ISSN No. 0976-5697

Volume 5, No. 5, May-June 2014

International Journal of Advanced Research in Computer Science

RESEARCH PAPER

Available Online at www.ijarcs.inf

An Incentive Approach to Increase the Performance of Hierarchical Peer To Peer System

Utpal Barman
Department of Computer Science and Engineering
Girijananda Chowdhury Institute of Management and Technology
Azara, Guwahati (Assam) India

Abstract: The Peer-to-Peer (P2P) model is a distributed computing model that enables decentralized collaboration by integrating computers into networks in which it can consume & offer services. In the recent scenario, these systems have grown in importance as an attractive way to mobilize the resources of Internet users. Moreover, incentive mechanisms have come up with better services to allow peers to share their computational, storage & networking resources to the benefit of every peer. In this paper I have gone through the different problems related to hierarchical P2P systems & have tried to propose a framework for Structured Hierarchical P2P system to increase the performance of the overall hierarchical P2P system.

Keywords: P2P; free riding; incentive mechanism; white washing; FS (Fully Stable;, S (stable); US (unstable); cooperation level (C.L.); suspicion level (S.L.)

I. INTRODUCTION

P2P system is an equal access network where all the computers (peers) that are in the network can behave as client or server as & when required & can communicate without client-server architecture. Each workstation on the network shares its files equally with others. There is no central storage or authentication of users. In P2P system, all computers have same rights & roles. With the increasing popularity of the P2P system, the demand for securing & improvements of such a distributed network is also increasing day by day. We have found many attacks in P2P system from our study such as White Washing, Free Riding etc. Free rider [1] is the user s that downloads maximum files without uploading files to the system. White-washers [2] are free- riders which frequently leave the system and re-appear with a different identity to get-rid-of penalties imposed by the network..But there are few papers which describes about the improvement techniques in a hierarchical P2P system to overcome the free riding problems & other related problem. As of today, there are different incentive mechanisms developed to secure P2P systems. Some of them relate to structured P2P systems while some relate to unstructured P2P systems.

The existing incentive mechanisms can be classified into three categories such as schemes based on inherent generosity, monetary-based and reciprocity [1, 2, 3].

In inherent generosity scheme should be either contribute or acts as a free-ride based on generosity compares to the current contribution cost in the system. If the social generosity of the system is below a threshold level, then numbers of free-riders are more and the system collapses. So the system performance is increase with increase the generosity if the system.

In monetary-based schemes the service recipients are required to pay some virtual currency to get resources from its service provider.

In reciprocity-based schemes every peer looks after the behavior of other users. These schemes can be based on direct reciprocity or indirect reciprocity. In direct-reciprocity schemes, a peer M will serve another peer N if it received any service from Y Example of direct reciprocity is a Bit Torrent [4] file-distribution system, which employs a tit-for-tat incentive mechanism to encourage cooperative behavior between a set of nodes performing coordinated exchange of large digital files. In indirect- reciprocity schemes, a peer M serves another peer N on basis of services that the peer has provided to other users in the system in addition to that user.

II. ANALYSIS OF DIFFERENT METHOD

In this paper basically two research papers are considered for comparative study and these are taking as MODEL 1 and MODEL 2 etc. The paper is respectively G.P. Khataniar et al [2] and E. Anceaume et al. [3]

To compare the model, following feature has taken consideration like free riding handling, white washing, incentive mechanisms, nee peer registration, resource sharing etc.

Table 1. Comparison of MODEL 1and MODEL 2

Feature	**Model 1**	**Model 2**
Free- riding	Proper handled	handled
White-washing problem	Proper handled	handled
Incentive mechanisms	By means of grading system and dividing nodes into unstable, stable, fully stable depend on contribution level	Service provider peer are rewarded and other are punished
Resource sharing	Unstable node uploads resource for stable and stable node for fully stable node and acts as a supervisor depend on grading.	Different resource of the peers is placed organized in different semantic groups which are headed by a supervisor.

III. PROS AND CONS OF THE MODEL

The Advantages and limitations of the incentive mechanisms discussed in section are summarized below:
MODEL 1: The Model has advantages that it handled with free riding, white washing, well resource sharing depend on grading system but it will not tell about structural representation of the group and also the criteria of selection supervisor.
According to model1 [2] stated that if a group has n node and if $n>c_{max}$ (maximum nodes in a group), then it will split in to two group.

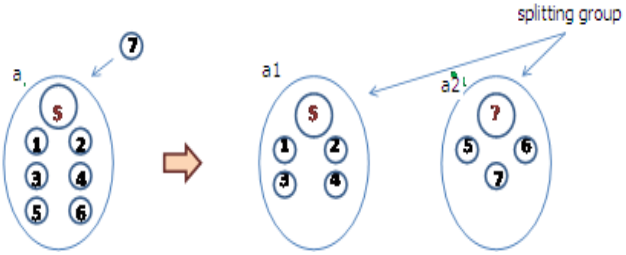


Figure 1: Splitting mechanisms

In this figure it is viewed that when node 7 approach to group a it will split down into a1 and a2. BUT who will be the supervisor of 2nd group (a2)?

