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INDUCEMENT MECHANISM INTEND FOR DIVERSE P2P STREAMING SYSTEM

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Abstract: **While P2P video streaming systems have achieved promising results, they have several drawbacks. First, there is a large number of unnecessary traverse links within a provider's network. As observed in, each P2P bit on the Verizon network traverses 1000 miles and takes 5.5 metro-hops on average. Second, there is a huge number of cross Internet Service Provider (ISP) traffic. With high scalability, high video streaming quality, and low bandwidth requirement, peer-to-peer (P2P) systems have become a popular way to exchange files and deliver multimedia content over the internet. However, current P2P systems are suffering from "free-riding" due to the peers' selfish nature. In this paper, we propose a credit-based incentive mechanism to encourage peers to cooperate with each other in a heterogeneous network consisting of wired and wireless peers. The proposed mechanism can provide differentiated service to peers with different credits through biased resource allocation. A Stackelberg game is formulated to obtain the optimal pricing and purchasing strategies, which can jointly maximize the revenue of the up loader and the utilities of the down loaders. In particular, peers' heterogeneity and selfish nature are taken into consideration when designing the utility functions for the Stackelberg game. It is shown that the proposed resource allocation scheme is effective in providing service differentiation for peers and stimulating them to make contribution to the P2P streaming system.**

Keyword: **Network Optimization, Credit-based Incentive Mechanism, Peer to- Peer Networks, Heterogeneous Networks.**

I. INTRODUCTION

Peer-to-peer (P2P) applications have shown their popularity on the Internet for file sharing. The P2P file sharing application allows users to distribute and obtain a file to be shared cooperatively. However, most P2P collaborative systems that rely on voluntary contributions from individual participants potentially face the problem of free-riding. Free-riding behavior has the negative effect of using up the service resources of a system while contributing nothing to the system. Empirical studies have shown that most P2P systems consequently suffer from free-riding. Cooperation is essential to a P2P file sharing system. However, it is difficult to promote cooperation among all individual participants without an effective incentive mechanism. Bit Torrent is a P2P file-distribution tool which has incentive mechanisms to reduce free-riding and increase user cooperation. Each peer can maximize its benefit within the constraints of the incentive mechanism.

The Bit Torrent system is extremely popular, and is accountable for 35% of all of the traffic on the Internet .In a Bit Torrent system, a file to be shared is divided into multiple small pieces, and peers can serve other peers as soon as they have downloaded one piece of the file. In the Bit Torrent system, there are two types of peers: seeds and down loaders. Seeds are peers who have all pieces of the file while down loaders are peers who simultaneously download and upload pieces of the file with others. Bit Torrent employs the tit-for-tat peer selection strategy to prevent free-riding and promote fairness, where each peer uploads to a set of peers from which it has highest downloading rates. In addition to the tit-for-tat strategy, Bit Torrent also incorporates an optimistic unchoking process to probe a new connection, where each peer randomly chooses a requesting peer to upload. A distinguishing feature of Bit Torrent is its policies for cooperation and preventing free-riding. However, the effectiveness of these policies in reducing free-riding and unfairness has not yet been carefully examined under practical conditions. Some studies, indicated that Bit Torrent mechanisms cannot prevent free-riding and unfairness. For example, Barambah, Herley, and Padmanabhan indicated that some peers uploaded 6.26 times as many pieces as they downloaded in Bit Torrent.

