MODELING OF OPTIMAL FILES DISTRIBUTION ON THE NETWORK

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A distributed computing system (DCS), in general, is considered to be those in which the computing functions are distributed among several physically distinct computing elements. These elements or resources (processing elements, data files, programs, etc.) may be geographically separated or co-located. Thus, each program can run on one or more computers and may frequently access files stored in other sites [1]. The running program and the data files are often placed at different computer sites; thus, execution requires remote file access. To shorten the data transfer time, the allocation of data files such that the data transfer time can be minimized becomes an important design issue. This kind of problem dealing with the assignment of files to processing nodes so as to optimize performance is commonly known as a file allocation problem (FAP). The primary goal of FAP is to minimize the data transfer time for a specific program which needs data from several data files in order to execute.

The optimality criterion in the model of optimal file allocation on a network is taken overall average query response time across the distributed computing system [2]. In the model, the amount of data to be sent through the system during the time unit is considered, but this model does not take into account the hard disk performance for the sites where data files are located. Hard disk file access time is compatible with the time for executing the queries of the local and remote type.

To implement the model it was proposed method based on the Ant Colony Optimization algorithm. Artificial ants build a solution to a combinatorial optimization problem by traversing a fully connected construction graph composed of network nodes and files to be allocated over network. The step for optimization are: *m* artificial ants are located on the nodes *K*1-*K*n; ants move over edges to nodes and mark edges with pheromone; pheromone value is updated according to new positions of ant colony members; after all edges become marked the optimal allocation is possible. Ants found optimal file allocation table that is checked for constraints for every node to define overloaded nodes. If overloaded nodes exist, the “taboo-list” is generated, and file reallocation is made. Reallocation is made until constrains become satisfied.

The efficiency of the procedures permits repeated problem solution to study the sensitivity of the optimal system design to changes in parameter values. This provides the decision maker with an effective decision support system.

References:

1. Ming-Sang Chang, Deng-Jyi Chen, Min-Sheng Lin and Kuo-Lung Ku, The Distributed Program Reliability Analysis on Star Topologies.

2. Г. Цегелик. Системы распределенных баз данных.: Изд-во “Свит”. Львов, 1990.