Development of Group Communication on Peer-to-Peer System : Car Auto Auction System

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Abstract

Peer-to-peer networking has become the hottest new thing in networking, and a lot of companies have been tempted to give this new networking paradigm a try. However, few solutions satisfy the actual peer-to-peer definition, and hybrid peer-to-peer solutions dominate the market. Central elements are included to control management and configuration. Specially configuring issues are discussed in this article, but also some elements of distributed processing is included. Nowadays, peer-to-peer systems become widely deployed and allow users to obtain and provide resources in a stable, scalable and reliable manner. In the other side, peer-to-peer network constitute a major part of the distributed system application. To construct peer-to-peer based system, group communication becomes a great challenge. In the world wide, real time system like auction system becomes the most popular application to implement peer-to-peer system. This system implemented to construct peer-to-peer base Auto Auction System by using group communication. In this system, group communication use to notify winner to all auctioneers.

Keywords
Peer-to-peer, group communication, auto auction system

1. Introduction

Peer-to-Peer (P2P) networks have sparked a great deal of interdisciplinary excitement and research in recent years [1]. The concept of P2P is increasingly evolving to an expanded usage as the relational dynamic active in distributed networks. Some researchers have explored the benefits of enabling virtual communities to self-organize and introduce incentives for resource sharing and cooperation, arguing that the social aspect missing from today's peer-to-peer systems should be seen both as a goal and a means for self-organized virtual communities to be built and fostered. Ongoing research efforts for designing effective incentive mechanisms in P2P systems, based on principles from game theory are beginning to take on a more psychological and information-processing direction. There is a strong relationship between network topology and algorithms to implement auction system.

The auction mechanism, by which self-interested traders are able to settle on a fair price for a commodity, is a key demonstration of the concept of autonomous agents working together without outside control [2][3] . Moreover the simplicity and robustness of agent auction algorithms make them well determination of prices, auctions are most often implemented using a central auctioneer and thus overall are not fully distributed systems. This central auctioneer distributes global information about current prices and deals made among traders. In this system running on a single machine or a well connected network, such high quality information is certainly worth the cost of maintaining a central source. However, as this system move to run on less reliable networks the communications cost of maintaining a central auctioneer could become prohibitive, limiting the number of auction participants. In this paper we investigate the abilities of a peer-to-peer auction, created by adapting a peer-to-peer matchmaking procedure which we have shown to be effective when agents search for one of a number of winner. We proposed a simple agent winner algorithm that has been shown to work well given information about the best bids and offers in an auction and run it with information from only a limited neighborhood of other clients. While the lower quality of this information means that such peer-to-peer take more time to find a solution, we find that they never the less are able to converge to the equilibrium price for the market. Moreover, the cost savings in terms of messages to any particular entity in the system are significant. While the number of messages processed by a central auctioneer grows linearly with the number of agents, we find in simulations that the maximum messages to any entity in our peer-to-peer system remains approximately constant both in the message rounds needed to reach equilibrium and the message rounds needed to continue making subsequent deals.

The remainder of this paper is organized as follow as Section 2 is Related Work. Section 3 is the theory background of the system. Section 4 is details described all algorithms which use in this system. Section 5 is implementation of the system and experimental result of the system data. Section 6 is provide conclusion remark.

2. Related Works

There are two broad categories of P2P systems: hybrid and pure [1]. Hybrid systems are characterized by some form of centralized control such as a name look-up service or a middle agent [4]. Pure systems strive for self-organization and total decentralization of computation. Pure P2P networks can be classified by the manner in which decentralization is realized. In *structured* systems [5] [6], placement of system resources at nodes is strictly controlled and network evolution, consequently, incurs extra overhead. Ideally, one would strive to minimize system constraints and costly datastructures when designing a P2P model. *Unstructured* systems are characterized by a complete lack of constraints on resource distribution and minimal network growth policies. These systems focus on growing a network with the desirable low diameter of small world systems using only limited local information. Early work on search methods for small world networks was done by Walsh and Kleinberg [7] and on decentralized search in scale-free networks by Adamic et al [7]. An early study of unstructured P2P network search performance was done by Lv et al., comparing search performance on generic power-law, random, and Gnutella networks. More recently, several groups have continued to study search performance with a focus on comparing power-law and random topologies with deployed P2P systems such as Gnutella. Initial studies on search have also focused on generic topologies . Several projects have investigated the topological characteristics and implementations of P2P networks. What has been missing in all of this work is a general comparative study of proposed unstructured P2P models, their topologies, and performance of algorithms [7]. This paper is an initial step in filling this gap in understanding of centralized search in unstructured P2P networks.