Jun and Ahamad showed that low bandwidth peers complete downloads in about the same amount of time as high bandwidth peers in BitTorrent. However, they did not analyze whether there was a reduction in free-riding in BitTorrent systems. In [9], Qiu and Srikant briefly discussed the effect of optimistic unchoking on free-riding and found that optimistic unchoking can induce free-riding. However, they failed to analyze the impact on free-riding that optimistic unchoking has in the BitTorrent system. On the other hand, recent advances in wireless communications technologies (3G/4G networks) and smart phones have enabled the development of mobile version of P2P applications for smart phones.. People use these mobile P2P applications to watch movies, watch dramas, or listen to music when traveling on buses and metros.Due to the convenience, mobile P2P users are increasing dramatically nowadays. As compared to the wired P2P users, mobile P2P users are more selfish due to the high cost of mobile data. Thus, there is also a compelling need to design effective incentive mechanisms for mobile P2P applications. The existing incentive mechanisms for P2P systems are mainly designed to work in wired networks. For the heterogeneous networks with both wired and wireless nodes, these ince ntive mechanisms may not work well due to the differences between the wired nodes and the wireless nodes. For example, the computing capability of the wireless nodes (such as smart phones and tablet PCs) is usually weaker than that of the wired nodes (such as desktop PCs, and workstations). Thus, incentive mechanisms with high complexity may not be suitable for mobile applications. It is true that there exist high-end smartphones with high-end four-core or eight-core processors. However, incentive mechanisms with high complexity are still not preferred on these mobile devices since the high complexity computing can drain out the devices' batteries fast. In addition, the connection bandwidth of the wireless nodes is usually less than that of the wired nodes. This should be taken into consideration when designing the incentive mechanism to achieve relative fairness. However, to the best of our knowledge, most of the existing work fails to do this. All these differences between the wireless and wired nodes pose new challenges to the design of the incentive mechanism for the heterogeneous networks.

II. PROBLEM DEFINITION

A simple incentive mechanism for P2P systems is the "tit-for-tat" strategy, where peers receive only as much as they contribute. A free rider that does not upload data chunks to other peers cannot get data chunks from them and suffers from poor streaming quality. Due to its simplicity and fairness, this scheme has been adopted by BitTorrent . Though this strategy can increase the cooperation between peers to a certain level, it is shown in literature that it may perform poorly in today's internet environment due to the asymmetry of the upload and download bandwidths. Unlike the "tit-for-tat" strategy, which enforces compulsory contribution from peers, another category of incentive mechanisms stimulate peers to contribute to the system by indirect reciprocity. In these incentive mechanisms, the contribution of each peer is converted to a score which is then used to determine the reputation or rank of the peer among all the peers in the network. Peers with a high reputation are given a certain priority in utilizing the network resources, such as selecting peers or desirable media data chunks. Therefore, peers with a high reputation have more flexibility in choosing desired data suppliers and thus are more likely to receive high-quality streaming. On the other hand, peers with a low reputation have quite limited options in parent-selection and thus receive low-quality streaming. Through this way, the P2P systems can provide differentiated service to peers with different reputation values. Hence, peers are motivated to contribute more to the P2P system to earn a higher reputation.

A. Problem Analysis

The existing incentive mechanisms for P2P systems are mainly designed to work in wired Networks. For the heterogeneous networks with both wired and wireless nodes, these incentive mechanisms may not work well due to the differences between the wired nodes and the wireless nodes. For example, the computing capability of the wireless nodes (such as smart phones and tablet PCs) is usually weaker than that of the wired nodes (such as desktop PCs, and workstations). Thus, incentive mechanisms with high complexity may not be suitable for mobile applications. It is true that there exist high-end smart phones with high-end four-core or eight- core processors. However, incentive mechanisms with high complexity are still not preferred on these mobile devices since the high complexity computing can drain out the devices' batteries fast. In addition, the connection bandwidth of the wireless nodes is usually less than that of the wired nodes. This should be taken into consideration when designing the incentive mechanism to achieve relative fairness. However, to the best of our knowledge, most of the existing work fails to do this. All these differences between the wireless and wired nodes pose new challenges to the design of the incentive mechanism for the heterogeneous networks.

B. Problem Solution

In this paper, we propose a credit-based incentive mechanism for heterogeneous networks with both wired and wireless nodes. We consider a P2P streaming network where each peer can serve as an uploader and a downloader at the same time. When a peer uploads data chunks to other peers, it can earn certain credits for providing the service. When a peer downloads data chunks from other peers, it has to pay certain credits for consuming the resource. A peer's net contribution to the network is reflected by its accumulated credits. A Stackelberg game is formulated to provide differentiated service to peers with different credits. Particularly, peers' heterogeneity and selfish nature are taken into consideration when designing the utility functions.The main contributions and key results of this paper are summarized as follows.

