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A combinatorial double auction resource allocation model in cloud computing

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ABSTRACT

Users and providers have different requirements and objectives in an investment market. Users will pay the lowest price possible with certain guaranteed levels of service at a minimum and providers would follow the strategy of achieving the highest return on their investment. Designing an optimal market-based resource allocation that considers the benefits for both the users and providers is a fundamental criterion of resource management in distributed systems, especially in cloud computing services. Most of the current market-based resource allocation models are biased in favor of the provider over the buyer in an unregulated trading environment. In this study, the problem was addressed by proposing a new market model called the Combinatorial Double Auction Resource Allocation (CDARA), which is applicable in cloud computing environments. The CDARA was prototyped and simulated using CloudSim, a Java-based simulator for simulating cloud computing environments, to evaluate its efficiency from an economic perspective. The results proved that the combinatorial double auction-based resource allocation model is an appropriate market-based model for cloud computing because it allows double-sided competition and bidding on an unrestricted number of items, which causes it to be economically efficient. Furthermore, the proposed model is incentive-compatible, which motivates the participants to reveal their true valuation during bidding.

1. Introduction

Distributed system resources have become prevalent in every facet of life through the use of Information Communications Technology (ICT). Basically, distributed system resources lessen the burden of the large expenses that are incurred from the use of expensive stand-alone processing power and storage computer systems. This situation has led to the emergence of grid and cloud computing paradigms. These two paradigms are currently considered to be one of the best technology options to provide affordable resources and services.

Grid and cloud computing have many similarities in terms of features and functions. Both paradigms are used primarily for enhancing the utilization of the available resources. Grid computing, coined in the 1990s by Ian Foster and Carl Kesselman, was briefly defined as a coordinated resource sharing and problem solving technology that spans many dynamic, multi-institutional virtual organizations [1]. Cloud computing is a re-discovered technology technique conceived by John

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