

Peer to Peer Applications: BitTorrent

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BitTorrent

- Basic Idea: Ignore search; focus on efficient fetch
- Why like this?
 - To handle flash crowds (e.g. new game release)
 - Past: single source, multiple mirror sources
 - Source servers can become bottlenecks; high cost
- BitTorrent: Users form a swarm of peers (all interested in the same file)
 - Each upload to/ download from each other simultaneously





The diagram illustrates a peer-to-peer network. At the bottom center is a server icon. To its left, the text "Large file divided into chunks" is written, with "Large file" underlined. Below this text is a red circle containing five colored squares (red, orange, yellow, green, blue). To the right of the server is a red checkmark and the word "Peer". Above the server, there are seven desktop computer icons arranged in a circular pattern. Red arrows point from the server to three of these desktop icons. One desktop icon at the top is circled in red. Another desktop icon on the right is circled in red. The word "Swarm" is written in red at the top right. There are several other red checkmarks and lines scattered around the desktop icons.

Large file divided
into chunks

Challenges:

- Churn: Peers come and go
- Freeloaders: Download but not upload

Publish

- Create a torrent file (.torrent). Includes meta data about the file you wish to share and url of a tracker
- Meta Data:
 - Name of the file
 - SHA-1 hash of each piece (a file is divided into pieces)
 - Piece size (usually 256KB)
 - Length of the file

Publish

- Tracker: A server that coordinates file transfer; keeps track of peers in the swarm
 - Both public (any one can use) and private trackers available (only by invitation)
- Publish the torrent file on a web server
- Ensure a machine that has the entire file joins the swarm (initial seed)
 - Seed: A node with a complete file

Search/Join

- Search: Out of band (use google or on popular websites that host torrents) to find the torrent file
- Join: Contact “tracker” listed in the torrent file
 - Provide your IP-addr, Port info, amount uploaded/downloaded etc (do this periodically)
 - Tracker provides a list of peers who are downloading same file

Terminology

- Seed: A node with the complete file
- Leech: A node that is still downloading the file
- Peer: Runs BitTorrent client. Can be a seed or a leech
- Sub-piece: File is divided into pieces (typically 256KB). Each piece further sub-divided into sub-pieces (typically 16 no.).
 - Unit of request is a subpiece; 5 requests pipelined at once
 - A peer can upload only after receiving a complete piece

Fetch

- As part of Join, a leecher gets a list of peers who are downloading same file
- Which piece (sub-piece) to request? ✓
 - Piece Selection Algorithm
- From whom to request? And whose request to accept or deny? ✓
 - Choking Algorithm

Break