• A credit-based incentive mechanism based on Stackelberg games is proposed for P2P streaming networks. To the best of our knowledge, this is the first work that applies the Stackelberg game to the incentive mechanism design for P2P streaming networks.

• Peers' heterogeneity is taken into consideration when designing the utility functions for the Stackelberg game. Thus, our incentive mechanism can be applied to heterogeneous P2P networks with wired and wireless peers having different connection bandwidths.

III. PROCESS FLOW

A. Authentication Process

In this module user will enter the user name and password in the login form, while clinking the login button the SQL server database connection will be established and validate that particular username and password .To establish a connection with SQL server we are using SQL connection String and for query passing we are using SQL Command text.

B. Routing Table Generation

Routing information will be maintained in this module. Routing table information is accessible for authorized user only and also they can insert, update, delete and clear the table data. The table will contain destination IP Address, Next Hop IP Address and cost information to establish a connection with SQL server we are using SQL connection String and for query passing we are using SQL Command text

C. Relay Node Generation

The intermediate node between the source and the destination will act as a relay. In this project we have used three relays between source and destination, in each relay Dynamic Hash Table should be maintained. That contain source IP, Destination IP, Next Hop IP, Packet Name, Date and Time of packet transmission

D. Rate Allocation Module

More specifically, the rate allocation must satisfy the constraint that an equal or higher rate should be allocated to a higher level node of the tree than lower level children in the same path to relay the video frames. In other words, for a multicast receiver to receive a video stream at its demand rate, all the ancestor nodes in the path should have time slots that are at least equal to or higher than the demand rate.

E. Packet Making

Authorized user can upload one file such as Text, Word and Image Then the end user will split that file into some N number of packets Theses packets will be stored in the local system at C drive now theses packets will be send to the destination one by one manner.

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While selecting the first packet one pop-up window will be appear in that form we can select the destination IP Address ,the corresponding Next Hop IP Address of the destination node will be automatically load. While sending the second packet the path will be randomly choose using the random process.

F. Destination

All splitted packets are received in the destination by packet by packet from various routing path using random process. Received individual packets are stored in a location finally these packets are merged into single file .Finally we will get the original file in a secure manner.

