided by limiting availability of the file to a fixed host machine (or even several).

Operation
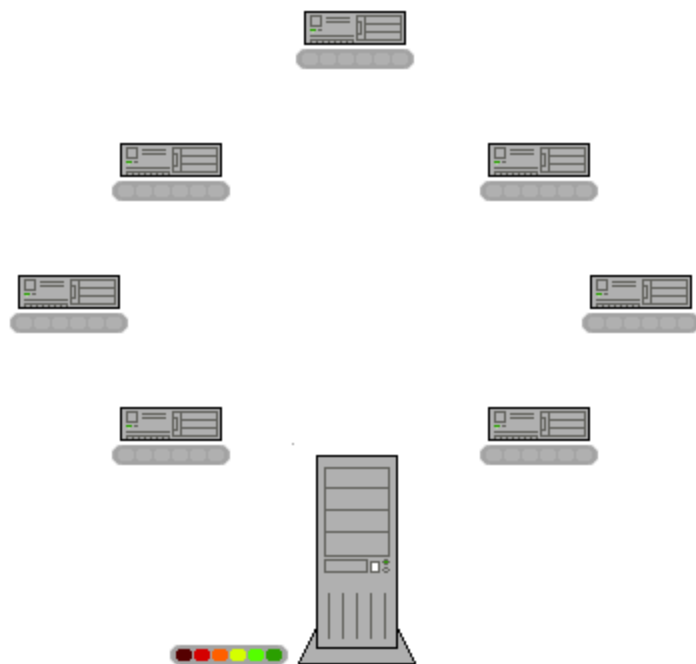
In this animation, the colored bars beneath all of the 7 clients in the upper region above represent the file, with each color representing an individual piece of the file. After the initial pieces transfer from the seed (large system at the bottom), the pieces are individually transferred from client to client. The original *seeder* only needs to send out one copy of the file for all the clients to receive a copy.

A BitTorrent client is any program that implements the BitTorrent protocol. Each client is capable of preparing, requesting, and transmitting any type of computer file over a network, using the protocol. A peer is any computer running an instance of a client.

To share a file or group of files, a peer first creates a small file called a "torrent" (e.g. MyFile.torrent). This file contains metadata about the files to be shared and about the tracker, the computer that coordinates the file distribution. Peers that want to download the file must first obtain a torrent file for it and connect to the specified tracker, which tells them from which other peers to download the pieces of the file.

Though both ultimately transfer files over a network, a BitTorrent download differs from a classic download (as is typical with an HTTP or FTP request, for example) in several fundamental ways:

- BitTorrent makes many small data requests over different TCP connections to different machines, while classic downloading is typically made via a single TCP connection to a single machine.
- BitTorrent downloads in a random or in a "rarest-first"[9] approach that ensures high availability, while classic downloads are sequential.

Taken together, these differences allow BitTorrent to achieve much lower cost to the content provider, much higher redundancy, and much greater resistance to abuse or to "flash crowds" than regular server software. However, this protection, theoretically, comes at a cost: downloads can take time to

rise to full speed because it may take time for enough peer connections to be established, and it may take time for a node to receive sufficient data to become an effective uploader. This contrasts with regular downloads (such as from an HTTP server, for example) that, while more vulnerable to overload and abuse, rise to full speed very quickly and maintain this speed throughout.

In general, BitTorrent's non-contiguous download methods have prevented it from supporting "progressive downloads" or "streaming playback". However, comments made by Bram Cohen in January 2007 suggest that streaming torrent downloads will soon be commonplace and ad supported streaming appears to be the result of those comments. In January 2011 Cohen demonstrated an early version of BitTorrent streaming, saying the feature will be available by summer 2011.[9]

Creating and publishing torrents

The peer distributing a data file treats the file as a number of identically sized pieces, usually with byte sizes of a power of 2, and typically between 32 kB and 16 MB each. The peer creates a hash for each piece, using the SHA-1 hash function, and records it in the torrent file. Pieces with sizes greater than 512 kB will reduce the size of a torrent file for a very large payload, but is claimed to reduce the efficiency of the protocol.[10] When another peer later receives a particular piece, the hash of the piece is compared to the recorded hash to test that the piece is error-free.[11] Peers that provide a complete file are called seeders, and the peer providing the initial copy is called the initial seeder.

The exact information contained in the torrent file depends on the version of the BitTorrent protocol. By convention, the name of a torrent file has the suffix `.torrent`. Torrent files have an "announce" section, which specifies the URL of the tracker, and an "info" section, containing (suggested) names for the files, their lengths, the piece length used, and a SHA-1 hash code for each piece, all of which are used by clients to verify the integrity of the data they receive.

Torrent files are typically published on websites or elsewhere, and registered with at least one tracker. The tracker maintains lists of the clients currently participating in the torrent.[11] Alternatively, in a *trackerless system* (decentralized tracking) every peer acts as a tracker. Azureus was the first[citation needed] BitTorrent client to implement such a system through the distributed hash table (DHT) method. An alternative and incompatible DHT system, known as Mainline DHT, was later developed and adopted by the BitTorrent (Mainline), µTorrent, Transmission, rTorrent, KTorrent, BitComet, and Deluge clients.

After the DHT was adopted, a "private" flag — analogous to the broadcast flag — was unofficially introduced, telling clients to restrict the use of decentralized tracking regardless of the user's desires.[12] The flag is intentionally placed in the info section of the torrent so that it cannot be disabled or removed without changing the identity of the torrent. The purpose of the flag is to prevent torrents from being shared with clients that do not have access to the tracker. The flag was requested for inclusion in the official specification in August, 2008, but has not been accepted.[13] Clients that have ignored the private flag were banned by many trackers, discouraging the practice.[14]

Downloading torrents and sharing files

Users browse the web to find a torrent of interest, download it, and open it with a BitTorrent client. The client connects to the tracker(s) specified in the torrent file, from which it receives a list of peers currently transferring pieces of the file(s) specified in the torrent. The client connects to those peers to obtain the various pieces. If the swarm contains only the initial seeder, the client connects directly to it and begins to request pieces.

Clients incorporate mechanisms to optimize their download and upload rates; for example they download pieces in a random order to increase the opportunity to exchange data, which is only possible if two peers have different pieces of the file.

