

# **A P2P file distribution system ——BitTorrent**



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# Outline

- 1 Advantages
- 2 BitTorrent Components
- 3 Publishing Content
- 4 Internal Mechanism



# Problems

- Traditional Client/Server Sharing
  - Performance deteriorates rapidly as the number of clients increases
- Free-riding in P2P network
  - Free riders only download without contributing to the network.



# BitTorrent

- Good Scalability
- Strong incentives to prevent free-riding.

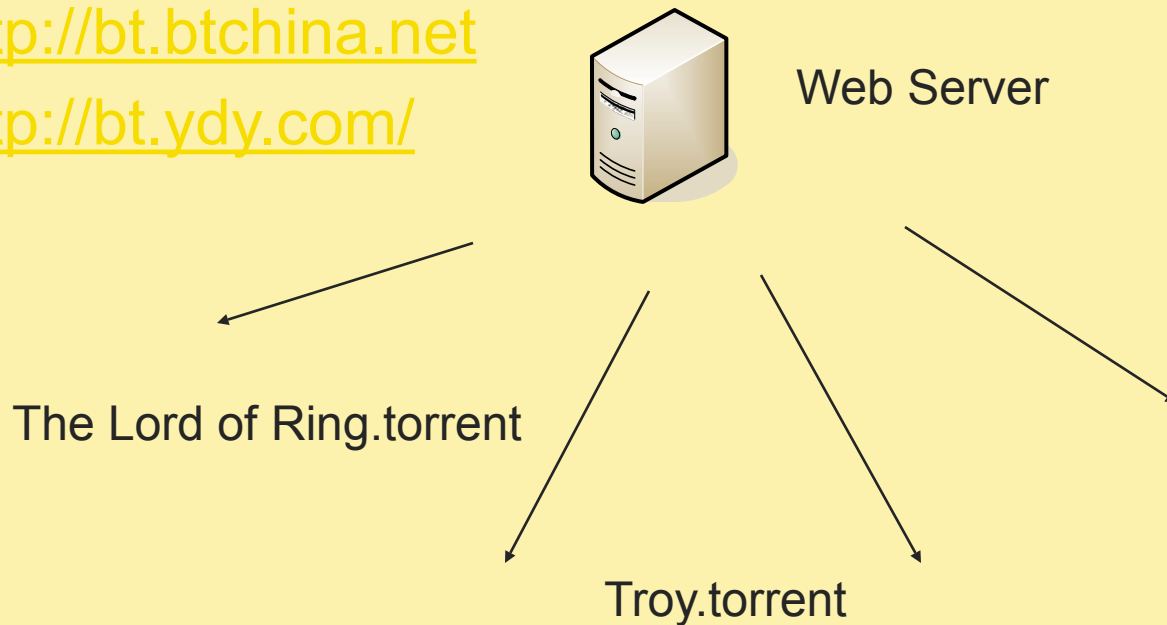


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# Critical Elements

- 1 A web server
  - To provide the 'metainfo' file by HTTP
  - For example:
    - <http://bt.btchina.net>
    - <http://bt.ydy.com/>



# Critical Elements

- 2 The .torrent file
  - Static 'metainfo' file to contain necessary information :
    - Name
    - Size
    - Checksum
    - IP address of the Tracker
    - ...



Matrix.torrent



# Critical Elements

- 3 A BitTorrent tracker
  - Non-content-sharing node
  - Track peers
  - For example:
    - <http://bt.cnxp.com:8080/announce>
    - <http://btfans.3322.org:6969/announce>





