Chapter XII

Reputation Evaluation Framework Based on QoS in Grid Economy Environments

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ABSTRACT

This chapter mainly introduces some recent researches of reputation evaluation methods in Grid economy. The GRACE (Grid Architecture for Computational Economy architecture) is adopted to explain some mechanisms in the Grid economy for its clearly inner modules architecture. In addition, several new developed modules based on GRACE architecture are detailed discussed and two of them are laid morn emphasis on by us, which are the RCM (Reputation Control Module) and distributed reputation control architectures based on VOD (Virtual Organizational Domain). The inner communication and workflow of them are shown in this chapter. Furthermore, through experiments results, the authors discover the profit of Grid nodes and tasks execution success rate are all improved by adding these new modules.

INTRODUCTION

The Grid computing technology has developed rapidly in recent years (I.Foster, 1998). The fields it covered are becoming more and more extensive. Therefore many more new research directions appeared, for example Grid economy. It combines different economy models with Grid computing and schedules resources by economic elements in the Grid environment. Many governments and enterprises around the world have implemented the Grid economy projects. One famous project is the program...
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of UK e-Science (S.Newhouse, 2001). It is laid down and implemented by UK’s Core Program. This project uses economic models to schedule resources in UK e-Science center and sets up the GESA (Grid Economy Service Architecture) according to it. G-Commerce (R.Wolski, 2000) project mainly compare the different functions and effects between the Commodity model and auction model in the Grid economy. To schedule resources reasonably, Rajkumar Buyya proposes a GRACE (Grid Architecture for Computational Economy, R.Buyya, 2000) architecture and develops a resource dispatching management tool, Nimrod-G, based on market models. This architecture is improved constantly and the Grid economy is becoming more practical.

At the meanwhile, the security issue of Grid is getting increasingly important, especially after the combination of Grid computing and economy architectures. The user and services provided by resources in Grid environments are dynamic. Therefore, the malicious nodes may exist in Grid systems. It will significantly affect the Quality of Service (QOS) requirements of users, even lead to the economic loss of users in the Grid economic environment.

Therefore in the Grid economy environment, it is significant to build a resource scheduling framework which could block access of malicious nodes and ensure the safety of the resource providers and resource consumers. Former methods usually consider the safety of transactions. Lots of trust models and reputation calculation methods are developed during the process of the reputation research. However few of these models are used in the Grid economy and most of them are lack of consideration about the influence of economy on Grid computing. For example, some of the models use the soft incentive way (M.Feldman, 2004; Y.Kwok, 2005; K.Ranganathan, 2003). The nodes that share more resources with others could accumulate higher value of reputation. Therefore they can have the authority to access other resources. While, if some nodes want to obtain profit by providing resources, this soft incentive way will not suitable in this situation. In the other researches that adopt hard incentive methods (B.Chun, 2004; M.Feldman, 2005; P.Golle, 2001) nodes provide its resources to obtain the virtual money, and then this virtual money is used to bid for other resources. This method also has weakness. The amount of virtual money could not be the evaluating standard of trust, thus it still cannot satisfy the trust requirement of Grid economy. Additionally, the function of economic elements in the reputation control always is neglected. They are also could not adapt to the dynamic extension of nodes in Grid environments.

This motivated us to design the distributed reputation architecture which could extend through multi-VOD in the Grid economy. In this chapter, we propose the architecture which is based on Virtual Organizational Domains (VOD) and propose reputation evaluation methods which span these domains. The inner structure and this framework are also detailed discussed here. At last, through the simulating experiments, it can be proved that this architecture could block the assessment of malicious nodes effectively and improve the efficient and stability of nodes in Grid economy environments.

BACKGROUND

Different approach, policy and architecture are developed in reputation management. In Peer-to-Peer system, there are some reputation control models, like The EigenTrust system for P2P networks (S.D.Kamvar, 2003). This system form directly trust relation and recommendation trust vector through the interaction of nodes, then it performs the iterative operation on recommendation trust vector, so that this vector tend to a fixed value. This value is the reputation of nodes. However, this model hasn’t taken the punishment factors and time factors into consideration. Damiani (2002) adopts distributed
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