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An Advance Incentive System (AIS) for Peer to Peer Network

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Abstract: After examined Peer-to-Peer network and problems in Peer-to-Peer network it is concluded that there must be a system that minimize these problems. A reputation system is a good choice for handling these types of problem. Because of the open nature of P2P models, the rational phenomenon is popular and degrades the system performance. Anonymity may exacerbate this problem since the Rational cannot be located, and since selfish behaviors might be prevalent without any punishment. So objective of this paper is to design a reputation system for Peer-to-Peer network that can handle rational problem in this network efficiently with minimum network load.
Keywords: global and local Incentive, trust, rational.

1. Introduction to Peer-to-Peer Networking

Peer-to-peer (P2P) systems and applications are used in the Internet to share resources between computers. Resources are therefore distributed all over the P2P network. Pure P2P networks do not have any centralized control or organization. Therefore, they differ fundamentally from the traditional client-server (CS) model. Resources are fully decentralized and the nodes have an equal role, no hierarchy or central servers are needed. Nodes in a P2P system are called peers and they function simultaneously as clients and servers. Between these models lay the hybrid model, where a server is used for lookups of resources, but the data is distributed and transferred in a P2P manner. Napster is an example of a hybrid model. Today many P2P systems are used for file sharing. P2P file sharing networks often involve illegal and copyright-violate sharing of movies, music etc. Some operators even obstruct P2P traffic in their network in order to prevent excessive network load that P2P file sharing networks often cause. Measurements show that as much as 60-80% of network traffic is caused by P2P traffic, while only 30-35% of all subscribers use P2P. Bit Torrent, one of the most popular P2P file sharing networks, alone accounted for 30% of all Internet traffic. Bit Torrent and other P2P file sharing networks are just one way to use P2P. P2P networking has also been widely exploited for making voice calls and for instant messaging (IM) over the Internet. Skype is a good example of a P2P system that is widely being used in the Internet. In addition to file sharing and media communication, P2P can also be used e.g. for emergency information flow, SPAM detection filtering as well as for sharing computing power like SETI@home.Participant nodes in a P2P network can be situated all over the world, as long as there are physical links that can be used to interconnect the nodes. In a pure CS model, a resource to be searched is always only one hop away. In a P2P model, a resource to be searched in a P2P overlay network may take one or more hops to be found. Also, as the resources are decentralized and the location information of the resources is distributed, every peer has to participate in other peer’s resource lookups. After a resource has been found, usually a direct connection between the two peers can be used. Thereby, peers are usually only helping in resource lookups, but the resource utilization like file download or a voice call is made directly between the corresponding peers. A fully decentralized P2P network is very difficult to shut down, as there are no central servers or other entities that the network is dependent of. In general, P2P networks potentially offer an efficient routing architecture that can be self-organizing, massively scalable and robust. They can also provide good fault-tolerance, load balancing and explicit notion of locality

2. Previous Work

In a peer-to-peer (P2P) network, peers are expected to contribute to the system by sharing their resources in return for using the network and other peers’ resources. However, in many P2P networks, a considerable portion of peers are reluctant to share resources. Thus, P2P networks primary expectation is peers implicit or explicit functional cooperation and resource contribution might fail, leading to a situation called free riding. In a P2P context, rationals a peer that uses P2P network services but doesn’t contribute to the network or other peer sat an acceptable level. Incentive-based approaches construct and maintain incentive information about peers, and peers with good incentives are offered better services. These approaches can construct incentive information about a peer on the basis of feedback from peers who have interacted with that peer. Such feedback can be positive, negative, or both. The system uses the feedback to build up a good incentive for contributing peers and a bad incentive for rational. A peer’s incentive information corresponds to its long-term behavior, so incentive-based approaches store and manage long-term peer histories. This implies that it isn’t easy to convert a bad incentive to a good one or vice versa. In the past, many incentive systems tried to distinguish malicious peers from other honest peers. This section, reviews the previously proposed incentive systems. P-Grid is incentive system based on a decentralized storage method. The incentive of a peer is calculated by summarizing complains of his neighbors who have interacted with him. In P2Rep every peer must keep transaction records. If a peer wants to download a file from providers, he cloud review the transaction record sand selects a best provider. If he never downloads files from the provider, he could apply polling protocols to query the incentives of the providers from other peers. XRep is also polling protocol but the difference between P2Rep and XRep is that P2Rep focuses on providers' incentives, while XRep concentrates on resource incentives. Since both systems use polling protocols to evaluate the incentives, they must produce a lot of polling messages and it will decrease the performance of network.