The effectiveness of this data exchange depends largely on the policies that clients use to determine to whom to send data. Clients may prefer to send data to peers that send data back to them (a tit for tat scheme), which encourages fair trading. But strict policies often result in suboptimal situations, such as when newly joined peers are unable to receive any data because they don't have any pieces yet to trade themselves or when two peers with a good connection between them do not exchange data simply because neither of them takes the initiative. To counter these effects, the official BitTorrent client program uses a mechanism called "optimistic unchoking", whereby the client reserves a portion of its available bandwidth for sending pieces to random peers (not necessarily known good partners, so called preferred peers) in hopes of discovering even better partners and to ensure that newcomers get a chance to join the swarm.[15]

Although swarming scales well to tolerate flash crowds for popular content, it is less useful for unpopular content. Peers arriving after the initial rush might find the content unavailable and need to wait for the arrival of a seed in order to complete their downloads. The seed arrival, in turn, may take long to happen (this is termed the seeder promotion problem). Since maintaining seeds for unpopular content entails high bandwidth and administrative costs, this runs counter to the goals of publishers that value BitTorrent as a cheap alternative to a client-server approach. This occurs on a huge scale; measurements have shown that 38% of all new torrents become unavailable within the first month.[16] A strategy adopted by many publishers which significantly increases availability of unpopular content consists of bundling multiple files in a single swarm.[17] More sophisticated solutions have also been proposed; generally, these use cross-torrent mechanisms through which multiple torrents can cooperate to better share content.[18]

BitTorrent does not offer its users anonymity. It is possible to obtain the IP addresses of all current and possibly previous participants in a swarm from the tracker. This may expose users with insecure systems to attacks.[15] It may also expose users to the risk of being sued, if they are distributing files without permission from the copyright holder(s). However, there are ways to promote anonymity; for example, the OneSwarm project layers privacy-preserving sharing mechanisms on top of the original BitTorrent protocol.

Adoption

A growing number of individuals and organizations are using BitTorrent to distribute their own or licensed material. Independent adopters report that without using BitTorrent technology and its dramatically reduced demands on their private networking hardware and bandwidth, they could not afford to distribute their files.[19]

Film, video and music

- BitTorrent Inc. has obtained a number of licenses from Hollywood studios for distributing popular content from their websites.
- Sub Pop Records releases tracks and videos via BitTorrent Inc.[20] to distribute its 1000+ albums. Babyshambles and The Libertines (both bands associated with Pete Doherty) have extensively used torrents to distribute hundreds of demos and live videos. US industrial rock band Nine Inch Nails frequently distributes albums via BitTorrent.
- Podcasting software is starting to integrate BitTorrent to help podcasters deal with the download demands of their MP3 "radio" programs. Specifically, Juice and Miro (formerly known as Democracy Player) support automatic processing of .torrent files from RSS feeds. Similarly, some BitTorrent clients, such as μTorrent, are able to process web feeds and automatically download content found within them.
- DGM Live! purchases are provided via BitTorrent.[21]

Broadcasters

- In 2008, the CBC became the first public broadcaster in North America to make a full show (*Canada's Next Great Prime Minister*) available for download using BitTorrent.[22]
- The Norwegian Broadcasting Corporation (NRK) has since March 2008 experimented with bittorrent distribution, available online.[23] Only selected material in which NRK owns all royalties are published. Responses have been very positive, and NRK is planning to offer more content.
- The Dutch VPRO broadcasting organization released three documentaries under a Creative Commons license using the content distribution feature of the Mininova tracker.

Personal material

- The Amazon S3 "Simple Storage Service" is a scalable Internet-based storage service with a simple web service interface, equipped with built-in BitTorrent support.
- Blog Torrent offers a simplified BitTorrent tracker to enable bloggers and non-technical users to host a tracker on their site. Blog Torrent also allows visitors to download a "stub" loader, which acts as a BitTorrent client to download the desired file, allowing users without BitTorrent software to use the protocol.[24] This is similar to the concept of a self-extracting archive.

Software

- Blizzard Entertainment uses BitTorrent (via a proprietary client called the "Blizzard Downloader") to distribute content and patches for Diablo III, StarCraft II and World of Warcraft, including the games themselves.[25]
- Many software games, especially those whose large size makes them difficult to host due to bandwidth limits, extremely frequent downloads, and unpredictable changes in network traffic, will distribute instead a specialized, stripped down bittorrent client with enough functionality to download the game from the other running clients and the primary server (which is maintained in case not enough peers are available).
- Many major open source and free software projects encourage BitTorrent as well as conventional downloads of their products (via HTTP, FTP etc.) to increase availability and to reduce load on their own servers, especially when dealing with larger files.[26]

Government

- The UK government used BitTorrent to distribute details about how the tax money of UK citizens was spent.[27][28]

Others

- Facebook uses BitTorrent to distribute updates to Facebook servers.[29]
- Twitter uses BitTorrent to distribute updates to Twitter servers.[30][31]

As of 2011 BitTorrent has 100 million users and a greater share of network bandwidth than Netflix and Hulu combined.[32][33]

At any given instant of time BitTorrent has, on average, more active users than YouTube and Facebook combined. (This refers to the number of active users at any instant and not to the total number of registered users.) [34][35]

CableLabs, the research organization of the North American cable industry, estimates that BitTorrent

represents 18% of all broadband traffic.[36][*dated info*] In 2004, CacheLogic put that number at roughly 35% of all traffic on the Internet.[37][*dated info*] The discrepancies in these numbers are caused by differences in the method used to measure P2P traffic on the Internet.[38]

Routers that use network address translation (NAT) must maintain tables of source and destination IP addresses and ports. Typical home routers are limited to about 2000 table entries while some more expensive routers have larger table capacities. BitTorrent frequently contacts 20–30 servers per second, rapidly filling the NAT tables. This is a common cause of home routers locking up.[39]

Indexing

The BitTorrent protocol provides no way to index torrent files. As a result, a comparatively small number of websites have hosted a large majority of torrents, many linking to copyrighted material without the authorization of copyright holders, rendering those sites especially vulnerable to lawsuits.[40] Several types of websites support the discovery and distribution of data on the BitTorrent network.

Public torrent hosting sites such as The Pirate Bay allow users to search and download from their collection of torrent files. Users can typically also upload torrent files for content they wish to distribute. Often, these sites also run BitTorrent trackers for their hosted torrent files, but these two functions are not mutually dependent: a torrent file could be hosted on one site and tracked by another, unrelated site.

Private host/tracker sites operate like public ones except that they restrict access to registered users and keep track of the amount of data each user uploads and downloads, in an attempt to reduce leeching.

Search engines allow the discovery of torrent files that are hosted and tracked on other sites; examples include Mininova, BTDigg, BTJunkie, Torrentz, The Pirate Bay, Eztorrent and isoHunt. These sites allow the user to ask for content meeting specific criteria (such as containing a given word or phrase) and retrieve a list of links to torrent files matching those criteria. This list can often be sorted with respect to several criteria, relevance (seeders-leechers ratio) being one of the most popular and useful (due to the way the protocol behaves, the download bandwidth achievable is very sensitive to this value). Bram Cohen launched a BitTorrent search engine on http://www.bittorrent.com/search that co-mingles licensed content with search results.[41] Metasearch engines allow one to search several BitTorrent indices and search engines at once. DHT search engines monitors the DHT network and indexes torrents via metadata exchange from peers.