Model 2: The Model has advantages that it handled with free riding, white washing, well resource sharing depends on four services provide by a middleware architectural review [5].but cannot give the solution for uncotribution peer.

Those are the following problems that we have come across during the comparative study –

a. Under what criteria the supervisor of the nodes in a group will be chosen?
b. Which peer & why will contribute the resource when a user requests for it?
c. What might happen to a peer who contributes very often? Will it die at the end hampering the overall group/network?
d. Are the groups in P2P arrangement or not?

IV. A MODEL FRAME WORK FRAMEWORK FOR HIERARCHICAL P2P SYSTEM

Considering the above cited problem, as per our study we have forward a model framework for Hierarchical peer to peer system to increase its performance. The Model has 3 types of nodes/peers [2].Stable node, unstable node and fully stable node. Stable nodes will look over the registration service (new nodes need to register before joining) while supervisor (one selected among the FS nodes; keeps rotating) will inspect the rest of the services which include semantic group membership, tracking & aggregation services [3].

Groups are made according to content of common resource type. Also, a FS node of a group can be an S node of another group.

In this model we have forwarded solutions for the problems that are found during our study.

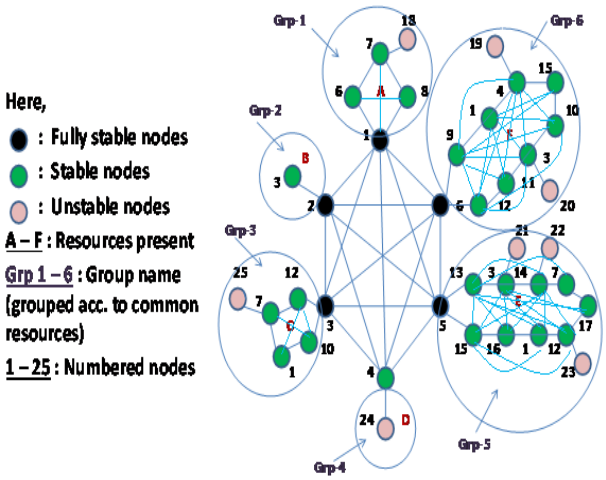


Figure 2: Model Framework for Hierarchical P2P

A. *Solution For Cited Problem A:*

(Under what criteria the supervisor of the nodes in a group will be chosen?)

In our model, we let the peer with the highest cooperation level (C.L.) in the group to be the supervisor. In case of peers with same (highest) C.L. values, the one who achieves full stability first is considered & if even this is same, then the one with lower suspicion level (S.L.) is given priority. Therein all peers will compete for the position & the system performance automatically upgrades.

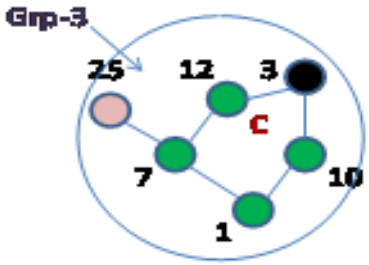


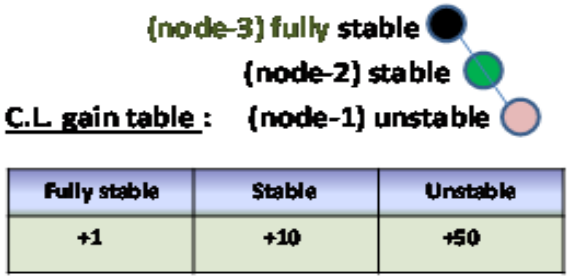
Figure 3: Model Framework for Hierarchical P2P

For example, in group-3, node-3 is the supervisor. The other nodes (12, 7, 1, 10 & also 25) know that they can compete for this post & so they try to increase their reputation in the system thus benefitting it.

B. *Solution For Cited Problem B:*

(Which peer & why will contribute the resource when a user requests for it?)

When the no. of peers in a network is high, the probability of finding a file is more, so new peers should be encouraged to become stable. If a newly joined peer keeps on contributing, it will soon achieve stability & at a time it might even become fully stable. To get maximum performance from the system, we introduce the CHAIN RULE. Here, when a normal peer (unstable/US peer) contributes, its C.L. gets credited by 50 points, its corresponding super-peer (stable/S peer) in the hierarchy by 10 points & the latter's corresponding super-peer (fully stable/FS peer) gains 1 point. We provide a level where a peer becomes stable (at C.L. =500) & fully stable (at C.L. =1000). The model is so made that when a user wants to interact with the network, it will approach the peer with the minimum C.L. so as to indirectly benefit the system.



Fully stable	Stable	Unstable
+1	+10	+50

Figure 4: CL level of different node

Stabilization table :

Peer	Stability at C.L.
S peer	500
FS peer	1000

Figure 5: Stabilization table of node

C. Solution For Cited Problem C:

(What might happen to a peer who contributes very often? Will it die at the end hampering the overall group / network?)

