Chapter 7.11
Survey on the Application of Economic and Market Theory for Grid Computing

Xia Xie
Huazhong University of Science and Technology, China

Hai Jin
Huazhong University of Science and Technology, China

Jin Huang
Huazhong University of Science and Technology, China

Melvin Koh
Asia Pacific Science & Technology Center, Sun Microsystems, Singapore

Song Wu
Huazhong University of Science and Technology, China

Jie Song
Asia Pacific Science & Technology Center, Sun Microsystems, Singapore

Simon See
Asia Pacific Science & Technology Center, Sun Microsystems, Singapore

ABSTRACT

In this chapter, we present a survey on some of the commercial players in the Grid industry, existing research done in the area of market-based Grid technology and some of the concepts of dynamic pricing model that we have investigated. In recent years, it has been observed that commercial companies are slowly shifting from owning their own IT assets in the form of computers, software and so forth, to purchasing services from utility providers. Technological advances, especially in the area of Grid computing, have been the main catalyst for this trend. The utility model may not be the most effective model and the price still needs to be determined at the point of usage. In general, market-based approaches are more efficient in resource allocations, as it depends on price adjustment to accommodate fluctuations in the supply and demand. Therefore, determining the price is vital to the overall success of the market.

INTRODUCTION

The term Grid computing was introduced for describing a new model for distributed computing. The basic concept refers to the sharing of distributed heterogeneous compute resources virtualized as a single resource pool (Foster & Kesselman, 1999; Foster, Kesselman, Nick & Tuecke, 2002). Typically, as grids are often used for running computational intensive applications, the common type of grid resource usually means compute cycle. However, the concept does not place any restrictions, as it can be all kinds of computing resources like network bandwidth, data storage, application licenses and even scientific devices.

Today, the practice of Grid computing is based on voluntary sharing of compute resources, which is sufficient for establishing small-scale private grid dedicated to a specific purpose. However, to build a global level generic grid, this is simply not sustainable. Organizations, especially from the industry, will find very little reason to share their resources for free, and will expect some gains from their participation. Therefore, in order for grid to be the mainstream computing model, an efficient supporting platform and mechanism should be designed for encouraging resource owners to offer their idle resources and customers to satisfy their resource needs. Therefore, the idea of using markets in Grid computing as a means for organizations to commercialize their grid resources was revitalized by many researchers.

A market is, as defined in economics, a social arrangement that allows buyers and sellers to discover information and carry out a voluntary exchange. Our definition of the Grid Market refers to a software platform with the business mechanisms to support trading between grid users. Its principle is similar to the conventional marketplace and the goods that are traded on are generic grid resources, including concrete computing/storage/network physical resources, grid services and complex workflows. The Grid Market provides the required business functions to support the business process to allow any customers to participate in the trading. Such functions have to cover the all the possible activities in a typical market such as registration of new customers, advertising the trade goods, searching and browsing the market, bartering, monitoring the prices and making or receiving payment. An emergence of such a marketplace for grid brings the following advantages:

- Encourages more users to adopt Grid technology, especially in enterprises.
- Provides incentives for resource owners to provide their idle resources, which is helpful for establishing large-scale, mature grid systems.
- Enforces efficient utilization of grid resources in which buyers who value a resource most highly will buy from sellers most willing to sell. Provide access for even small businesses to temporary grid resources which may be too expensive to acquire on their own, or just to meet their short term peak demand.
- Customers, including both buyer and seller, can easily design their trading policies based on their current status so as to maximize resources' utilization and their benefits.

Currently, many works have been done on applying market-based economic paradigm to Grid computing. The objective of this chapter is to provide a review of the past and current efforts in commercialization of Grid computing, as well as some of the business and pricing models that have been considered for e-commerce and e-business which can be apply to the Grid Market.

Related Content

Trust and Fairness Management in P2P and Grid Systems

Adam Wierzbicki, Tomasz Kaszubaand Radoslaw Nielek (2010). *Handbook of Research on P2P and Grid Systems for Service-Oriented Computing: Models, Methodologies and Applications (pp. 748-773).*

www.irma-international.org/chapter/trust-fairness-management-p2p-grid/40826

A Load and Distance Aware Cloudlet Selection Strategy in Multi-Cloudlet Environment

Ramasubbareddy Somulaand Sasikala R. (2019). *International Journal of Grid and High Performance Computing (pp. 85-102).*

www.irma-international.org/article/a-load-and-distance-aware-cloudlet-selection-strategy-in-multi-cloudlet-environment/224032

Dynamic Maintenance in ChinaGrid Support Platform

Hai Jin, Li Qi, Jie Daiand Yaqin Luo (2009). *Handbook of Research on Grid Technologies and Utility Computing: Concepts for Managing Large-Scale Applications (pp. 303-311).*

www.irma-international.org/chapter/dynamic-maintenance-chinagrid-support-platform/20532

Software Defined Cognitive Radio Network Framework: Design and Evaluation

Yaser Jararweh, Mahmoud Al-Ayyoub, Ahmad Doulat, Ahmad Al Abed Al Aziz, Haythem A. Bany Salamehand Abdallah A. Khreishah (2015). *International Journal of Grid and High Performance Computing (pp. 15-31).*

www.irma-international.org/article/software-defined-cognitive-radio-network-framework/128358

Architectural Pattern for Scheduling Multi-Component Applications in Distributed Systems

Absalom El-Shamir Ezugwu, Marc Eduard Frincuand Sahalu Balarabe Junaidu (2016). *International Journal of Grid and High Performance Computing (pp. 1-22).*

www.irma-international.org/article/architectural-pattern-for-scheduling-multi-component-applications-in-distributed-systems/149911