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Resource Allocation in Grid Computing Environment Using Genetic–Auction Based Algorithm

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ABSTRACT

The main core functionality of Grid Computing is resource allocation and scheduling. With the idea of genetic algorithms and microeconomics, it is proposed a Resource allocation method called a genetic-auction based algorithm [GAAB]. This algorithm contains two modules, auction module and genetic approach. Auction module find outs resource-trading price between resource provider and resource buyer, and the resource allocation carried out by Genetic algorithm by considering both time and cost constraints simultaneously. In this article, evaluations are made in the simulation environment and the results show the effectiveness of the proposed model.

KEYWORDS

Auction, Cost, Genetic Algorithm, Resource Pricing, Time

1. INTRODUCTION

Grid computing is one of the emerging fields in parallel and distributed computing. Grids are evolving as the compromising future generation of computational platforms for executing large-scale resource concentrated applications arising in the field of science, engineering, and commerce (Foster and Kesselman, 1999; Abraham et al., 2000; Xhafa et al., 2007). It supports the heterogeneous resources by the creation of virtual organisations and enterprises. These virtual organisations enable the selection, sharing, aggregation and exchange of information between heterogeneous resources. The customer can access grid resources by maintaining a grid portal like Globus (Foster and Kesselman, 1997) and Legion (Grimshaw and Wulf, 1997) and each resource owner share their resources by running a grid portal too. Different customers' demands different resources, different resources have different capabilities and availabilities based on their policies, which are selected. At any point of time, the resources may enter or exit from the grid. On the other side, customers with varying resources (Babu and Krishna, 2014) can enter in to the grid. As a result, the environment of the grid is highly dynamic, uncontrollable, and heterogeneous across different domains.

The traditional methods cannot be applied simply to the grid resource management because they adopt total control over requests and resources. Meanwhile the grid resources are belonging to different domains and are distributed in different geographical regions so decentralized method is an appropriate solution for resource management in grid. A suitable resource management for grid exploits the resources capability effectively and satisfies the customer requests. In the past few years, the growth of market based resource management takes place.

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The two main characteristics of supportable market-based resource management is to allow resource consumers and resource suppliers to make independent decisions for scheduling, and both events of providers and customers must have adequate rewards to stay and play in the market (Xiao et al., 2008). Two groups of industry-based designs that are used for grid resource management (Babu et al., 2014) are public auction model and product market models. In public auction model, each provider and consumer acts individually and they agree independently on the cost level. In industrial design, providers specify their resource cost and charge users according to the quantity of resource they consume.

In this paper job, scheduling method (Reddy et al., 2014) is suggested with the knowledge of Microeconomics and Genetic technology by taking both time limit and cost. It determines the trading price based on auction model between resource customers and resource suppliers, and then gets a resource scheduling solution based on the cost using GA (Genetic algorithm) (Cheng et al., 2004).

The rest of the paper is organized as follows. In section 2, it deals with related work and in section 3 deals with problem formulation, section 4 deals with the auction model for resource pricing., In section 5 deals with proposed method as a resource allocation process by using GAAB. In section 6 evaluate the results and finally section 7 concludes this work.

2. RELATED WORK

The most commonly studied economic models in the context of resource management in distributed systems are commodities markets and auctions. In the commodities market model (Buyya, Abramson & Giddy, 2002) the users are charged a publicly agreed price per unit of resource consumed. In the auction model each service provider and user acts independently and they agree privately on the selling price. The advantage of using auctions for resource allocation is that they require little global information, have decentralized structure and are easy to implement. There exist several studies on applying auction models in resource management (Gomoluch & Schroeder, 2003). In auction model the main participants are resource owners and users. The resource owners provide services like computational power, data storage, software or computer networks and users consume services provided by resource owners. Each user has a broker who manages and schedules user's jobs in the Grid, bids the price that user agrees to pay in the auction and hands payments to resource providers. Each resource owner has an auctioneer agent who has the responsibility of setting the rules of the auction and conducting the auction for the resource. This involves collecting bids from brokers participating in the auction, deciding the winner in the auction (based on a given auction algorithm) and collecting the payment from the winner. Besides it also interacts with the local scheduler to schedule the jobs of the user who wins in the auction.

Several researchers are investigated about economic based resource management systems (Hu et al., 2012; Kant & Grosu, 2004; Huang & Qiu, 2007). Huang et al. (2004) proposed a resource advance booking through suppliers playing multiple successive auctions. They used intellectual suppliers that can automatically adjust to the environment, exchange personal information, and learn new experiences from their network communities. Buyya (2012) used economic based concepts with posted price modelling, commodity market, bargaining modelling, contract net models, etc. for grid resource allocation. Attanasio et al. (2007) designed a public auction procedure, depending on a modern Lagrangean heuristic and revealed that it was able to offer similar performance to central heuristics. Xiao et al. (2008) discussed an incentive-based arranging a system which uses a peer-to-peer decentralized arranging structure to maximize the success rate of job functioning and to minimize the equity difference among resources. Anthony et al. (2013) developed a heuristic decision-making structure through which an independent agent can manipulate to deal with the problem of putting in a bid across multiple sales with different start and end times and with different methods such as British, Netherlander and Vickrey sales. He et al. (2004) developed a bidding strategy for obtaining

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