

Abstract of Thesis presented to UFF as a partial fulfillment of the requirements for the degree of Master of Science (M.Sc.).

Hybrid Heuristics for Static Task Scheduling in Computing Systems with
Heterogeneous Processors

Eyder Franco Sousa Rios

December/2004

Advisor : Luiz Satoru Ochi, DSc

Co-Advisor : Maria Cristina Silva Boeres, PhD

Department of Computer Science - IC/UFF

The utilization of existing resources in distributed computing systems with adequate allocation of parallel application's components is not an elementary issue. Such process constitutes the Task Scheduling Problem which is in general a NP-complete problem, and it has been explored in specialized literature. The complexity of this problem has motivated the development of heuristic methods to solve it, in which algorithms within the list scheduling class constitute commonly used mechanisms. However, the greedy characteristic of such heuristics can, in many cases, contribute negatively on the achievement of the best solution. This work investigates the applicability of the integration of List Scheduling class heuristics with search mechanisms based on meta-heuristics. The goal is to combine meta-heuristics search power with low-complexity of List Scheduling heuristics for generating efficient schedules on distributed computing systems, in which resources are heterogeneous, in general. For this, two heuristics are proposed: HTSGA and HTSG, which are based on Genetic Algorithm and GRASP, respectively. The search mechanisms implemented in such heuristics aims to eliminate the greedy behaviour of List Scheduling algorithm, providing new scheduling possibilities by determining different task allocation sequences during the solution construction. Moreover, it was investigated the possibility of adapting proposed heuristics to different parallel application classes. To validate this work, the solutions generated by the proposed heuristics were

compared with traditional construction algorithms presented in the literature and to a meta-heuristic which was the basis of this work. The results showed that the proposed algorithms are robust both related to adaptability to characteristics of the submitted instances and to quick convergency to sub-optimal solutions.