Technologies built on BitTorrent

The BitTorrent protocol is still under development and therefore may still acquire new features and other enhancements such as improved efficiency.

Distributed trackers

On May 2, 2005, Azureus 2.3.0.0 (now known as Vuze) was released,[42] introducing support for "trackerless" torrents through a system called the "distributed database." This system is a DHT implementation which allows the client to use torrents that do not have a working BitTorrent tracker. The following month, BitTorrent, Inc. released version 4.2.0 of the Mainline BitTorrent client, which supported an alternative DHT implementation (popularly known as "Mainline DHT") that is incompatible with that of Azureus. Current versions of the official BitTorrent client, μTorrent, BitComet, Transmission and BitSpirit all share compatibility with Mainline DHT. Both DHT implementations are based on Kademlia.[43] As of version 3.0.5.0, Azureus also supports Mainline

DHT in addition to its own distributed database through use of an optional application plugin.[44] This potentially allows the Azureus client to reach a bigger swarm.

Another idea that has surfaced in Vuze is that of *virtual torrents*. This idea is based on the distributed tracker approach and is used to describe some web resource. Currently, it is used for instant messaging. It is implemented using a special messaging protocol and requires an appropriate plugin. Anatomic P2P is another approach, which uses a decentralized network of nodes that route traffic to dynamic trackers.

Most BitTorrent clients also use Peer exchange (PEX) to gather peers in addition to trackers and DHT. Peer exchange checks with known peers to see if they know of any other peers. With the 3.0.5.0 release of Vuze, all major BitTorrent clients now have compatible peer exchange.

Web seeding

Web seeding was implemented in 2006 as the ability of BitTorrent clients to download torrent pieces from an HTTP source in addition to the swarm. The advantage of this feature is that a website may distribute a torrent for a particular file or batch of files and make those files available for download from that same web server; this can simplify long-term seeding and load balancing through the use of existing, cheap, web hosting setups. In theory, this would make using BitTorrent almost as easy for a web publisher as creating a direct HTTP download. In addition, it would allow the "web seed" to be disabled if the swarm becomes too popular while still allowing the file to be readily available.

This feature has two distinct and incompatible specifications.

The first was created by John "TheSHAD0W" Hoffman, who created BitTornado.[45] From version 5.0 onward, the Mainline BitTorrent client also supports web seeds, and the BitTorrent web site had[46] a simple publishing tool that creates web seeded torrents.[47] µTorrent added support for web seeds in version 1.7. BitComet added support for web seeds in version 1.14. This first specification requires running a web service that serves content by info-hash and piece number, rather than filename.

The other specification is created by GetRight authors and can rely on a basic HTTP download space (using byte serving).[48]

In September 2010, a new service named Burnbit was launched which generates a torrent from any URL using webseeding. [49]

There exist server-side solutions that provide initial seeding of the file from the webserver via standard Bittorrent protocol and when the number of external seeders reach a limit, they stop serving the file from the original source. [50]

RSS feeds

Main article: Broadcatching

A technique called Broadcatching combines RSS with the BitTorrent protocol to create a content delivery system, further simplifying and automating content distribution. Steve Gillmor explained the concept in a column for Ziff-Davis in December, 2003.[51] The discussion spread quickly among bloggers (Ernest Miller,[52] Chris Pirillo, etc.). In an article entitled *Broadcatching with BitTorrent*, Scott Raymond explained:

I want RSS feeds of BitTorrent files. A script would periodically check the feed for new items, and use them to start the download. Then, I could find a trusted publisher of an Alias RSS feed, and "subscribe" to all new episodes of the show, which would then start downloading automatically — like the "season pass" feature of the TiVo.

—Scott Raymond, *scottraymond.net*[53]

The RSS feed will track the content, while BitTorrent ensures content integrity with cryptographic hashing of all data, so feed subscribers will receive uncorrupted content.

One of the first and popular software clients (free and open source) for *broadcatching* is Miro. Other free software clients such as PenguinTV and KatchTV are also now supporting broadcatching.

The BitTorrent web-service MoveDigital had the ability to make torrents available to any web application capable of parsing XML through its standard REST-based interface,[54] although this has since been discontinued. Additionally, Torrenthut is developing a similar torrent API that will provide the same features, as well as further intuition to help bring the torrent community to Web 2.0 standards. Alongside this release is a first PHP application built using the API called PEP, which will parse any Really Simple Syndication (RSS 2.0) feed and automatically create and seed a torrent for each enclosure found in that feed.[55]

Throttling and encryption

Main article: BitTorrent protocol encryption

Since BitTorrent makes up a large proportion of total traffic, some ISPs have chosen to throttle (slow down) BitTorrent transfers to ensure network capacity remains available for other uses. For this reason, methods have been developed to disguise BitTorrent traffic in an attempt to thwart these efforts.[56]

Protocol header encrypt (PHE) and Message stream encryption/Protocol encryption (MSE/PE) are features of some BitTorrent clients that attempt to make BitTorrent hard to detect and throttle. At the moment Vuze, Bitcomet, KTorrent, Transmission, Deluge, µTorrent, MooPolice, Halite, rTorrent and the latest official BitTorrent client (v6) support MSE/PE encryption.

In September 2006 it was reported that some software could detect and throttle BitTorrent traffic masquerading as HTTP traffic.[57]

Reports in August 2007 indicated that Comcast was preventing BitTorrent seeding by monitoring and interfering with the communication between peers. Protection against these efforts is provided by proxying the client-tracker traffic via an encrypted tunnel to a point outside of the Comcast network.[58] Comcast has more recently called a "truce" with BitTorrent, Inc. with the intention of shaping traffic in a protocol-agnostic manner.[59] Questions about the ethics and legality of Comcast's behavior have led to renewed debate about net neutrality in the United States.[60]

In general, although encryption can make it difficult to determine *what* is being shared, BitTorrent is vulnerable to traffic analysis. Thus even with MSE/PE, it may be possible for an ISP to recognize BitTorrent and also to determine that a system is no longer downloading but only uploading data, and terminate its connection by injecting TCP RST (reset flag) packets.

Multitracker

Another unofficial feature is an extension to the BitTorrent metadata format proposed by John Hoffman[61] and implemented by several indexing websites. It allows the use of multiple trackers per file, so if one tracker fails, others can continue to support file transfer. It is implemented in several clients, such as BitComet, BitTornado, BitTorrent, KTorrent, Transmission, Deluge, µTorrent, rtorrent, and Vuze. Trackers are placed in groups, or tiers, with a tracker randomly chosen from the top tier and tried, moving to the next tier if all the trackers in the top tier fail.

