Assignment2 Application Layer Protocols

Note:

1. Please submit the handwriting hard-copy solutions to the lecture during class
2. Due date: 10 Oct. 2019

About P2P protocol BitTorrent, please answer the following questions:

1. Why BitTorrent uses P2P instead of Client/Server?

* without dedicated infrastructure or centralized control
* scalable
* reliable

1. What kind of service does BitTorrent need, in terms of data-loss, delay and throughput? Does it use TCP or UDP? Why?

* BitTorrent is a p2p version of ftp, so it needs similar service as ftp: **reliable no data loss, delay insensitive, and elastic throughput.**
* BitTorrent uses both TCP for its reliability or UDP for its high efficiency:
  + **Between peer and tracker**: HTTP/TCP or UDP. HTTP can traverse firewall; UDP is efficient.

( <http://www.bittorrent.org/beps/bep_0015.html> )

* + **DHT**: UDP for high efficiency.

( <http://www.bittorrent.org/beps/bep_0005.html> )

* + Between peers: TCP BitTorrent's peer protocol operates over TCP or uTP/UDP)

( <http://www.bittorrent.org/beps/bep_0003.html> )

1. How the resource is indexed? Centralized (tracker) or decentralized (DHT)?

BitTorrent support **centralized index service with tracker and decentralized index service with DHT.**

* Tracker: index data is stored in tracker. Every peer first login and send request to tracker for index information
* Trackerless: **the index data (key, value) pair is distributed among peers with the matching between key of resource and ID of peers, both of which are created with the same SHA1 hash algorithm.**

1. What is DHT? How it works?

DHT is “distributed sloppy hash table" for storing peer index information among peer for P2P applications.

* Distribute index information: the index data (key, value) pair is distributed among peers with the matching between key of resource and ID of peers, both of which are created with the same SHA1 hash algorithm. The matching is as following: ID is the immediate successor of key.
* **Lookup index information: the source peer generate “key” of resource in demand, then lookup its immediate successor hop by hop to get the index data (key, value) pair.**

1. How to encourage contribution? Please explain “tit-for-tat” principle.

BitTorrent uses “tit-for-tat” principle to encourage contribution. This means that in order to receive files, you have to give them. They maintain a top-n list that uploaded to them most, favor the top-n peers rapidly; “choke” peers that don’t by slowing the data rate to them.