Parallel Graph Partitioning Optimization under PEGASUS DA Application Global State Monitoring

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The paper concerns the use of global application states monitoring in distributed programs for advanced graph partitioning optimization. Two strategies for the control design of advanced parallel/distributed graph partitioning algorithms are presented and discussed. In the first one, the parallel algorithm control runs on top of the ready to use basic graph partitioning functions available inside an existing graph partitioning METIS tool. The second control strategy is based on a genetic programming algorithm in which the applied basic graph partitioning primitives and the overall algorithmic parallel/distributed control can be freely designed by the user. In these strategies the graph partitioning control is executed by processes and/or threads conveniently supervised by the application global states monitoring facilities provided inside a novel distributed program design framework PEGASUS DA. This framework provides system support to construct user-defined strongly consistent global application states and an UPI to define corresponding execution control. In particular it concerns computing global control predicates on the constructed global states, the predicates evaluation and asynchronous execution control handling to obtain application global state-driven reactions. Based on such implementation, different features of the graph partitioning optimization strategies have been designed and tested. The experimental results have shown benefits of the new graph partitioning control methods designed with the use of the application global states monitoring.

Keywords: global application states monitoring, hierarchical graph partitionig, distributed program design tools.