Torrents with multiple trackers[62] can decrease the time it takes to download a file, but also has a few consequences:

- Poorly implemented[63] clients may contact multiple trackers, leading to more overhead-traffic.
- Torrents from closed trackers suddenly become downloadable by non-members, as they can connect to a seed via an open tracker.

Decentralized keyword search

Even with distributed trackers, a third party is still required to find a specific torrent. This is usually done in the form of a hyperlink from the website of the content owner or through indexing websites like The Pirate Bay, Torrentz or BTDigg.

The Tribler BitTorrent client is the first to incorporate decentralized search capabilities. With Tribler, users can find .torrent files that are hosted among other peers, instead of on a centralized index sites. It adds such an ability to the BitTorrent protocol using a gossip protocol, somewhat similar to the eXeem network which was shut down in 2005. The software includes the ability to recommend content as well. After a dozen downloads the Tribler software can roughly estimate the download taste of the user and recommend additional content.[64]

In May 2007 Cornell University published a paper proposing a new approach to searching a peer-to-peer network for inexact strings,[65] which could replace the functionality of a central indexing site. A year later, the same team implemented the system as a plugin for Vuze called Cubit[66] and published a follow-up paper reporting its success.[67]

A somewhat similar facility but with a slightly different approach is provided by the BitComet client through its "Torrent Exchange"[68] feature. Whenever two peers using BitComet (with Torrent Exchange enabled) connect to each other they exchange lists of all the torrents (name and info-hash) they have in the Torrent Share storage (torrent files which were previously downloaded and for which the user chose to enable sharing by Torrent Exchange).

Thus each client builds up a list of all the torrents shared by the peers it connected to in the current session (or it can even maintain the list between sessions if instructed). At any time the user can search into that Torrent Collection list for a certain torrent and sort the list by categories. When the user chooses to download a torrent from that list, the .torrent file is automatically searched for (by info-hash value) in the DHT Network and when found it is downloaded by the querying client which can after that create and initiate a downloading task.

Implementations

Main article: Comparison of BitTorrent clients

The BitTorrent specification is free to use and many clients are open source, so BitTorrent clients have been created for all common operating systems using a variety of programming languages. The

official BitTorrent client, μTorrent, Xunlei, Vuze and BitComet are some of the most popular clients.[69]

Some BitTorrent implementations such as MLDonkey and Torrentflux are designed to run as servers. For example, this can be used to centralize file sharing on a single dedicated server which users share access to on the network.[70] Server-oriented BitTorrent implementations can also be hosted by hosting providers at co-located facilities with high bandwidth Internet connectivity (e.g., a datacenter) which can provide dramatic speed benefits over using BitTorrent from a regular home broadband connection.

Services such as ImageShack can download files on BitTorrent for the user, allowing them to download the entire file by HTTP once it is finished.

The Opera web browser supports BitTorrent,[71] as does Wyzo. BitLet allows users to download Torrents directly from their browser using a Java applet. Sites such as xFiles and DuShare allow to transfer big files directly using bittorrent inside adobe Flash.

An increasing number of hardware devices are being made to support BitTorrent. These include routers and NAS devices containing BitTorrent-capable firmware like OpenWrt.

Proprietary versions of the protocol which implement DRM, encryption, and authentication are found within managed clients such as Pando.

[edit] Development

An unimplemented (as of February 2008) unofficial feature is Similarity Enhanced Transfer (SET), a technique for improving the speed at which peer-to-peer file sharing and content distribution systems can share data. SET, proposed by researchers Pucha, Andersen, and Kaminsky, works by spotting chunks of identical data in files that are an exact or near match to the one needed and transferring these data to the client if the "exact" data are not present. Their experiments suggested that SET will help greatly with less popular files, but not as much for popular data, where many peers are already downloading it.[72] Andersen believes that this technique could be immediately used by developers with the BitTorrent file sharing system.[73]

As of December 2008, BitTorrent, Inc. is working with Oversi on new Policy Discover Protocols that query the ISP for capabilities and network architecture information. Oversi's ISP hosted NetEnhancer box is designed to "improve peer selection" by helping peers find local nodes, improving download speeds while reducing the loads into and out of the ISP's network.[74]

Legal issues

Main article: Legal issues with BitTorrent

There has been much controversy over the use of BitTorrent trackers. BitTorrent metafiles themselves do not store file contents. Whether the publishers of BitTorrent metafiles violate copyrights by linking to copyrighted material without the authorization of copyright holders is controversial.

Various jurisdictions have pursued legal action against websites that host BitTorrent trackers. High-profile examples include the closing of Suprnova.org, Torrentspy, LokiTorrent, Mininova and OiNK.cd. The Pirate Bay torrent website, formed by a Swedish group, is noted for the "legal" section of its website in which letters and replies on the subject of alleged copyright infringements are publicly displayed. On 31 May 2006, The Pirate Bay's servers in Sweden were raided by Swedish

police on allegations by the MPAA of copyright infringement;[75] however, the tracker was up and running again three days later.

BitTorrent and malware

Several studies on BitTorrent have indicated that a large portion of files available for download via BitTorrent contain malware. In particular, one small sample[76] indicated that 18% of all executable programs available for download contained malware. Another study [77] claims that as much as 14.5% of BitTorrent downloads contain zero-day malware, and that BitTorrent was used as the distribution mechanism for 47% of all zero-day malware they have found.

Torrent file

A **torrent file** stores metadata used for BitTorrent. It is defined in the BitTorrent specification.[1] Simply, a torrent is data about a target file, though it contains no information about the content of the file. The only data that the torrent holds is information about the location of different pieces of the target file. Torrents work by dividing the target file into small information chunks, found on an unlimited number of different hosts. Through this method, torrents are able to download large files quickly. When a client (the recipient of a target file) has initiated a torrent download, the chunks of target file that are needed can be found easily, based on the data from the torrent itself. Once all the chunks are downloaded the client can assemble them into a usable form. Note: the torrent must be completed before it can be assembled into a usable form. This differs from conventional internet downloads which have only one host and are usable even if the file is incomplete.

A torrent file contains the URLs of many trackers and integrity metadata about all the pieces. It can also contain additional metadata defined in extensions to the BitTorrent specification.[2] These are known as "BitTorrent Enhancement Proposals". Examples of such proposals include metadata for stating who created the torrent, and when.

A torrent file is a bencoded dictionary with the following keys:

- `announce` - the URL of the tracker
- `info` - this maps to a dictionary whose keys are dependent on whether one or more files are being shared:
  - `name` - suggested file/directory name where the file(s) is/are to be saved
  - `piece length` - number of bytes per piece. This is commonly 2^{18} = 256 KiB = 262,144 B.
  - `pieces` - a hash list. That is, a concatenation of each piece's SHA-1 hash. As SHA-1 returns a 160-bit hash, `pieces` will be a string whose length is a multiple of 160-bits.
  - `length` - size of the file in bytes (only when one file is being shared)
  - `files` - a list of dictionaries each corresponding to a file (only when multiple files are being shared). Each dictionary has the following keys:
    - `path` - a list of strings corresponding to subdirectory names, the last of which is the actual file name
    - `length` - size of the file in bytes.

