Efficient task scheduling based on theoretical scheduling pattern constrained on single I/O port collision avoidance

Waralak Chongdarakul, Peraphon Sophatsathit, and Chidchanok Lursinsap
Advanced Virtual and Intelligent Computing (AVIC) Center
Department of Mathematics and Computer Science
Faculty of Science, Chulalongkorn University
Payathai Road, Bangkok, Thailand 10330.

Abstract

Most distributed computing applications require an effective scheduling algorithm to distribute and assign client's tasks running on a set of processors. The existing algorithms assumed that the scheduled tasks can be simultaneously and ideally sent and received from the processors without any latent delay. However, this assumption is obviously impractical and unrealizable due to lack of consideration for constraints caused by the limited number of existing I/O ports at the client site. Such an I/O port constraint confines the overall throughputs of the computing systems. This study investigates the theoretical scheduling patterns under the constraint of one I/O port which typically exists to achieve optimal makespan and latent delay. A heuristic algorithm to effectively schedule the given set of tasks is also proposed. Two primary scheduling patterns leading to the optimal makespan and delay are discovered. Performance of the proposed scheduling is better than other scheduling algorithms under the imposed constraints in terms of shorter makespan and less latent delay, in particular, the average time complexity is equal to $O(n^2)$.

Keywords: Task scheduling; I/O port collision; Task graph; DAG scheduling