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A Survey Of Free-Ridingbehaviour In Peer-To-Peer Networks

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Abstract
This paper present the extensive survey of P2P file sharing network with different protocols.This paper presents the most highlighted issue in the network that is Free-Riding issue. Free riding is an important issue for any peer-to-peer system. An extensive analysis of user traffic on Gnutella shows a significant amount of free riding in the system. Reseachers have analyse Free-Riding extensively and give various results. They found that nearly 70% of Gnutella users share no files, and nearly 50% of all responses are returned by the top 1% of sharing hosts.In this paper we present Bittorent Protocol that can overcome Free-Riding to a greater extent,and many other methodology. While it is well-known that BitTorrent is vulnerable to selfish behaviour of the networkbehavior

Key Words*:* Napster , Gnutella, Bittorent ,freeriding.

Introduction
Peer - to - peer networking, often referred to as P2P, is a class of applications that take advantage of resources like storage, cycles, content, human presence, etc. available at the edges of the Internet. It is an emerging model for service distribution. The P2P model has already been established as an important area of distributed computing where an extremely large number of users collaborate and share their resources. In contrast to the traditional centralized server-based service model, i.e., client-server and push models, the P2P model is characterized by cooperation among peers, decentralization, self-organization, and heterogeneity. The notion of client or server is dubious here; instead, any peer is eligible to take the place of any other peer, if the resource constraints are satisfied.It is an alternative approach to network communication because accessing these decentralized resources means operating in an environment of unstable connectivity and unpredictable IP addresses, peer-to-peer nodes must operate outside the DNS and have significant or total autonomy of central servers. Every participating node acts as both a client and a server – servent.

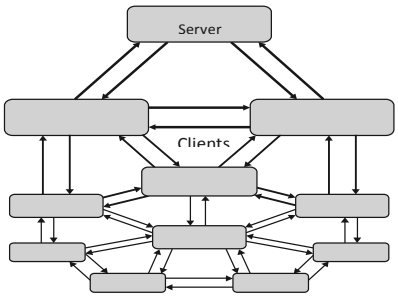

Fig.1 Peer-to-peer model

The peer - to - peer approach is completely different from either the scaling up or scaling out approach. With P2P, instead of focusing on and attempting to streamline the communication between the server and its clients, you instead look at ways in which clients can communicate with each other.In this paper, we present a comprehensive survey of P2P networks protocols and also we present a survey of Free-Riding problem in the network.

1. PEER-TO-PEER NETWORK

The peer-to-peer (P2P) communications model has emerged a widely deployed alternativeto the traditional client-server model for many distributed systems. In a typical P2P system, each node is owned and operated by an independent entity, and the nodes collectively form a self-organizing, self maintaining network with no central authority[1]. John Colquhounexamined that in the domain of file-sharing, the problem of server overloading has been successfully addressed by the use of Peer-to-Peer (P2P) techniques in which users (peers) supply files – or pieces of files – to each other[2].

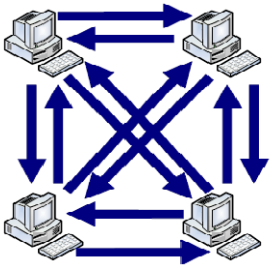

Figure2. P2P file sharing

There are certain characteristic properties of a P2P Network as described below:

a. Nodes are autonomous (no administrative authority).
b. Network is dynamic: nodes enter and leave the network “frequently”.
c. Nodes collaborate directly with each other (not through well-known servers).
d. There is no central coordination and database.
e. No peer has a global view of the system.
f. All existing data and services are accessible from any peer, thus global behaviour emerges from local interactions.

1.1 Major protocols used in P2P network

When we talk about file sharing, there are 3 major protocols used, viz. Napster, Gnutella, and Kazaa. These protocols are discussed in detail ahead.

2.1.1 Napster

Napster is a file-sharing P2P application that allows people to search for and share MP3 music files through the vast Internet. It was single handedly written by a teenager named Shawn Fanning (Jeff, 2000). Not only did he develop the application, but he also pioneered the design of a protocol that would allow peer computers to communicate directly with each other. This paved a way for more efficient and complex P2P protocols by other organizations and groups. Shawn Fanning designed Napster protocol in such a

way that protocol is divided into peer to server communications and P2P communications. Each message is composed of three fields; they are "length", "type" and "data". The fields of "length" and "type" are 2 byte-long data. The "length" field specifies the length in bytes of the "data" portion of the message. The "type" field specifies the type of message and the "data" portion of the message is a plain ASCII string.Bsically Napster was used to share MP3 music files through Internet.