All strings must be UTF-8 encoded.

Extensions

Draft extensions

These extensions are under consideration for standardization. the torrent file uses the extension is ".torrent"

Distributed hash tables

BEP-0005[3] extends BitTorrent to support distributed hash tables.

A trackerless torrent dictionary does not have an `announce` key. Instead, a trackerless torrent has a `nodes` key:

```
{
...
'nodes': [["<host>", <port>], ["<host>", <port>], ...]
...
}
```

For example,

```
'nodes': [["127.0.0.1", 6881], ["your.router.node", 4804]]
```

The specification recommends that `nodes` "should be set to the K closest nodes in the torrent generating client's routing table. Alternatively, the key could be set to a known good node such as one operated by the person generating the torrent."

Multiple trackers

BEP-0012[4] extends BitTorrent to support multiple trackers.

A new key, `announce-list`, is placed in the top-most list (i.e. with `announce` and `info`)

```
...
}
```

HTTP seeds

BEP-0017[5] extends BitTorrent to support HTTP seeds.

A new key, `httpseeds`, is placed in the top-most list (i.e. with `announce` and `info`). This key's value is a list of web addresses where torrent data can be retrieved:

```
{
...
'httpseeds': ['http://www.site1.com/source1.php',
'http://www.site2.com/source2.php']
...
}
```

Private torrents

BEP-0027[6] extends BitTorrent to support private torrents.

A new key, `private`, is placed in the `info` dictionary. This key's value is 1 if the torrent is private:

```
{
...
'private': 1
...
}
```

Merkle trees

BEP-0030[7] extends BitTorrent to support Merkle trees.

A torrent file using Merkle trees does not have a `pieces` key in the `info` list. Instead, such a torrent file has a `root hash` key in the `info` list. This key's value is the root hash of the Merkle hash:

```
{
...
'info': {
...
'root hash': e6bdebcc5d55da0a77f4bb1b57d88de794838577
...
}
...
}
```

Examples

Single file

Here is what a de-bencoded torrent file (with `piece length` 256KiB = 262144 bytes) for a file `debian-503-amd64-CD-1.iso` (whose size is 647MiB = 678301696 bytes) might look like:

```
{'announce': 'http://bttracker.debian.org:6969/announce',
'info': {'name': 'Win7.iso',
'piece length': 262144,
'length': 678301696,
'pieces': '841ae846bc5b6d7bd6e9aa3dd9e551559c82abc1 ...
d14f1631d776008f83772ee170c42411618190a4'
}
}
```

Note: `pieces` here would be a ceil(`length`/`piece length`) * 160-bit = ceil(678301696/262144) * 160-bit = ceil(2587.515625) * 160-bit = 2588 * 160-bit = 414080-bit = 51KiB value.

Multiple files

Here is what a de-bencoded torrent file (with `piece length` 256KiB = 262144) for two files, 111.txt & 222.txt, might look like:

```
{'announce': 'http://tracker.site1.com/announce',
'info: {
   'name': 'directoryName',
   'piece length': 262144,
```

```
    'files': [ {'path': '111.txt', 'length': 111}, {'path':
'222.txt', 'length': 222} ],
    'pieces':
'6a8af7eda90ba9f851831073c48ea6b7b7e9feeb...8a43d9d965a47f75488d3fb4
7d2c586337a20b9f'
   }
}
```

How to create a torrent?

orrents are great, they are the best way to share large files with your friends, or even with people you don't know at all. But surprisingly enough, not many people create torrents when they need to share something. I have "a lot of" friends who know how to download torrents, but when they need to send me their latest 200MB vacation picture collection, they ask me to "get on msn".

It's not that I have anything against msn (although the file transfer sucks), but why don't just use BitTorrent? Especially if you want to send something to more than one person, or if you want to share high quality HDTV files, because then you can share the bandwidth.

So how do you do this? Well it's very simple. Open your favorite BitTorrent client and do the magic trick:

file > create torrent

That's all? Well almost. All you need to do now is put in the tracker info and tick some boxes. This can differ somewhat from client to client but it all comes down to the same thing.
uTorrent

1. File > Create new Torrent *(or CTRL + N)*
2. Select the files and or directories

3. Trackers: This is probably the hard part for most people. But it's pretty easy, just put in one of the popular public trackers. You can use one or more trackers, but in general one is enough.

Here are some good trackers you can use:

http://open.tracker.thepiratebay.org/announce

http://www.torrent-downloads.to:2710/announce

http://denis.stalker.h3q.com:6969/announce

udp://denis.stalker.h3q.com:6969/announce

http://www.sumotracker.com/announce

Put one of these in the tracker box

4. Do NOT tick the private torrent box (unless you're using a private tracker)

5. Save the torrent and send it to your friends

Bitcomet

1. **File > Create Torrent** *(or CTRL + M)*

2. Select the files and or directories

3. Select "enable public DHT network" from the dropdown box
This way you can be your own tracker if the public tracker goes down.

4. Tracker server and DHT node list
Again, This is probably the hard part for most people. But it's pretty easy, just put in one of the popular public trackers. You can use one or more trackers, but in general one is enough.

Here are some of the most popular trackers at the moment:

http://open.tracker.thepiratebay.org/announce

http://www.torrent-downloads.to:2710/announce

http://denis.stalker.h3q.com:6969/announce

udp://denis.stalker.h3q.com:6969/announce

http://www.sumotracker.com/announce

Put one of these in the tracker box

5. Save the torrent and send it to your friends

Azureus

1. **File > New Torrent** *(or CTRL + N)*

2. Tick "use an external tracker".
And again, This is probably the hard part for most people. But it's pretty easy, just put in one of the popular public trackers.

Here are some of the most popular trackers at the moment:

http://tracker.prq.to/announce

http://inferno.demonoid.com:3389/announce

http://tracker.bt-chat.com/announce

http://tracker.zerotracker.com:2710/announce

Put one of these in the tracker box

3. Select single file or dicectory, click NEXT and point to the file or directory you want to share, and click NEXT

4. Do NOT tick "private torrent"

5. Do tick "allow decentralized tracking"

6. Save the torrent and send it to your friends

Happy sharing. Note that you don't need to upload the torrent to a website or a tracker. This means you control who gets the file and who doesn't, and it won't be visible to others!

A "torrent" or a "bit torrent" is a type of meta-data that facilitates peer-to-peer filesharing. Torrents have garnered much media attention lately because of their relatively unregulated use and the tendency of torrent users to trade illicit data. However, not all torrents are illegal.