3. Theory Background

3.1 Structured Peer-to-Peer Network

Structured P2P networks employ a globally consistent protocol to ensure that any node can efficiently route a search to some peer that has the desired file, even if the file is extremely rare. Such a guarantee necessitates a more structured pattern of overlay links. In structured peer-to-peer networks, peers are organized specific criteria and algorithms, which lead to overlays with specific topologies and properties. They typically use distributed hash table-based (DHT) indexing. Distributed hash tables (DHTs) are a class of decentralized distributed systems that provide a lookup service similar to a hash table: (*key*, *value*) pairs are stored in the DHT, and any participating node can efficiently retrieve the value associated with a given key.

3.2 Unstructured Peer-to-Peer Network

In an unstructured P2P network, if a peer wants to find a desired piece of data in the network, the query has to be flooded through the network to find as many peers as possible that share the data. Many of the popular P2P networks are unstructured. Popular content is likely to be available at several peers and any peer searching for it is likely to find the same thing. But if a peer is looking for rare data shared by only a few other peers, then it is highly unlikely that search will be successful.

3.3 Centralized Peer-to-Peer Network

Hybrid P2P network are also unstructured peer-to-peer networks using on the one hand central server(s) or bootstrapping mechanisms, on the other hand P2P for their data transfers. These networks are in general called **'centralized networks'** because of their lack of ability to work without their central server(s).

4. System Algorithms

4.1 Winner Algorithm

4.1.1 Winner Algorithm

Begin
Create numbers of bidder i and set value zero to it.
While count down time is not until target time **do**
    b_{i++}
    if ($b_{i.price} > b_{w.price}$) $b_w = b_i$
    else if ($b_{i.price} == b_{w.price}$)
        if ($b_{i.arrivalTime} < b_{w.arrivalTime}$)
            $b_w = b_i$
        else if ($b_{i.arrivalTime} == b_{w.arrivalTime}$)
            TimeSynchronization ()
            if $b_{i.sendTime} < b_{w.sendTime}$
                $b_w = b_i$
            else if($b_{i.sendTime} == b_{w.sendTime}$)
                REJECT the bid;
            EndIf
        EndIf
    EndIf

Enddo

Broadcast the information of winner b_w to all auctioneers.

4.1.2 Parameter Definition

Parameter	Description
B	A set of bidders b_i
b_i Î B	($i = 1, 2, 3, \ldots, n$)
$b_{i.price}$	the price for the item of bidder b_i
$b_{i.ip}$	IP address of the bidder b_i computer
$b_{i.arrivalTime}$	the time arrived to the server from the bidder b_i computer
$b_{i.sendTime}$	the time sent by the bidder b_i computer to the server
$base_{.price}$	the first bid of the item
b_w	the winner of the item

In the algorithm, initial price is same with the first bid (base price).

$$b_{w.price} = base_{.price}$$

4.2 Time Synchronization Algorithm

4.2.1 Time Synchronization Algorithm

Latency = $b_{i.arrivalTime} - b_{i.sendTime}$

T_{trans} = Latency + Message Length / Data Transfer Rate

$T_{syn} = b_{i.sendTime} + T_{trans}$

Latency is the delay that occurs after a send operation is executed.

4.2.2 Parameter Definition

Parameter	Description
T_{trans}	the delay between the start of a message's transmission.
T_{syn}	the time that already synchronized.

4.3 Group Communication Algorithm

4.3.1 Group Communication Algorithm

While P has more than one peer **do**
if ($P_{i.groupAdd}$ is same with the $G_{groupAdd}$)
- Define P_i as the bidder peer in the bidding group.
- Allow P_i to send bid data and private messaging with all group members.
- Allow P_i to receive winner information and receive message from all group members.