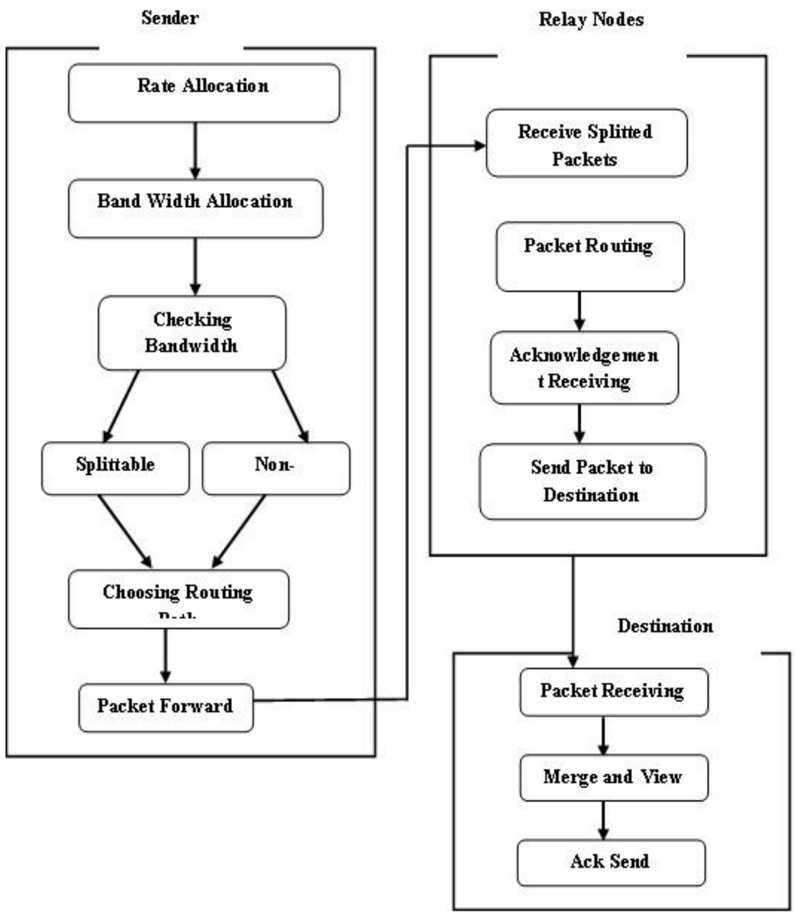

Figure 1: Process Flow

IV. EXPERIMENTAL RESULTS

A. Implementation

A simple incentive mechanism for P2P systems is the “tit-for-tat” strategy, where peers receive only as much as they contribute. A free rider that does not upload data chunks to other peers cannot get data chunks from them and suffers from poor streaming quality. Due to its simplicity and fairness, this scheme has been adopted by BitTorrent . Though this strategy can increase the cooperation between peers to a certain level, it is shown in literature that it may perform poorly in today’s internet environment due to the asymmetry of the upload and download bandwidths.Unlike the “tit-for-tat” strategy, which enforces compulsory contribution from peers, another category of incentive mechanisms stimulate peers to contribute to the system by indirect reciprocity. In these incentive mechanisms, the contribution of each peer is converted to a score which is then used to determine the reputation or rank of the peer among all the peers in the network. Peers with a high reputation are given a certain priority in utilizing the network resources, such as selecting peers or desirable media data chunks. Therefore, peers with a high reputation have more flexibility in choosing desired data suppliers and thus are more likely to receive high-quality streaming.