1. Function

- In a conventional Internet download, a file or group of files is transmitted from one computer (usually a server) to another computer (a client). Data is held in a central location and is retrieved per the request of a single user.

  A torrent, however, distributes data differently on many levels. Firstly, a .torrent file is not the actual file being retrieved. The .torrent file is merely data which has information about the file that the user is seeking. The .torrent file is, in a sense, a sort of index of the file being retrieved. The torrent divides the target file into a series of equally sized pieces that are each assigned an identifying checksum.

  The transfer of the torrent file is done between many different peers. Rather than the data being transferred from one machine to the next, the various pieces of the file are held on many different computers. The torrent client communicate with other peers in order to check which pieces they have and exchanges them for the ones they need. In this way, transferring files via a torrent is sort of like a lightning fast, digitally automated game of "Go Fish." Peers swap pieces of files with as many different computers as possible and eventually combine the various parts into the whole, requested file.

2. Benefits

- Transferring files via torrent is, in most cases, much faster than downloading files from a single host. This is because the demand for data, or bandwidth, is

distributed evenly amongst many different users. Think of it as a group of Egyptians trying to haul an immense block. While a single worker may be able to shift a block inches at a time under great strain, hundreds of workers working together will be able to move a large block with relative ease.

The tracking system of the disparate pieces of file also allow for easily resumed transfers. If your transfer is interrupted, you can simply pick up where you left off the next time you sign on. In this way, you can download very large files over several sessions without leaving your computer on for an extended amount of time.

The decentralization of files also makes for a more reliable. In cases where a file is only hosted on one machine, an outage for that particular server makes retrieving the file an impossibility. Meanwhile, with a torrent, if one machine goes down, users can easily retrieve the needed piece from another machine.

3.   Considerations

o   On the other hand, torrent transfer are wholly dependent on connectivity of peers. Getting torrents up and running is a somewhat more technical endeavor than downloading a file off a server, sometimes requiring configuration of routers and the bypassing of firewalls and the opening of ports. Some machines and ISPs are simply not conducive to torrent transfers.

There is also an understood quid pro quo amongst torrent users. Many torrent services require users to upload data in order to gain downloading privileges. Downloading data without contributing to the community ("leeching") is heavily frowned upon in some circles.

One frustration that frequent torrent users encounter are incomplete downloads. For example, the first portion of a torrent is often easy to find, but if very few users have a certain portion of the file, you will not be able to complete your download unless they are signed onto the torrent host.

4.   Warning

o   Though few casual Internet users ever find themselves in legal trouble for downloading pirated music, many ISPs closely monitor the type of data that is uploaded. The majority of cases in which an individual was prosecuted on charges of file sharing involve the user sending illicit music files rather than receiving them. With a torrents, uploading data is often a prerequisite for downloading files. As such, you are much more liable for being implicated for software or music piracy by utilizing torrents.

Note that colleges, employers and residential internet service providers pay extra attention to their Internet activity. This is because if a user is found to be engaging in illicit activity, the onus may fall on the institution, rather than the individual. As such, many schools and employers will ban your access to the Internet after your first offense.

Be advised: if you are downloading music or software that you would typically have to pay for, you are likely breaking the law, thus putting yourself at risk.

5.   Significance

o   Torrents open the doors for swifter and wider file sharing. Many reputable software distributors choose to release their products via torrent files in order to reduce strain on their servers. This method of distribution also helps independent and smaller software companies or artists who do not have as much capital at their disposal to create physical media.

However, torrents pose a threat to those who do not wish for their material to be traded freely via the Internet. In the past, labels and corporations have merely sought to shut down the facilitator of peer-to-peer fileshares, such as Napster. But torrents do not require a centralized network in order to function. All that is required is a site to announce the torrent and publish the corresponding file. This type of distribution is much more difficult to shut down. As the software and music piracy becomes more aggressive, so too does the digital rights management (DRM) and copyright protection efforts, resulting in more hoops to be jumped through when registering legitimately purchased data, such as product keys and serial numbers.

The Top 8 Torrent Clients on the Web

Organize your files, increase your download speeds, and find more content

By Wendy Boswell, About.com Guide

If you want to download torrents - small files that are make up a much larger file, delivered in part as a "swarm" to many users at the same time - you have to have a torrent client. A torrent client is a simple software program that manages your torrent downloads and uploads, helps you find files, and even organizes your download library.

Once you have your torrent client installed, you're ready to search for torrents. Many torrent clients offer you the ability to search for torrents from multiple sites directly from the client itself. You can also use the Web to search for torrents, such as torrent search engines or torrent sites.

Once you've found the torrent file you want to download, simply click "download this file". Your Web browser will usually ask you what you want to do with this program; make sure you select the torrent client that you just downloaded in order to download and manage it.

If your Web browser for some reason does NOT ask you what you want to do with this file, save the file to an easily accessible spot on your computer, such as a special folder that you've designated specifically for torrent files. That way, it will be easier to find and organize. Once you have the torrent file tethered on your computer, you can use your torrent client to find and download the torrent. Note: it's easiest to search for torrents from within a torrent client, if this option is available. Most of the clients on this list give you the ability to search multiple torrent sites at once, track your torrent downloads, and organize them just the way you want them.

While searching for torrents and P2P sharing technology is completely legal, many of the torrent files that you will come across on the Web are actually copyrighted. Copyright law in the United States and other countries (excluding Canada) puts these torrent files and downloading these torrent files at risk for legal action, including lawsuits. **Please use common sense and know your local laws before using torrent technology.**

1. uTorrent

uTorrent is a lightweight, open source, torrent client that's easy to set up and easy to use. It's extremely small, which means that it provides extremely fast downloads of very large files. uTorrent works on both Windows and Mac systems. You can search for torrents within the software itself, download files and manage them in the download manager, even remotely access and organize your downloads from anywhere you might be.
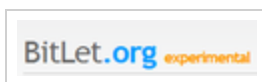
2. BitLet

BitLet is simply an application that lets you download any torrent file directly in your browser instead of using a separate torrent client, which makes it a very convenient application to use if you'd rather not download anything. Simply use a torrent search engine, copy and paste the URL into BitLet's simple to use interface, and click the "download torrent" button.

3. Transmission

Download torrents even easier with Transmission, a fast, easy, and free multi-platform BitTorrent client with a focus on being lightweight with lots of interesting features, such as watchlists, a streamlined integration, and a very user-friendly interface. It's also an open source client, which means that people who enjoy Transmission can choose to add more features if they so choose.

4. Vuze

Vuze is one of the most popular torrent clients on the Web and with good reason. It's easy to use, it organizes your torrent downloads, and it offers lots of very useful features, including a meta search, subscriptions to your favorite content, fast downloads with multiple streams, remote control, and drag and drop device playback.

