GENETIC ALGORITHM BASED SCHEDULERS FOR GRID COMPUTING SYSTEMS

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ABSTRACT. *In this paper we present Genetic Algorithms (GAs) based schedulers for efficiently allocating jobs to resources in a Grid system. Scheduling is a key problem in emergent computational systems, such as Grid and P2P, in order to benefit from the large computing capacity of such systems. We present an extensive study on the usefulness of GAs for designing efficient Grid schedulers when makespan and flowtime are minimized. Two encoding schemes have been considered and most of GA operators for each of them are implemented and empirically studied. The extensive experimental study showed that our GA-based schedulers outperform existing GA implementations in the literature for the problem and also revealed their efficiency when makespan and flowtime are minimized either in a hierarchical or a simultaneous optimization mode; previous approaches considered only the minimization of the makespan. Moreover, we were able to identify which GAs versions work best under certain Grid characteristics, which is very useful for real Grids. Our GA-based schedulers are very fast and hence they can be used to dynamically schedule jobs arriving in the Grid system by running in batch mode for a short time.*
Keywords: Computational grids, Scheduling, Genetic algorithms, Resource allocation, Makespan, Flowtime, Expected time to compute, Benchmark simulation model

1. **Introduction.** A computational grid is a large scale, heterogeneous collection of autonomous systems, geographically distributed and interconnected by heterogeneous networks. Job sharing (computational burden) is one of the major difficult tasks in a computational grid environment. Grid resource manager provides the functionality for discovery and publishing of resources as well as scheduling, submission and monitoring of jobs. However, computing resources are geographically distributed under different ownerships each having their own access policy, cost and various constraints. Since the introduction of computational grids by Foster et al. [11, 12], this problem is increasingly receiving the attention of researchers due to the use of Grid infrastructures in solving complex problems from many fields of interest such as optimization, scientific simulation, drug discovery,