If the peer will well contribute to all other peer using the chain rule then only all the peer will benefited and the CL will increase for all the peer.

Figure 5: Chain rule implementation of different peer.

D. Solution For Cited Problem D:

(Are the groups in P2P arrangement or not?)

The connection amongst the peer in each group is considered as peer to peer connection. Due to peer to peer connection the performance of system will increase.

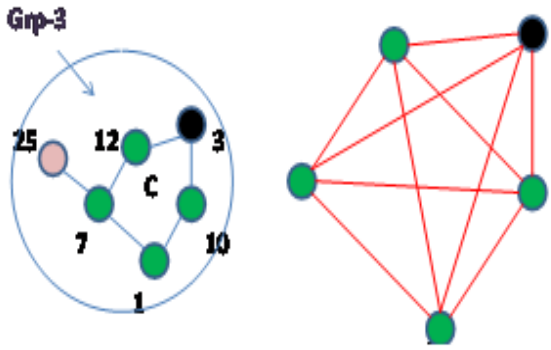


Figure 6: peer to peer connection in group.

V. EXPERIMENTAL RESULT

The model is implemented in java platform and run the simulation 1024 peers. The numbers of resources, groups are chosen randomly over the simulation. The simulation runs 1000 units of time and the respective success and failure result of the query processing can be calculated. When simulation runs for 1024 peers, every times when increase the numbers of peer in the system then success rate of the query processing is also increased. It is also noticed that a peer with a higher grade has higher access, so every peer tries to place them in higher grade. It is observed that higher grade peer is increasing sharply which implies that the system provides incentives to the system. In Figure, the graph shows the Success and Failure rate query processing as per peers.

Table: 2 Success and Failure rate for the peers

Peers	Success	Failure
2	51	949
4	127	873
8	194	808
16	520	480
32	718	282
64	817	183
128	842	158
256	827	173
512	861	139
102	869	131

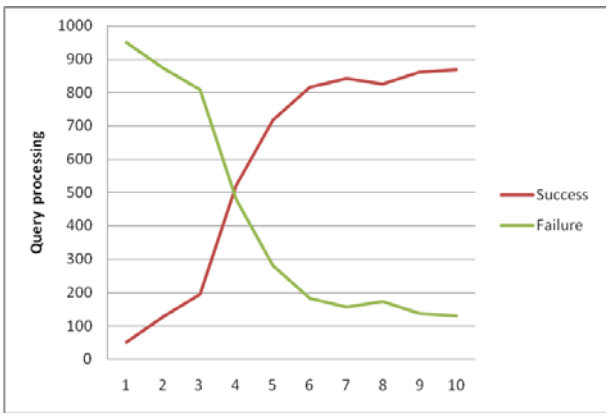


Figure: 7

VI. CONCLUSION

In this paper I have presented a comparative model analysis for increase the performance of Hierachical peer to peer system.I have discussed various pros and cons of different incentives in Structured Hierarchical P2P networks. In summary, a proper incentive mechanism will help developers to enhance the performance p2p system. In future an integrated incentive mechanism system will develop so it will help in all p2p system provided the direct analysis of the different problems of different incentive mechanism.

VII. REFERENCES

[1]. M. R. Rahman, “A Survey of Incentive Mechanisms in Peer-to-Peer Systems,” in University of Waterloo Technical Report CS-2009-22, June 2009.

[2]. A Hierarchical Approach to Improve Performance of p2p Systems (G. khataniar et al.)

[3]. E. Anceaume, M. Gradinariu and A. Ravoaja, “Incentive For Peer-to-Peer Fair Resource Sharing,” in Proceedings of the Fifth IEEE International Conference on peer-to-peer Computing (peer-to-peer’05), IEEE, May 2005.

[4]. M. Feldman and J. Chuang, "Overcoming Free-Riding Behavior in Peer-to-Peer Systems," in ACM SIGECOM Exchanges, Vol. 5, No. 4, pp. 41–50, ACM, July 2005

[5]. G. Khataniar, "A Hybrid Architecture for Unstructured Peer-to-Peer Systems" in International Journal of Information Processing, pp. 12 – 20, Volume 2, Issue 3, 2008

[6]. G. Khataniar, B. K. Shrivastava, S. K. Samudrala, G. B. Kumar, D. Goswami Hybrid Architecture for Unstructured Peer-to-Peer Systems" in International Journal of Information Processing, pp. 12 – 20, Volume 2, Issue 3, 2008.

[7]. M. Feldman, C. Papadimitriou, J. Chuang and I. Stoica, "Free-Riding and Whitewashing in Peer-to- Peer Systems," in SIGCOMM'04 Workshop Portland, Oregon, USA, ACM, August 30, 2004

[8]. The incentive secure mechanism based on quality of service in P2P network -Y Liu, Y Li, N Xiong, JH Park, YS Lee - Computers & Mathematics with …, 2010 – Elsevier