5. BitComent

BitComet is a complete download management/organizational tool that is completely free, promising to increase download speed by several times over. Features that BitComet offers include easy seeding and sharing, preview options while downloading, and complete download customization.

6. Deluge
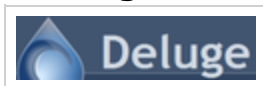
Deluge is a free torrent client that is available for Linux, Mac, and Windows systems. It offers full encryption for security and peace of mind, a wide variety of plugins for increased functionality, and private torrents that can be remotely controlled for easy access.

7. BitTornado

BitTornado is a free, streamlined torrent client that is easy to use for the beginner. Features include upload and download speed settings, batch downloading, and specific information about connections to any peers.

8. BitTorrent

BitTorrent is the original torrent software client, offering many features that make it even easier to use for beginners and advanced users alike. Features include:

- A hub for searchers to connect with independent artists
- A streamlined, intuitive interface that is simple to start using immediately
- Skin personalization and the addition of new features through the App Studio

- Fast downloads
- Maximization of network bandwidth so you can keep doing what you're doing with little to no interference

Torrent Downloads: The Top Nine Websites

By Wendy Boswell, About.com Guide

Web searchers all over the world use the Web and an ingenious networking technology originated by Bram Cohen called **BitTorrent**, aka torrents, to find and share music, movies, and books quickly and easily. This protocol makes it possible to distribute very large files to many people simultaneously simply by sharing the load; small chunks of a file are downloaded and uploaded by many different people in many different locations, all at the same time.

Note: While searching for torrents and P2P sharing technology is completely legal, many of the torrent files that you will come across on the Web are actually copyrighted. Copyright law in the United States and other countries (excluding Canada) puts these torrent files and downloading these torrent files at risk for legal action, including lawsuits. Please use common sense and know your local laws before using torrent technology.

1. YouTorrent

YouTorrent is a torrent search engine that scours a dozen or so different torrent search services and brings the results to you all in one place. Simply type in the name of the multimedia content that you are looking for, and you'll have a good array of results quickly.

You can filter your results on YouTorrent by checking out the rotating list of torrents that are being downloaded right now on the front page, viewing the Featured torrents, searching via keyword, or browsing the categories: Music, Movies, TV, or Games.

More about YouTorrentRead Review

2. Torrentz

Torrentz is a meta-search engine that brings back results from several different torrent search engines and sites, offering literally millions of file selections in their impressive index. You can use Torrentz to find what you're looking for several different ways: by keyword, by title, by tag, or by category. Torrentz's search results pages return (potentially) dozens of links to the same content item, since they are finding all the different occurrences of that particular item on several different torrent sites and search engines. Scroll down the page and you'll see whether or not this file was actually verified by other Torrentz users (verified bittorrents are virus-free and contain all that they advertise), as well as the contents of the file so you know exactly what you're getting.

Read more about Torrentz Read Review

3. Mininova

Mininova is one of the largest torrent search engines on the Web, started back in 2005, and therefore offers you a LOT of torrents from which to choose from - even an RSS feed so you can stay updated easily on featured content.
You can search for files at Mininova several different ways: see what's the most popular, browse the categories (books, anime, games, TV shows, etc.), or check out Mininova's advanced search. The advanced search gives you even more options, including the ability to filter your search via keyword.

More about Mininova

4. Torrent Reactor

TorrentReactor has a lot to offer, and initially the site can be somewhat overwhelming because of that. Browse the categories ranging from Anime to Movies to Popular Torrents, see what the Latest Torrents might include, and check out the list of daily torrents that other users have uploaded or downloaded.
More about Torrent Reactor

5. The Pirate Bay

The Pirate Bay is a peer to peer file sharing site where users can swap movie, music, and game files. It's defined as a torrent tracker, which means that it's a central hub for all file transfers that Pirate Bay users share. The site was created in 2003 and remains one of the most popular places online to find torrents. While you can search via keyword on Pirate Bay, it's more interesting to see what's in the Pirate Bay Top 100 picks. These are the files that are seeing more activity than anything else on the site, divided by category into Books, Music, TV Shows, Movies, and lots more.

Learn more about the Pirate BayRead Review

6. Isohunt

Isohunt is a bittorrent file search engine with millions of fans all over the world. Hundreds of thousands of torrents are shared here every single day, making it one of the most popular torrent websites currently in existence.
Isohunt offers a sophisticated search that offers Boolean search filters, wildcards, and the use of quotations to specify a phrase. You can subscribe via RSS to any search phrase. Click on a search result, and you'll see a summary of contents, user submitted comments and criticism, and of course, a link to download the torrent files.

Read more about IsohuntRead Review

7. Public Domain Movie Torrents

You're not going to find any extremely popular movie torrents here at Public Domain Movie Torrents, but what you will find are tons of completely free classic and B-movie movie torrents. Because they have fallen out of copyright and are now in the public domain, you can share these movies, available in a variety of different formats, with as many people as you would like.
Read more about Public Domain TorrentsRead Review

8. KickAss Torrents

Kickass Torrents, a torrent search engine created in 2008, offers a very user-friendly site that beginners to torrents will especially appreciate. Check out the content on Kickass Torrents several different ways: by tag, by keyword, by category, by latest download, and by most recent releases.

Torrent Search Engines: The Top Fifteen

By Wendy Boswell, About.com Guide

Millions of people all over the world use the bittorrent peer to peer file-sharing system to exchange and share large files. Here are the top-rated torrent search engines on the Web, as reviewed and rated by About.com users and the Web community at large.

While searching for torrents and P2P sharing technology is completely legal, many of the torrent files that you will come across on the Web are actually copyrighted. Copyright law in the United States and other countries (excluding Canada) puts these torrent files and downloading these torrent files at risk for legal action, including lawsuits. **Please use common sense and know your local laws before using torrent technology.**

1. The Pirate Bay

The Pirate Bay is one of the Web's largest torrent search engines and trackers, started in Sweden in 2003. Thousands upon thousands of torrent files can be found here, anything from books to movies to television shows. One of the best ways to use the Pirate Bay is to check out the top 100 list, an ever-changing collection of what's being downloaded or shared by the most people. The Pirate Bay is also one of the most reliable torrent search engines on the Web, with an active community that communicates clearly whether or not a torrent is worth dealing with or not.
More about the Pirate BayRead Review

Sponsored Links

2. Mininova

Mininova is one of the largest torrent search engines on the Web, started in 2005. Mininova provides an easy to use torrent search engine and directory, and since adult submissions are not allowed, Mininova is a family-friendly site (as

always however, use your best judgement when allowing minors to access anything on the Web - see How to Keep Kids Safe on the Web).