EndIf
Enddo

4.3.2 Parameter Definition

Parameter	Description
P	a set of peers in the Network
P_i Î P	($i = 1, 2, 3, \ldots, n$)
$P_{i.groupAdd}$	the group address of P_i
$G_{groupAdd}$	the address of bidding group

5. System Details Design

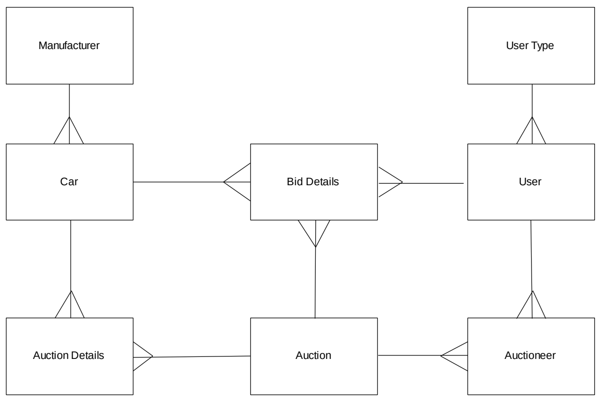

Figure 1. ERD for Proposed System

This system has two main parts: administrator module and auction module. In administrator module, all of the administrator can manage all of the information deals with car auto auction system such as inserting new car, creating new auction and registration new auctioneer. In auction module, register auctioneer can login to the auction and bid the car. Auctioneer can join to the auction and browse auction information such as bid details. The following fact need for the user to become auctioneer:

1. User needs to register as auctioneer and login to the auction.
2. When the auction start, the system will displays bid details and request auctioneer to login to the system.
3. After auctioneer login to the system, auctioneer can start bidding for the auction.
4. When the auctioneer send bid price, system will run winner algorithm, time synchronization algorithm and group communication algorithm.
5. After the system chose winner, system will broadcast winner information to all auctioneers.
6. When the time out, the system will automatically terminate the auction and display the bid details for the desire auction.
7. When the time out, the system will not accept the bid price for the auction.

6. System Implementation

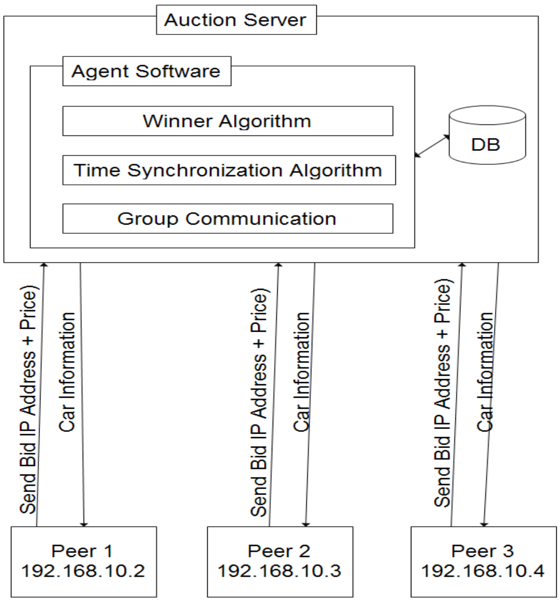

Figure 2. Proposed System Architecture

According to the above diagram, all of the system algorithms are run in the agent software which is placed in the auction server. And then, database of the system will also locate in the auction server. Above diagram describe interactive connecting between peers by using group communication.

Firstly, customers need to register to become as auctioneers. When the system administrator start running the agent that define as the auction is started. In the mean time, all auctioneers can login to the system and they can start their bid. System constraint unauthorized user joining to the auction. When the agent receive the bid price, agent start to run winner algorithm, search winner and announce winner to all auctioneers. In the winner algorithm, system use time synchronization to synchronize time from the auctioneers. In this system, use group communication method to broadcast winner to all auctioneers. Group communication can broadcast message to all group member by once and unauthorized group member cannot accept message from group. Agent also runs the time counting procedure to check time out for each car. When time out, agent announces bidding time out for current car and agent change next car for next bid.
When the whole auction is completed, agent will announce winner with his/her bid success car.

