The Design of Schedulers Based on the Weight of Sub-task Branches in the Grid Environment

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ABSTRACT

Dynamic computing such as Grid computing and Cloud computing is regarded as the major approach to solve large-scale computing problems. It only requires a portal that users can use resource provided by distributed computing. The environment is dynamic in the sense that arrivals of user requests are issued continuously and the number of user requests is unknown in advance. Traditional scheduling algorithms, such as genetic algorithm, tend to generate optimal solutions with high computing costs. They are not suitable for the dynamic environment because of their large scheduling costs and the user requests are unpredictable. The performance of the single scheduler system is degraded as the number of user requests increases. Due to the unpredictability of the user requests, the scheduler may match the requests with sub-optimal processing elements. The situation gets worse as the scheduler becomes the bottleneck because of employing some high cost scheduling algorithms. One of the solutions to cope with this problem is deploy multiple schedulers in the system to distribute the scheduling load. However, this scheme cause the rise of communication cost among schedulers which may not benefitted from the multi-scheduler design. In our research, we proposed a dynamic scheduling technique based on the resource competition strategy. We serialize the user requests according to the interrelationship among the sub-tasks of a request. The schedulers then compete for the available processing elements based on the acknowledgement of the status of the processing elements. If a scheduler successfully gain the right to a specific processing element, it sends the sub-task to the element for processing. Otherwise, it updates the status of the processing element locally and repeat the matching processing again. This design can efficiently avoid the communications among the schedulers and our simulation results show the system has overwhelm advantage over the traditional single-scheduler systems.

Keywords : resource competition、dynamic scheduling、DAG、Grid computing

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