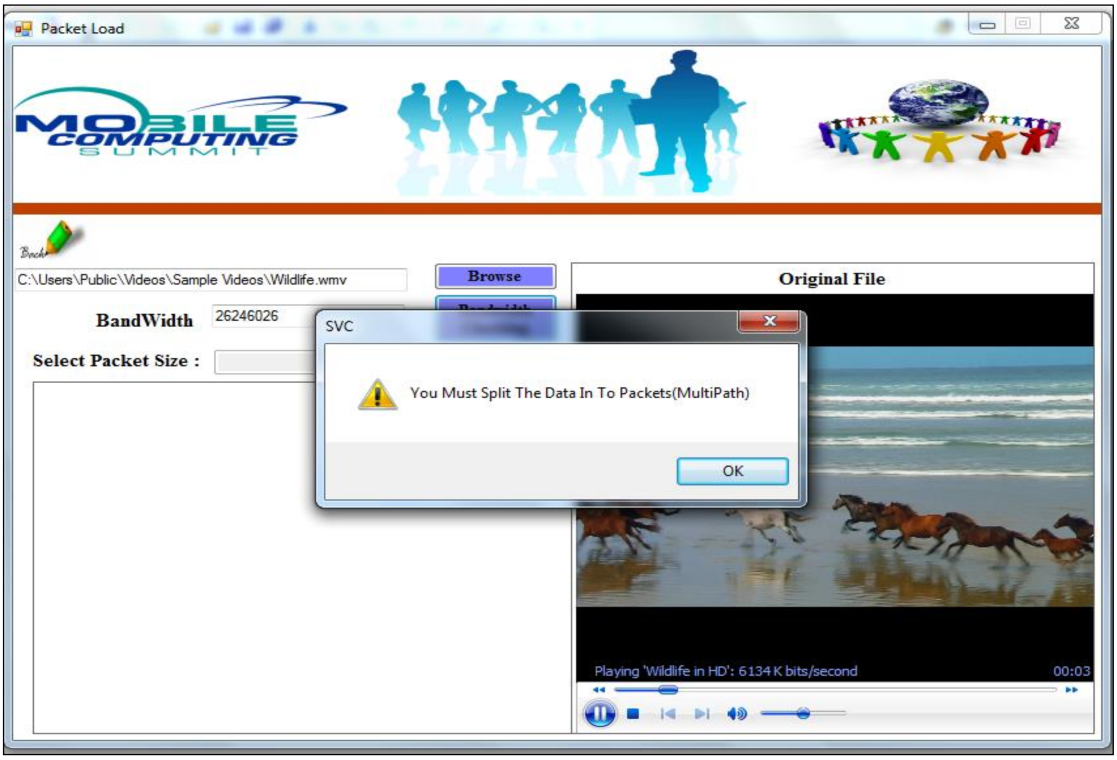

Figure 2: Bandwidth Verification

Figure. 2 show the network setup in this experiment. The authors discussed how to apply game theory to the design of incentive mechanisms for P2P networks at a high level. It is pointed out that straightforward use of results from traditional game theory do not fit well with the requirements of P2P networks. The utility functions must be customized for P2P networks. In a simple, selfish, link-based incentive mechanism for unstructured P2P file sharing systems was proposed.