6.1 System Evaluation

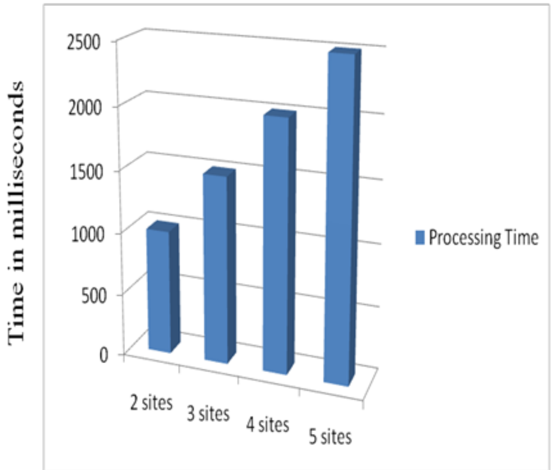

Figure 3. Processing Time

In Figure 2, we display the processing time for the winner algorithm in this system. According to the below diagram, system processing time is just a millisecond. In this diagram, number of sites refers to number of peer. The diagram show processing time for each peer is 300 milliseconds.

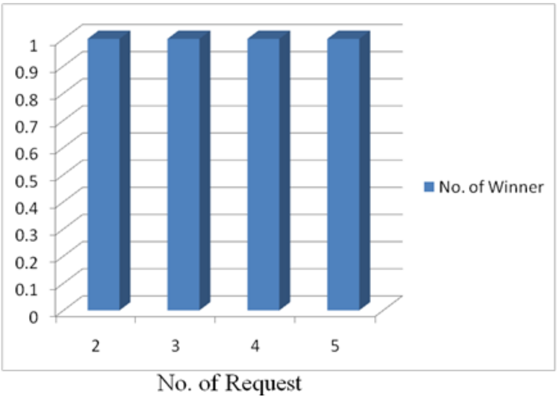

Figure 4. Winner Situtation

In Figure 3, we display comparison for the number of request and winner. System can accept unlimited request and it define only one winner with the winner algorithm. So, only one person win for each car.

7. Advantages of the System

In P2P networks, clients provide resources, which may include bandwidth, storage space, and computing power. As nodes arrive and demand on the system increases, the total capacity of the system also increases. In contrast, in a typical client–server architecture, clients share only their demands with the system, but not their resources. In this case, as more clients join the system, less resources are available to serve each client. The distributed nature of P2P networks also increases robustness and—in pure P2P systems—by enabling peers to find the data without relying on a centralized index server. In the latter case, there is no single point of failure in the system.

Data networks are important to all organizations, proposed system perform faster, easier access to any message and bid process. The distributed nature of P2P networks also increases robustness. Winner Algorithm effectively and accurately choose the winner of the current auction. In winner algorithm, system use time comparison to verify the accurate winner and also check with both bid price send and arrive time. Time Synchronization in proposed system can perform the bid times synchronization accurately and compare the bid times effectively. By Group Communication, proposed system can control the users who join the group and system also not allow unauthorized bidding access to the system.

8. Limitation of the System

In time synchronization algorithm, the calculation of latency is just approximate. So, synchronize will be different with each other. All of the proposed system algorithms are relied on the LAN. So, if there are network break down, proposed system cannot choose the accurate winner for the auction and bid time will be conflict. In proposed system, trader is only one. Many traders cannot join to the system.

9. Conclusion

The concept of P2P is increasingly evolving to an expanded usage as the relational dynamic active in distributed networks. Associated with peer production are the concepts of:

- peer governance (referring to the manner in which peer production projects are managed)
- peer property (referring to the new type of licenses which recognize individual authorship but not exclusive property rights.
- peer distribution (or the manner in which products, particularly peer produced products, are distributed).

Some researchers have explored the benefits of enabling virtual communities to self-organize and introduce incentives for resource sharing and cooperation, arguing that the social aspect missing from today's peer-to-peer systems should be seen both as a goal and a means for self-organized virtual communities to be built and fostered. Ongoing research efforts for designing effective incentive mechanisms in P2P systems, based on principles from game theory are beginning to take on a more psychological and information-processing direction.

In this proposed system the auctioneers, and the participating traders, may be represented by computational processes. This proposed system is also an interesting combination of distributed computation and distributed algorithmic mechanism design. In summary, the problem of distributed winner determination in auctions is an important problem. The algorithms and analysis which used in this proposed system are a first step towards the understanding of this problem.

10. References

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