

## Abstract

One of the key requirements for Grid infrastructures is the ability to share resources with nontrivial qualities of service. However, resource management in a decentralized infrastructure is a complex task as it has to cope with different policies and objectives of the different resource providers and the resource users. This problem is further complicated due to the diversity of the resource types and the heterogeneity of their local resource management systems. Agreement-based resource management can be used to address these issues because in the negotiation process of creating such bilateral service level agreements (SLAs) between Grid parties, the different policies of the resource providers and the users will be abstracted and observed. Such negotiation processes should be automated with no or minimal human interaction, considering the potential scale of Grid systems and the amount of necessary transactions. Therefore, strategic negotiation models play important roles. In this thesis, we have made several novel research contributions which are as follows:

- An agreement based resource management approach is analyzed. Requirements for the automatic negotiation problems in Grid computing are introduced. Furthermore, related work in the areas of economics and agent communities are investigated.
- Several negotiation models and negotiation strategies are proposed and examined. Simulation results demonstrate that these proposed negotiation models are suitable and effective for Grid environments.
- Firstly, a strategic negotiation model using time-based negotiation strategies is proposed and evaluated using discrete event based simulation techniques.

- Secondly, time-based negotiation strategies are quite limited in the dynamically changing Grid environment because they are quite simple and static; so learning based negotiation strategies are investigated and evaluated, which are quite flexible and effective in the dynamically changing Grid environment. Also we adopted negotiation strategies considering opportunistic functions for Grid scheduling.
- Thirdly, it is usually necessary that resources from different resource providers are co-allocated to satisfy the complex requirements of the users, so a strategic negotiation model supporting co-allocation and the tradeoff between “first” and “best” agreements in the Grid computing is also proposed and evaluated.
- Finally, the contributions of the current research work to the WS-Negotiation protocol are analyzed.