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Exchange-Based Mechanisms for File Sharing In WSN

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***Abstract* - The cooperation of participants decide the performance of peer to peer resource sharing networks. Our existing technologies namely cash based systems are too complex where as light weight credit systems does not provide strong incentives. Hence we propose an exchange based incentive mechanisms for peer to peer file sharing in WSN. Peers give higher service priority to requests from peers that can provide a simultaneous and symmetric service in return. We generalize this approach to n-way exchanges among rings of peers and present a search algorithm for locating such rings.**

***Index Terms* - AMC, WSN, SVC, CSI**

I. INTRODUCTION

Due to widespread cooperative resource sharing between participants, peer-to-peer systems serves as a powerful tool for complex computing applications. Cooperation and a critical mass of participants with sufficient resources are key elements for enabling a variety of novel applications such as file sharing, large-scale content distribution, and distributed data processing. Performance in such systems depends on the cooperation between the system's participants. While most existing peer-to-peer architectures have assumed that participants are generally cooperative, still deviation exists. This may result in service degradation and system collapse depending on design goals and performance requirements. In a wireless communication environment, data is usually lost during transmission due to packet loss or packet delay. Random network coding (RNC) has been considered as a useful means of improving the reliability as a forward error correction (FEC) scheme in the application layer for the multicast/ broadcast transmission systems. As the redundant packets will be transmitted only until the multicast packet is successful for all receivers, each receiver can recover the source message immediately after a sufficient number of the linearly independent random network-coded packets have been received for a set of packets.

The advantage of RNC in the multicast/broadcast network is that no unnecessary redundant transmission can be made as long as a common uplink feedback channel is available to indicate if all users have successfully received the frame subject to RNC. Bandwidth efficiency can be improved by optimising signal to noise ratio threshold by taking the retransmission opportunities into account, e.g., truncated automatic repeat request (ARQ). A similar design principle can be applied to multicast/broadcast networks. In a multicast/broadcast network, a most robust AMC mode must be employed to cover all users in the different channel conditions which reduces the bandwidth efficiency of the users under good channel conditions. The inefficiency associated with link adaptation can be handled by scalable video coding (SVC) for the multicast/broadcast service. SVC encodes a high quality video stream that contains one or more subset bit streams, each formed by dropping packets from the original video to reduce the bandwidth. SVC can be useful for adapting the video quality to varying channel conditions (data rate) of the individual user in the mobile system. An SVC stream has one base layer and one or more enhancement layers. As the base layer provides a minimum quality, frame rate, and resolution of the video, it must be protected by the most robust AMC mode so that all multicast/broadcast users can decode it.

Advanced wireless technologies such as multiple- input–multiple-output (MIMO) require each mobile station (MS) to send a lot of feedback to the base station. This periodic feedback consumes much of the uplink bandwidth. This expensive bandwidth is very often viewed as a major obstacle to the deployment of MIMO and other advanced closed-loop wireless technologies. This paper is the first to propose a framework for efficient allocation of periodic feedback channels to the nodes of a wireless network. Several relevant optimization problems are defined and efficient algorithms for solving them are presented.

II. EXCHANGE MECHANISMS

Different types of exchange mechanisms exist namely pairwise, 3 way and n-way exchanges. The upload capacity is more likely to be the resource bottleneck than the download capacity. To manage the upload link, we respond to all requests in relatively large, equal, fixed-size, blocks. We assume that the system supports partial transfers and that peers can download different parts of the same object concurrently from multiple sources. Each peer has an incoming request queue (IRQ) where remote peers register their interest for a local file. A transfer to satisfy a request is initiated if two conditions are met. First, there must be sufficient capacity at both peers for the transfer. The local peer must have upload capacity (an open fixed size slot on the upload link), and the remote peer must have sufficient download capacity. Second, either the transfer is an exchange transfer, or else no other request in the IRQ is both an exchange transfer *and* satisfies the first condition.

In practice, the local node does not check the download capacity of the remote node, but assumes it is sufficient. Inadequate download capacity terminates the transfer when the remote node cannot receive its incoming request, it terminates its outgoing upload, and issues the request again when a download is feasible.

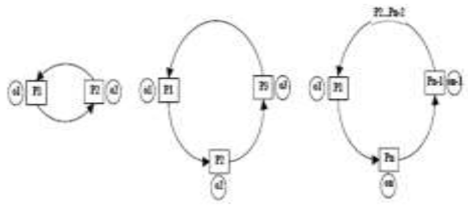

Figure 1. Exchange Mechanisms

III. EXCHANGE TRANSFERS

Centralized mechanism inherits the typical disadvantages of centralized designs in that they introduce a single point of failure. This may put a significant burden on a single peer and, perhaps most importantly, it may be hard to design the right incentives for one or more peers to take up such a demanding and sensitive role. Recent proposals for decentralized credit mechanisms are based on distributed hash tables and therefore inherit another set of problems.