2.1.2 Gnutella

Gnutella (pronounced "newtella") is a protocol for distributed search. In the early of March 2000, Gnutella was originated by Justin Frankel and Tom Pepper, working under the Gnullsoft, which is one of the AOL subsidiaries. Although the Gnutella protocol supports a traditional client/centralized server search paradigm, Gnutella's distinction is its peer-to-peer, decentralized model. In this model, every client is a server, and vice versa. These so-called Gnutella serventsperform tasks normally associated with both clients and servers. They provide client-side interfaces through which users can issue queries and view search results, while at the same time they also accept queries from other servents, check for matches against their local data set, and respond with applicable results. Due to its distributed nature, a network of servents that implements the Gnutella protocol is highly fault-tolerant, as operation of the network will not be interrupted if a subset of servents goes offline. Many open-source developers quickly reverse-engineered Gnutella's communication protocol and published a number of Gnutella clones with several improvements, e.g., LimeWire, BearShear, Gnucleus, XoloX, and Shareaza.

2. FREE-RIDING

It is widely believed that the success of P2P file sharing systems depends upon the quality of service offered by such systems. Inspite of quality of service there is one more parameter that reflects the success of P2P file sharing that is quality of the data present in the system. For a file sharing system, no matter how excellent the lookup capabilities of a system are, or what speed it offers to download a file, if the system does not have a large and quality files, it will eventually fail to attract or retain users.This problem is exemplified by the phenomenon of free riding in many P2P file sharing systems [8]. . The Achilles heel of P2P file-sharing is Freeriding. This occurs when users use the resources of the P2P network without contributing back. Free riding is when the user downloads content and doesn't share it.A recent study [6] on Gnutella file sharing system shows that as many as 70% of its users don't share any files at all. This means that these users use the system for free. This behaviour of an individual user who uses the system resources without contributing anything to the system is the first form of the Free Ridingproblem. Such users are referred to as free riders [6].

It is based on the principle that the user should download as well as share the content. But there is no methodology to ensure that the user shares the content. Freeriding is one of the man issue in P2P networks[7]. In the Gnutella v0.6, 42% of users are free riders and 16% of all hosts are distributed among the top 2 backbone providers (Asvanund et al., 2003). Since 2000, the number of free riders has increased markedly (Hughes, Coulson, &Walkerdine, 2005)[12]. Free riders significantly decrease the performance of P2P file-sharing systems and the will to share resources with other peers. In designing incentive compatible P2P networks,

it is important to understand the characteristics and parameters that affect the degree of free-riding. The main focus of this paper is free-riding.

2.1 Free-Riding in Gnutella

Eytan Adar and Bernardo A Hubermananalyzed by sampling messages on the Gnutella network that over a 24-hour period, they found that nearly 70% of Gnutella users share no files, and nearly 50% of all responses are returned by the top 1% of sharing hosts.[6]

In their analysis they have consider two types of free riding. In the first type, peers that free ride on Gnutella are those that only download files for themselves without ever providing files for download by others. The second definition of free riding considers not only the amount of downloadable content a producer has, but how much of that content is actually desirable content. This is essentially a quantity versus quality argument that also poses a social dilemma when there is a cost to the provider to make desirable files available to others. The provider to make desirable files available to others.[6]

3. BITTORRENT

Bittorrent is a protocol supporting the practice of P2P file sharing that is used to distribute large amounts of data over the internet. Programmer BRAM COHEN, university of Buffalo, graduate student in computer science, designed the protocol in April 2001, and released first version on 2nd July 2001, and final version in 2008.As of January 2012, bitTorrent is utilized by 150 million active users. BitTorrent is one of the most common protocols for transferring large files, and peer-to-peer networks have been estimated to collectively account for approximately 43% to 70% of all Internet traffic (depending on geographical location) as of February 2009. In November 2004, BitTorrent was responsible for 35% of all Internet traffic. As of February 2013, BitTorrent was responsible for 3.35% of all worldwide bandwidth, more than half of the 6% of total bandwidth dedicated to file sharing.

Bittorrent is a file distribution system used for transferring files across a network of people.As you download a file,BitTorrent places what you download on upload for other users, when multiple people are downloading the same file at the same time they upload pieces of the file to each other .BitTorrent pieces together the file you are downloading, to where the first part of a file you get may be the last part someone else gets.