# Critical Elements

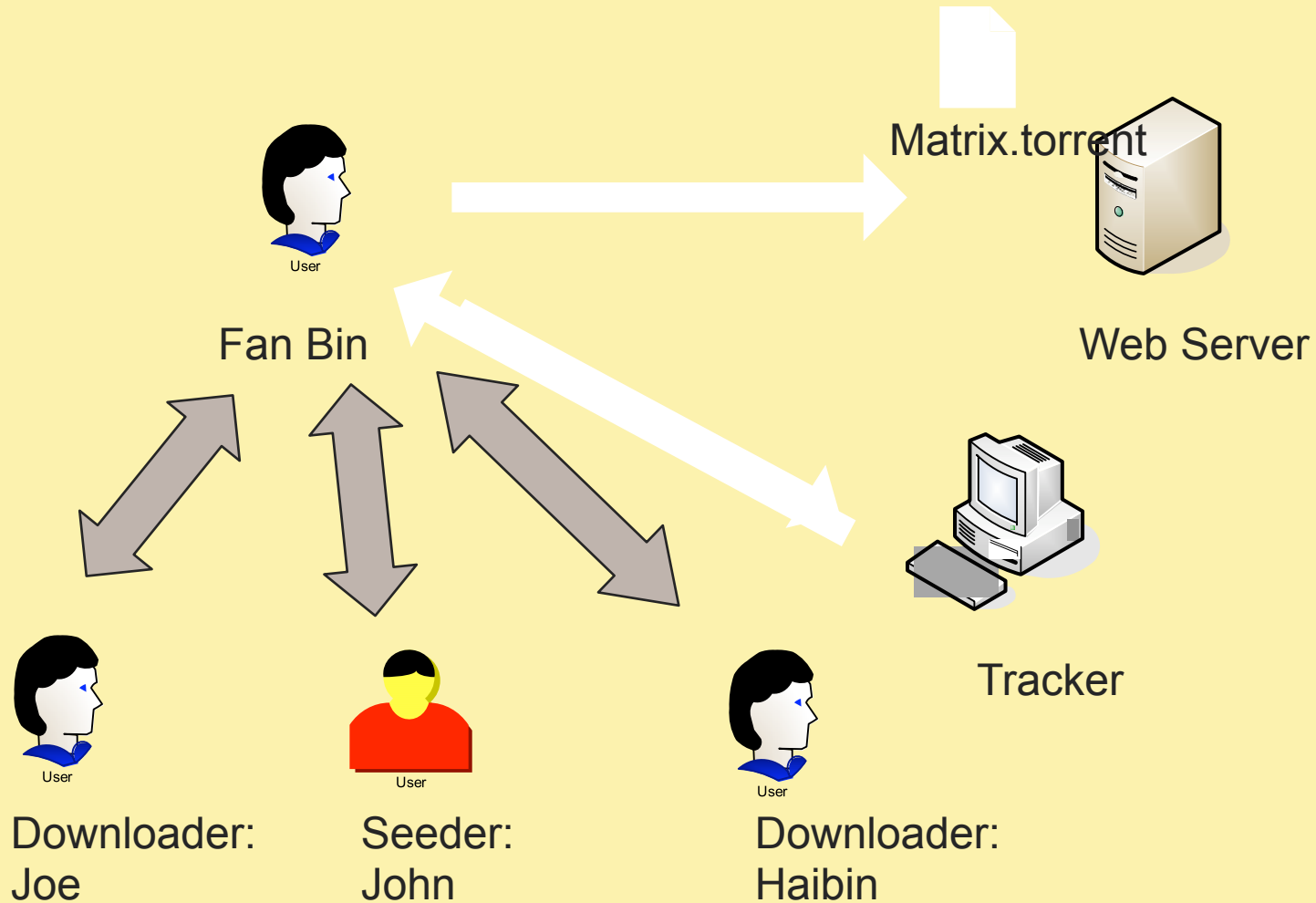
- 4 An end user (peer)
  - Guys who want to use BitTorrent must install corresponding software or plug-in for web browsers.
  - *Downloader (leecher)* : Peer has only **a part ( or none )** of the file.
  - *Seeder*: Peer has the **complete** file, and chooses to stay in the system to allow other peers to download