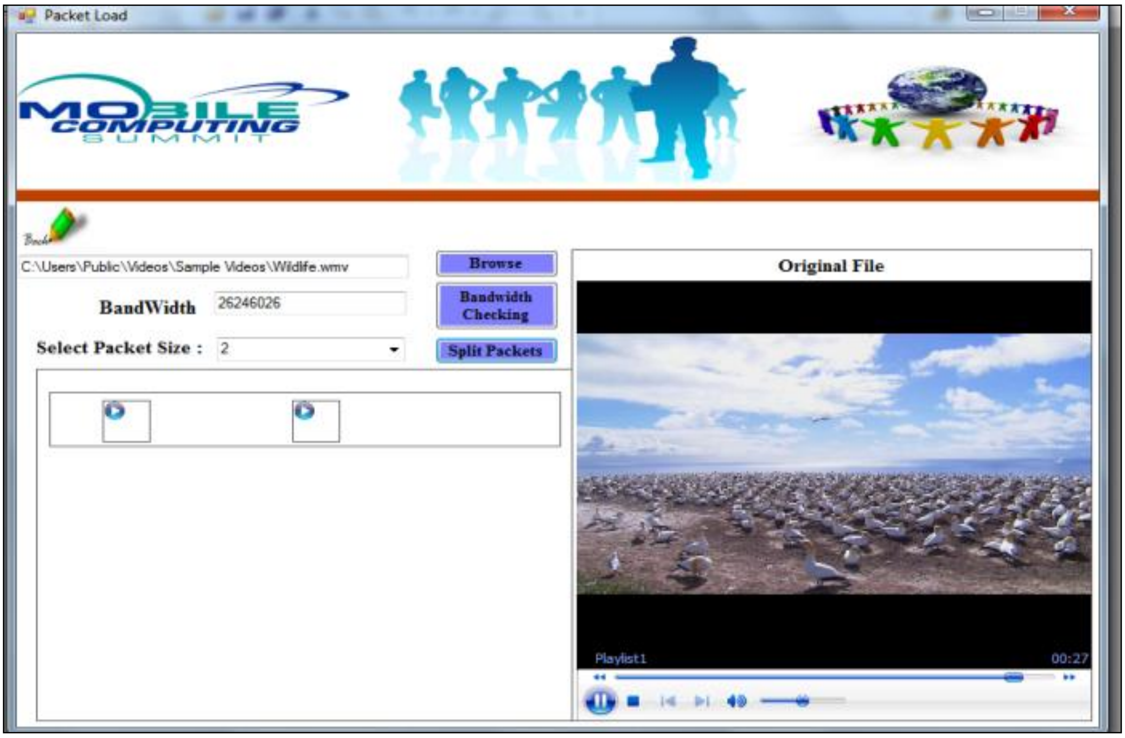

Figure 3: Packet Split

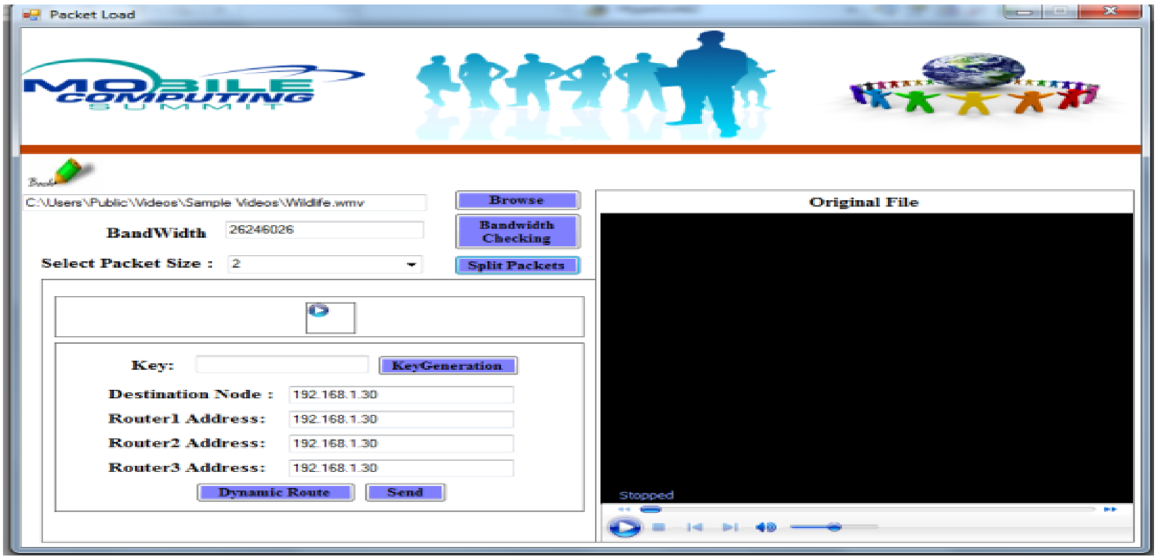

Figure 4: Routing Packet

Figure 5: Relay Receive Packet

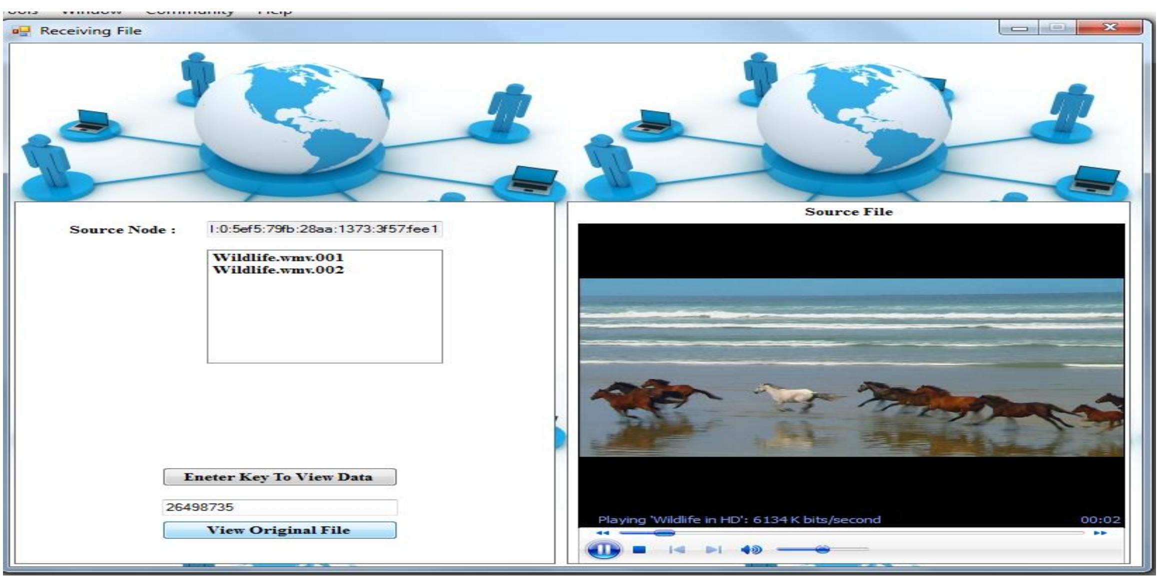

Figure 6: Receive Packet Successfully

V. RESULT AND DISCUSSION

We evaluate the effectiveness and robustness of the PowerTrust system against various malicious peer behaviors. The experiment was performed under both noncollusive and collusive malicious settings. To estimate the accuracy of the aggregated global reputation, we rank the peers by their global reputation scores. We measure below the ranking discrepancy between the estimated ranking and the actual ranking. The discrepancy comes mainly from greedy factor and malicious peers reporting false trust scores. We use normalized Euclidean distance [9] to measure the ranking discrepancy. During each round of reputation aggregation, we assume 100 new peers joining the system and transacting with existing peers. We refer each aggregation round to one full convergence of reputation vector computations Power-law distribution of peer feedbacks:We developed a trust overlay network model for analyzing the feedback properties of P2P reputation systems. By collecting real-life data from eBay, we confirmed the power-law connectivity in TON graph. This powerlaw distribution is not restricted to eBay reputation system. Our mathematic analysis justifies its applicability to general dynamic P2P systems.

Fast reputation aggregation, ranking, and updating: Our PowerTrust system offers the very fast mechanisms for global reputation aggregation, ranking, and updating. Besides leveraging power-law peer feedbacks, weutilize look-ahead random walk (LRW) strategy and locality preserving hash (LPH) functions, which are easily implemented in a DHT-based P2P system.