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. This lower bandwidth usage also helps prevent large spikes in internet traffic in a given area, keeping internet speeds higher for all users in general, regardless of whether or not they use the BitTorrent protocol.

3.1 Mechanism of Bittorent protocol

The BitTorrent protocol divides the file, which is to be shared into small chunks specifically into 256KB, and share these chunks among the peers. The peers can share the chunks among themselves in the network.The BitTorrent protocol involves three parties: the server of the torrent file, the tracker, and the client. The torrent file contains meta-data information of the file to be downloaded, which includes the tracker's URL, the file's name and length, and the

SHA-1 hash values of individual file chunks. A trackermaintains a list of all the clients that are currently downloading a certain file (leechers) or have the complete file and only upload it to others (seeders)[5]. The tracker, the leechers, andthe seeders constitute a BitTorrentswarm(also referred to as torrent). To download a file, a client: 1) obtains the corresponding torrent file; 2) contacts the tracker to obtain a partial swarm view, which usually consists of up to 50 peers; 3) connects to the peers in the partial view; and 4) downloads file chunks from the seeders and/or exchanges file chunks with the leechers.

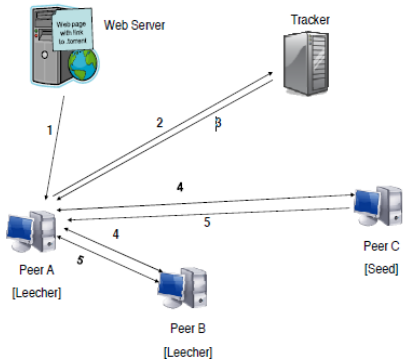

Figure3.Bittorent protocol mechanism

3.2 How to solve Free-Riding using Bittorent.

BitTorrent [4] has incorporated a fairness mechanism from the beginning. Although this
mechanism has similarities to the well known tit-for-tat mechanism [3], the mechanism employed in
BitTorrent distinguishes itself from the classic tit-for-tat mechanism in many respects. BitTorrent
clients use a tit-for-tat scheme for chunk exchanges: a client always cooperates in the first move by
uploading to another peer (optimistic unchoking). Thereafter, it uploads to peers that reciprocally
upload to it. Cohen [5] describes that this strategy leads to cooperation, as the data exchange between
two peers can be modeled as a repeated prisoner dilemma game and tit-for-tat is the winning strategy
[5]. According to Peng Shi and KshipraBhawalkar a big breakthrough came with the advent Of
BitTorrent, which breaks files into many “chunks” and have users obtain files by trading with peers.
This system now dominates P2P file-sharing, claiming about 33% of all internet bandwidth in the US
In BitTorrent, each user maintains connections with 4 peers who are uploading to him/her the most,
and the other peers are “choked”– temporarily dropped as trading partners. The creators of Bit-

Torrent argue that this choking algorithm follows the ancient notion of "tit-for-tat" –an eye for an eye,
a tooth for a tooth–which is one of the best known strategies to the repeated Prisoner's Dillemma.
They claim that BitTorrent provides robust incentives against freeriding. According to Jun and Ahamad [16][13], the problem is that choking in BitTorrent is not strictly "tit-for-tat": users perform so-called "optimistic unchoking"–uploading chunks to a random peer for up to 30 seconds [16] to lure the peers with higher upload bandwidths to trade chunks. Jun and Ahamad showed empirically that in the current BitTorrent system, a user's average completion time has little correlation with that user's upload rate [16][13]. Qiu and Srikant studied BitTorrent's performance both analytically and experimentally, and they found that optimistic unchoking provides opportunities to freeride [17].
These studies demonstrate that BitTorrent does not possess a robust incentive mechanism to eliminate freeriding.[13]

3.2.1 Other Methodology To Overcome Free-Riding

There have been many incentives based mechanism proposed to achieve freeriding free network.Proposed schemes include peer auditing [18], upload credits and download debits [19], utility-based allocation [20],chunk-for-chunk exchange [21], [22], and strict tit-for-tat choking[16][13].

CONCLUSION

Here in this paper we have discussed the most serious issue in network - Free-riding .The original problem with freeriding is that it restricts the total throughput of the system, so such solutions would
only replace freeriding with a greater evil. Here we have shown different methodology to overcome this issue . The most famous protocol is Bittorrent protocol which can be used to avoid Free-Riding. The research has shown that BitTorrent provides robust incentives against freeriding. Some researchers conclude thatbittorent does not effectively overcome Freeriding. They have found that all currently proposed mechanisms that ensure fairness are either not robust or overly-restrictive.

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