3. Problem domain

The Peer-to-Peer (P2P) paradigm of file sharing has been growing dramatically in popularity over the last decade. Consequently, large amounts of data and resources are being shared co-operatively among P2P users on a global-scale, that is a good sign but also there are some problems related to such systems. Some basic problems in peer-to-peer network are

- A number of Users do not want to share files, data, or resources rather desire to free ride on others.
- Some malicious behavior can't be punished due to open nature of P2P networks.
- A worst condition for open networks is when a group of malicious peers make collusive attempts to manipulate the ratings.
- A malicious request responder, if selected as a service provider can attack on the system.

4. Proposed work:

In our system, it is assume semi-decentralized architecture for peer to peer network to decrease the transaction messages. It assume that there is a P2P network with m groups in which each group has at most n group managers. A group could consist of many peers according to their IP ranges, the types of shared files or other requirements. For example, a group with similar IP range has high transmission speed, or groups consisting of peers who share music files increases successful probability of searching music files. Group managers can be creators of groups or the oldest peers with high incentives. Peers can join into a group as their requirements.

4.1 Distributed Ranking Mechanism

A distinction of our Efficient Incentive system is to leverage mainly the best nodes to aggregate the global incentives. However, in a large P2P system with frequent peer joining and leaving, we could not assume that there always exist some static and predetermined good nodes. Instead, we propose a fully distributed ranking mechanism to select the m most reputable nodes, dynamically. Every node has a score manager that accumulates its global incentive. When a new node i joins the system, node j is assigned as the score manager of node i if node j is the successor node of ki, where ki is the hash value of the unique identifier of node i by a pre-defined hash function. All other nodes can access the global incentive of node i by issuing a lookup request with key equal to ki. Different hash functions can be used to have multiple score managers for each node in case the malicious score manager reports some wrong global incentive scores.To select the m most reputable nodes, our distributed sorting mechanism applies locality preserving hashing (LPH) to sort all nodes with respect to their global scores. Hash function H is a locality preserving hash function if it has the following two properties: (1) H(vi) < H(vj), iff vi <vj, where vi and vj are the global incentives of node i and j respectively; and (2) if an interval [vi, vj] is split into [vi, vk] and [vk, vj], the corresponding interval [H(vi), H(vj)] must be split into [H(vi), H(vk)] and [H(vk), H(vj)].

5. Working

Suppose node j is the score manager of node i, it stores a pair (vi, i) for node i, where vi is theglobal incentive of node i. Node j hashes the incentive value vi using a LPH function to a hash value H(vi) and inserts the triplet (vi, i, j) to the successor node of H(vi). The triplets are stored in the ascending order of their incentive values in the DHT hash space due to the property of LPH. Assume node x is the successor node of the maximum hash value and it stores k triplets with highest incentive values. If k is less than m, node x sends a message to its predecessor node y to find the next m-k highest incentive triplets. This process repeats recursively until the m highest incentive triplets are found.

6. Simulation Environment

Network simulator version 2 is used, for the simulation purpose with ns2 version ns-2.29 was used with different network scenario. In the following section the details regarding to the NS2 simulator and their usage is given.For the implementation of proposed model I have selected ns-2 version 2.29 and RedHat version 5 operating system. Ns-2 is a good tool for the implementation of various wired and wireless scenario that can represent all kind of network performances.

7. Behavior Analysis

As per figure 1 shows the simulation of our model consists of 25 nodes. The circles inside the simulation represent the groups in Peer-to-Peer network. There is more than one group manager in a group and services are delivered in terms of packet in the group and between the groups.