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# Connectivity

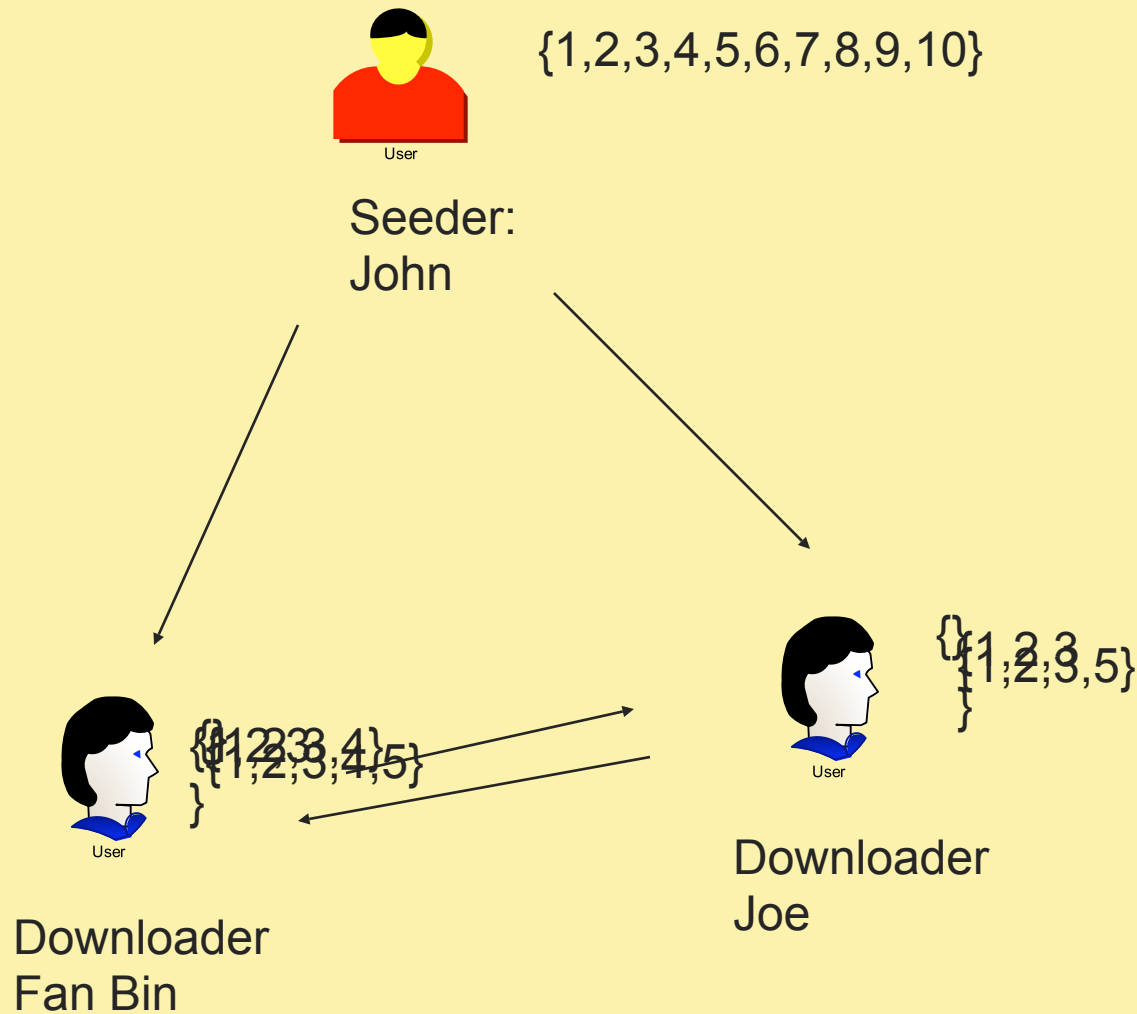




# Piece

- A file is cut into pieces of fixed size, typically 256Kb
- Each downloader reports to all of its peers what pieces it has.
- To verify data, Hash codes are used for all the pieces, included in .torrent files.

# A trivial example





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# Piece Selection

- **Strict Priority**
  - First Priority
- **Rarest First**
  - General rules
- **Random First Piece**
  - Special case, at the beginning
- **Endgame Mode**
  - Special case, in the end



# Peer Selection

- Built-in incentive mechanism (*where all the magic happens*):
  - *Choking Algorithm*
  - *Optimistic Unchoking*
  - *Anti-snubbing*



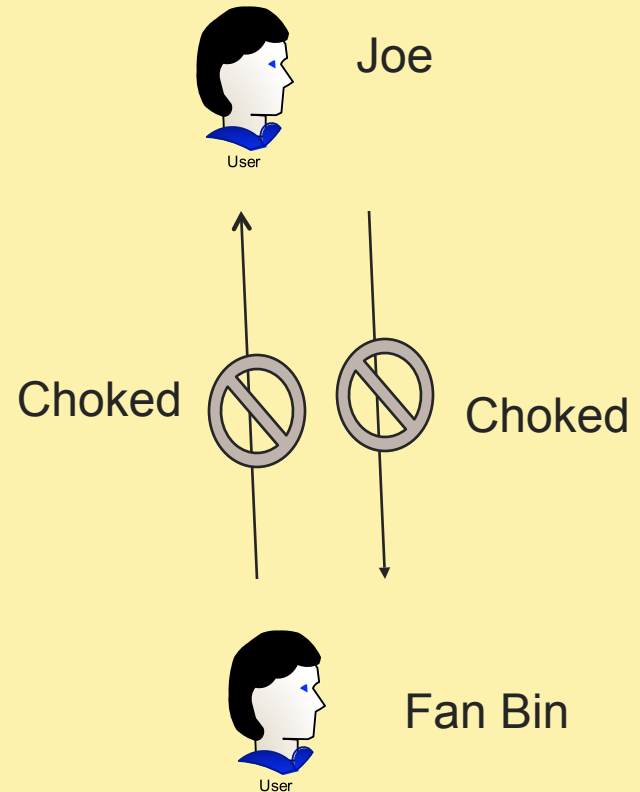


# Choking Algorithm

- Choking is a temporal refusal to upload
- Each peer unchokes a fixed number of peers (default = 4)

# Reasons for Choking

- TCP congestion control.
- To ensure the peers to get a consistent download rate.