System scalability and wide applicability: Power- Trust is applicable to P2P systems in general and to P2P Grids in particular. These are attractive to cope with dynamic growth of both P2P systems and collaboration Grid built with distributed peer resources.

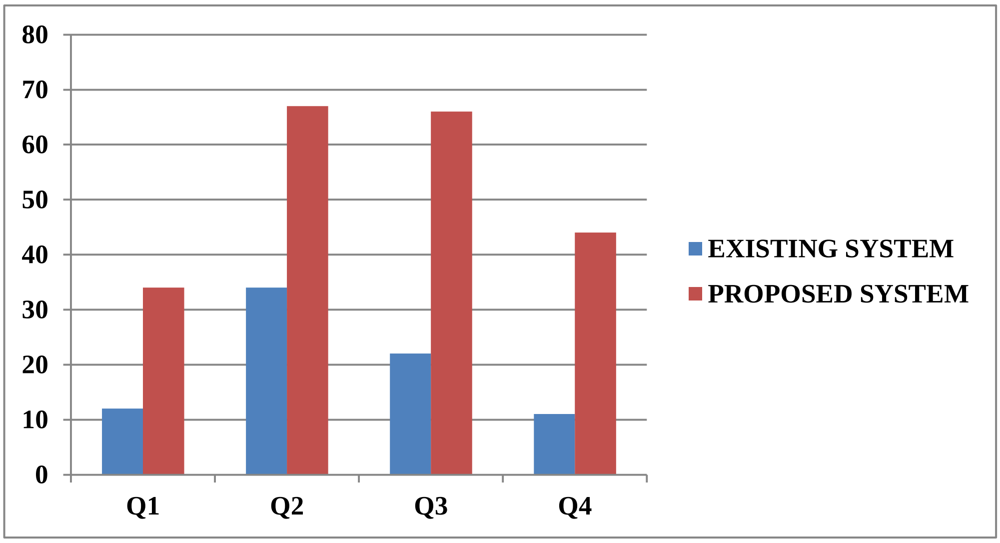

Figure 7: Experimental Result

System robustness and operational efficiency: The robustness is resulted from curtailing malicious peers. The system is resilience to peer abuses in global reputation evaluation. The operational efficiency comes mainly from the use of reliable powernodes in PowerTrust.

VI. CONCLUSION

Taking the peers' heterogeneity and selfish nature into consideration, a Stackelberg game is designed to provide incentives and service differentiate on for peers with different credits and connection types. The optimal pricing and purchasing strategies, which can jointly maximize the up loader's and the down loaders' utility functions, are derived by solving the Stackelberg game. The Stackelberg equilibrium is shown to be unique and Paretooptimal. Then, two fully distributed implementation schemes are proposed and studied. It is shown that each of these schemes has its own advantages. The impact of peer churn on the proposed incentive mechanism is then analyzed. It is shown that the proposed mechanism can adapt to dynamic events such as peers joining or leaving the network. Finally, several numerical examples are presented, which show that the proposed incentive mechanism is effective in encouraging peers to cooperate with each other.

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