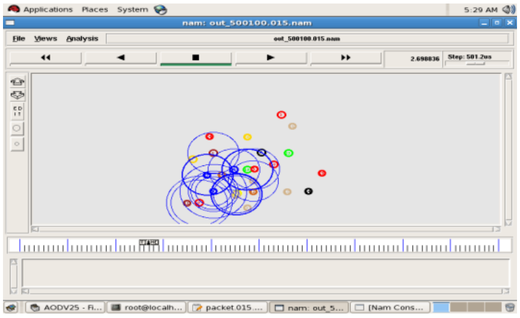


Figure1: simulation of AIS

From the figure 2 it is analyzed that as soon as full network is established number of groups increases to balance load between the groups. In this way maximum services are provides to the network. Surely it will be a flexible and robust model for Peer-to-Peer network

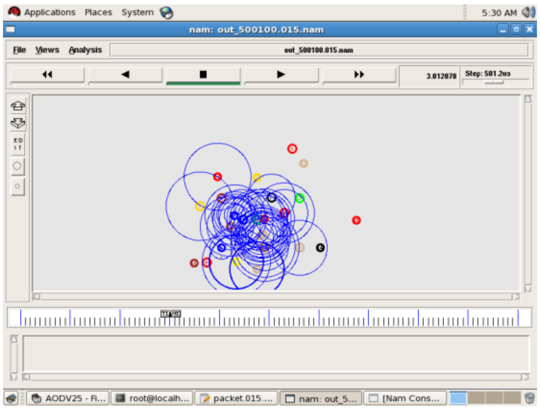


Figure 2: example of delivery of Services behaviors of AIS

Figure 3 shows that groups are communicated for the services. It is not always possible that services are available in to a peer node in the same group so group manager extends the search to another group. So groups need to be communicating other groups for better services. If any malicious node is detected then services are not proved to that node. In simulation packet drops represent that malicious node is eliminated from the network by note giving any service to that node based on their incentive in the network.

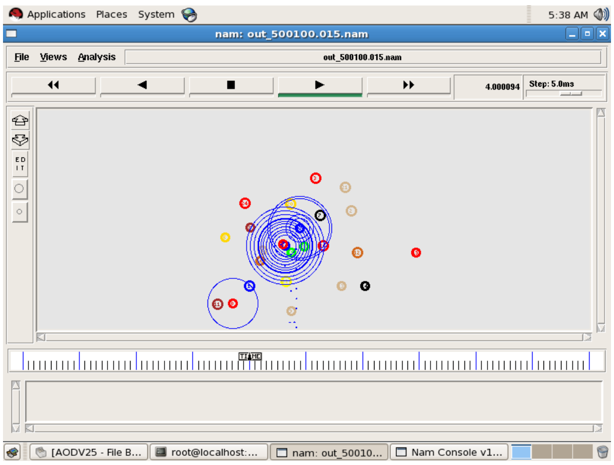
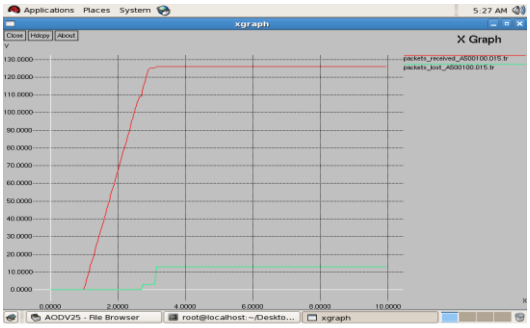


Figure 3 : Example of Packet drops

Performance Analysis

Following are the graphs for the peer to peer network with the AODV protocol which is having the functionality of detecting and preventing the network attack. Graph 4 represent packet lost and packet send ratio in the network.



Graph 4: packet received packet lost

8. Conclusion:

In this paper a rational detective and contribution-oriented incentive system including two transaction protocols presented which is aiming to degrade the willing of rationals and resist malicious file spreading. It uses a semi-decentralized P2P network to decrease network traffic for peer incentive computation. AIS stops figuring out all peers in unstructured P2P network by creating group, so each peer figures out all peers that are very difficult in unstructured P2P networks.AIS can control the number of exchanges incentive data. Our incentive management scheme is simple, proactive and has minimal overhead in terms of computation, infrastructure, storage and message complexity. Further more, it does not require any synchronization among peers. This system provides an easy way to find a good file and avoids malicious file spreading in the P2P file-sharing networks.

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