# Optimistic Unchoking

- a BitTorrent peer has a single '*optimistic unchoke*' which is uploaded regardless of the current download rate from it. This peer rotates every 30s
- Reason:
  - To discover currently unused connections are better than the ones being used

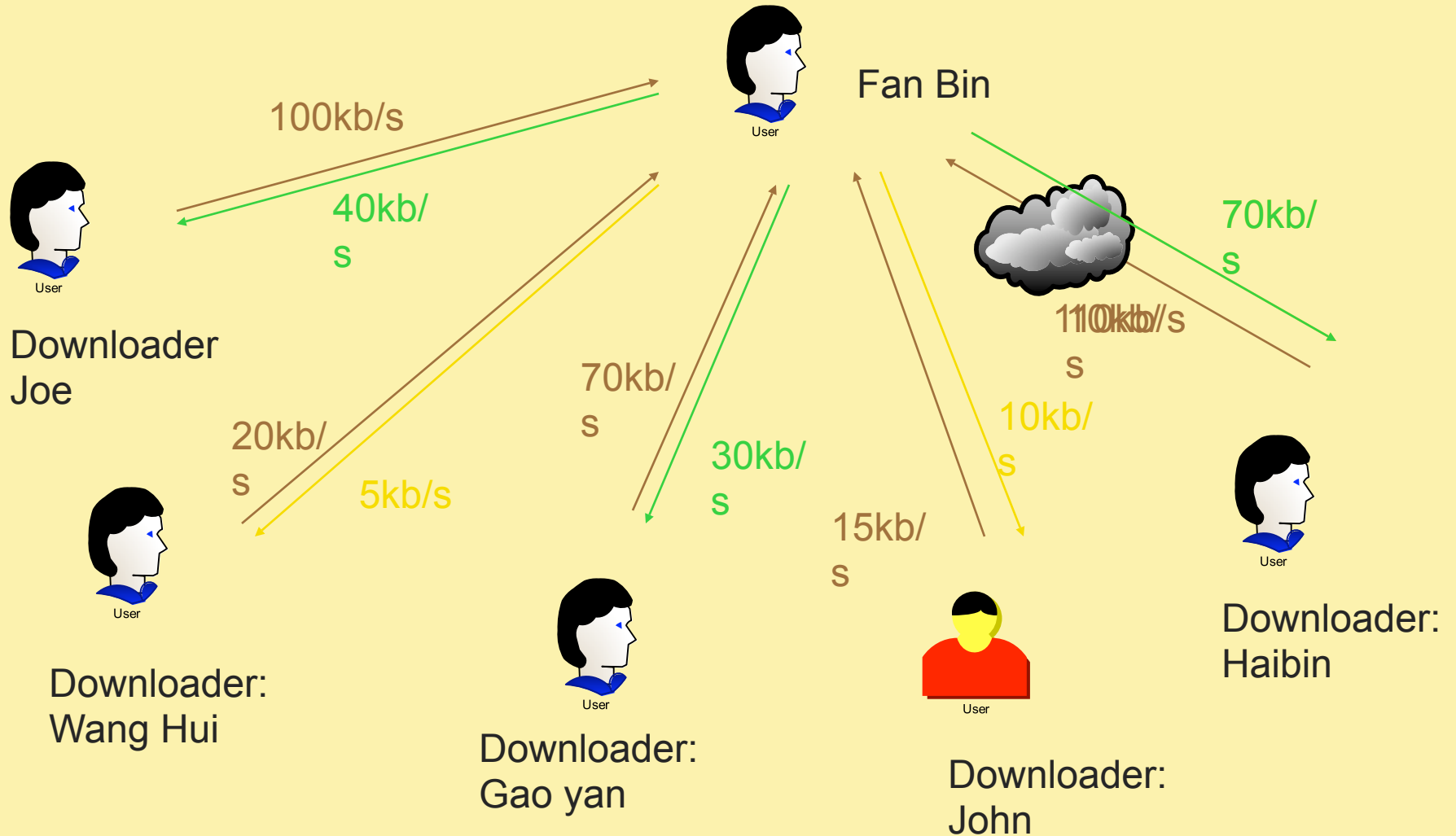


# Anti-snubbing

- When a peer received no data in 60s, we assume it is choked by all other peers, and refuse to upload to it except for the optimistic unchoking.
- Reason
  - It may cause several concurrent optimistic unchokes.



# Example





# Conclusion

- BitTorrent is a well thought-out protocol that embraces aspects of cooperation and self-optimizing mechanisms.
- BitTorrent propose solutions for current optimization and scalability problems