For instance, heterogeneous node capabilities make efficient allocation decisions hard. As an alternative, we propose a more lightweight approach that avoids the complexities of credit mechanisms. Rather than building a system based on principles of monetary or credit economies, we structure the system as a more primitive exchange or barter economy.

Users directly trade resources between themselves, so little or no long-term bookkeeping is required. Requests from peers that can provide a simultaneous, symmetric, service in return are given higher priority. The service need not be a pairwise exchange, but more generally priority is given to peers who participate in way exchanges to which the provider currently belongs. These types of exchanges are implemented as rings of peers, where each peer is served by its predecessor and serves its successor in the ring. Non exchange transfers are only served if no other exchange is possible and peers have spare capacity. The preference given to exchange transfers provides a strong incentive for participants to cooperate.

Peers must give priority to exchange transfers. It is therefore imperative that feasible exchanges be identified. Pairwise exchanges can be easily detected. Each peer A regularly examines its incoming request queue and determines if, for any pending request, the remote peer B has some object that A is interested in that would qualify for a pairwise exchange. Although pairwise exchanges are simple, unfortunately, requests frequently do not resolve into convenient pairs. Fortunately, it is easy to compute feasible way exchanges

IV. PREVENTING CHEATING

As the system gives priority to exchange transfers, malicious peers may attempt to cheat. For example, a peer could claim that there is an exchangeable object available and serve junk in exchange for real data. Several mechanisms can be used to solve this problem. Peers can locally blacklist cheating peers and refuse to serve them later. In a large and dynamic system this is likely to be ineffective as cheaters may perform well enough even if they can cheat each peer only once. Cooperative blacklisting could help tackle this problem, although it requires additional mechanisms which may themselves be subject to attacks.

First, the cheating peer needs to wait in low-priority queues to get the 'bait' blocks anyway, for both files, adding some latency to the process. Second, the number of potential "victim" peers decreases with the number of blocks the cheater has available. Third, since the cheater needs to have two blocks, one for each peer, he is also constrained by the number of peer-pairs interested in those blocks. Fourth, the cheater is wasting his resources because he is using part of his upload capacity for an object that is totally useless to him. unless of course he is interested in both objects. if not, he may be better off using this capacity for real exchanges.

Fifth, the peers he is targeting are likely to be talking to each other already so they may be uninterested in what he has to offer, and they may have already committed all of their upload capacity to each other. Finally, additional constraints can be designed into the system to discourage.

V. SYSTEM REQUIREMENTS

Operating System: Ubuntu 10
Tool needed: Network Simulator 2 (NS2)
Packages Needed : NS Allinone -2.35
Languages: Tool Command Language (TCL), C++
NS is an object oriented discrete event simulator targeted at network researching. It provides substantial support for routing and multicast traffic.

VI. SIMULATIONS AND RESULTS

Figure 5. shows the evaluate the adapted scheme , we use a CSI allocation tree. We start with an initial list of MSs and invoke Algorithm 1 to allocate their CSI channels. Then, we simulate 1000 events of adding or deleting randomly chosen MSs. Thus, the average number of MSs equals the initial number.

The profit obtained using scheme 2 divided by the (maximal) profit obtained by invoking Algorithm 1 for each event, as a function of the average number of MSs. We see that scheme 2 achieves between 92% and 100% of the maximum profit. When the load is very small, the maximum bandwidth can be allocated to each CSI channel, and scheme 2 will thus obtain a profit very close to the maximum one.

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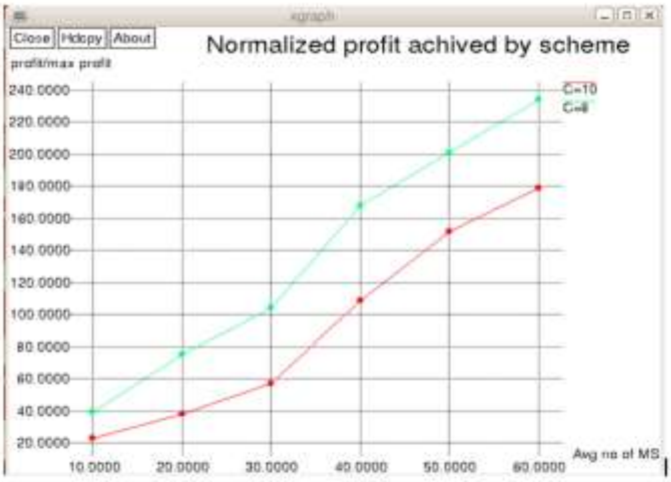

Figure 5 . Normalized profit achieved by scheme

VII. CONCLUSION

Since exchange based mechanism that we proposed are decentralized file sharing mechanisms become more simpler and easier. The basic idea is that peers give higher service priority to requests from a set of peers that can (transitively) provide a simultaneous, symmetric service in return. We also mentioned the ideas to guard these mechanisms against several attacks.

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