3. Isohunt

Isohunt was started way back in 2003 by a young student named Gary Fung. This very popular torrent search engine deals with thousands of torrents every single day, funneling results from one hundred different torrent sites on the Web for the very best selection, and enjoys millions of visitors from all over the world daily.
Read more about IsohuntRead Review

4. SeedPeer
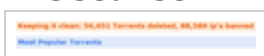
SeedPeer offers torrents for searchers in a wide variety of categories, including movies, TV shows, and games. A few nice features that SeedPeer offers: language-specific to whichever country you're currently residing in, a free Firefox browser add-on that you can use to surf SeedPeer from wherever on the Web you may be, and internally verified torrents that you can trust to contain the files you're looking for.

5. YouTorrent

YouTorrent is an easy to use torrent platform/search engine that even beginners will find intuitive. Find torrents on YouTorrent several different ways: via a keyword search, browsing through categories, or simply checking out what's in the Featured list on the front page.
More about YouTorrentRead Review

6. btjunkie

btjunkie definitely is one of the larger torrent search engines out there, with over 1.5 million active torrents and from 5,000-25,000 torrents added daily. Search for torrents on btjunkie via keyword, or find what you're looking for by selecting the "Browse" tab, then explore the various drop-down menus: Category, Seeded, Trackers, etc.

7. Torrentz

Torrentz is a torrent metasearch engine, which means that it filters results from a wide selection of other torrent sites on the Web to bring you what you're looking for. Type in a query, and your search results will come back with results from several different sites and/or search engines.

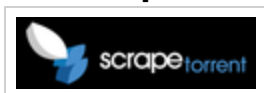More about TorrentzRead Review

8. TorrentReactor

TorrentReactor can be a little bit overwhelming to use simply because there's so much available here. To cut down the noise to signal ratio a bit, try exploring the categories found on the left-hand and middle of the home page.

(Continued from Page 1)

11. ScrapeTorrent

ScrapeTorrent combines torrents from many different sites onto one convenient page; it also gives you quite a few sorting options. All torrents that are actually verified (safe for downloading) are clearly marked with icons for easy access. In addition, duplicated torrents are identified and filtered out as soon as possible, making the site even more user-friendly.

12. Fenopy

Find and share torrents with friends at Fenopy; you can also check the dead torrents list to see if your torrent stream is no good. Searchers can quickly check the tag cloud that is front and center on the home page to see what the latest torrents are; each search result page gives you vital stats on that particular torrent such as how many people are downloading and uploading it, how large the file is, what it is currently rated, and any comments from users who have previously downloaded that file.
Learn more about Fenopy

13. Torrents.to

Browse through a nicely organized collection of torrent sites and portals at Torrents.to, an extremely user-friendly site with multiple features. Searching for files on Torrents.to is easy with simple search filters. You can also add different torrents to your Favorits on Torrents.to with just one click of an icon, see detailed analysis of each file, or download a search plugin for Firefox, Internet Explorer, or Google Chrome.

14. KickAss Torrents

KickAss Torrents is probably one of the most easy to use sites in this list, certainly one of the most visually appealing. The site is arranged in an easy to use way, with tags at the top indicating the most searched for torrents, then categories with the most popular files arranged top to bottom (with RSS feeds for each one). Browse the Latest, Releases, or Community sections for the most up to date torrents and torrent information.

15. Demonoid

Demonoid may have a somewhat scary name, but it's actually a very good torrent directory/portal with a very active forum community. Not just anyone can participate here; registrations are periodically closed down to ensure that the site is functioning at top capacity. Some torrents are available to non-registered users, but to enjoy the full realm of all that Demonoid has to offer, users must watch for a chance to register and become part of the Demonoid community.

What is a torrent search hash

A HASH BE JUST A NUMBER ASSIGNED TO SOME DATA AND INDEXED BY A DATABASE TO EXPEDITE THA SUBSEQUENT RETRIEVAL OF SAID DATAS.
IF YOU BE USIN A TORRENT SEARCH ENGINE DEY BE STORIN ALL THEIR TORRENT INFORMATION IN A DATABASE SO ALL DA HASH NUMBER IS IS A WAY FOR DAT DATABASE TO GET DA TORRENT INFORMATION FASTER

Is it illegal to download torrent files?

No it's not.

BUT WAIT ...

Before you run off and start downloading last week's bootlegged theatrical movie release, you *really* need to understand why *that* particular download and others like it probably *are* illegal.

-

(Caveat: I'm basing this on my knowledge of the current state of Copyright law. Please, realize I'm no lawyer, and this shouldn't be taken as legal advice. This is mostly just common sense with the high level concepts we're talking about.)

"Torrent" files are, specifically, a small file of information used by a file sharing technology known as "bitTorrent". To be super pedantic about it, because the ".torrent" file itself just has some administrative information in it, there's nothing wrong with downloading it.

But that, of course, is not what you meant.

The word "torrent" is also frequently, though incorrectly, used to refer to the actual files being shared using bitTorrent. So while you might use the ".torrent" to initiate a download, most people call the download itself a "torrent" as well. And that's more than likely what you're asking.

"bitTorrent is nothing more than a file downloading technology. "

But here's the catch: bitTorrent is nothing more than a file downloading technology. It's highly efficient, optimized for large files and for decentralized storage of the files being downloaded, but ultimately it's nothing more than a way to copy a file down to your machine.

Copying a file to your machine is not illegal.

The technology used to copy a file to your machine is not illegal.

In some ways you could just as well ask "Is it legal to download files from the web?", to which the answer is (obviously, I hope), of course it's legal. We do it every time we view a web page.

The problem comes from looking at exactly what kinds of files are being downloaded.

Downloading copyrighted files without permission *is* illegal. And it doesn't matter what technology you happen to use to do it: bitTorrent, FTP, web downloads, email or getting a CD in the mail. If the material is copyrighted and you didn't pay for or otherwise get the legal right or license to receive those files, those are all copyright violations.

Unfortunately bitTorrent technology has become confused with illegal file sharing simply because so much of that illegal activity uses that technology.

So let's be clear: the technology is legal. BitTorrent is legal. Torrents are legal. But using bitTorrent or any other technology to download copyrighted material that you don't have the right to is not.

And yes, bitTorrent and bitTorrent-like technology can most definitely be used for totally legal activities. As just one small example I believe many Linux distributions are often made available as torrents. Perfectly legal, and exactly the kind of large download that bitTorrent technology was designed for and excels at.

Sadly, people who should know better either don't, or are purposely using that confusion to further their own agenda. We've heard of ISPs and other facilities blocking or throttling bitTorrent file transfers, or politicians suggesting they do so, "because it's all illegal". It's not. Along with blocking the illegal file sharing that's going on, doing so also blocks the legal and appropriate use of the technology as well.

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