The Simulation of Static Load Balancing Algorithms

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Load balancing is a technique in parallel system that is used to accomplish optimal system condition, which is workloads are evenly distributed amongst computers, and as its implication will decrease programs execution time. One type of load balancing algorithm that may be used is static load balancing algorithm. This algorithm performs load balancing tasks before programs execution begin. The advantages of this algorithm are on its fast process and low overhead. Round Robin, Randomized, Central Manager, and Threshold are of commonly used static load balancing algorithms.

A simulation model of parallel system is developed in order to observe and compare the four static load balancing algorithms. The simulation model is developed based on discrete event simulation, which is the events on it are generated following a statistic distribution. The simulation model then implemented using Java programming language.

Simulation processes are performed to the four static load balancing algorithms: Round Robin, Randomized, Central manager, and Threshold. In the case of Central Manager and Threshold algorithms, they use CPU queue length, amount of used memory, and harddisk I/O queue length as load indices. The amounts of computers used in simulation are 5, 10, 15, 20 and 25 computers. As the input of simulation are three programs, i.e. Program1, Program2, and Program3, that have dominance in amount of CPU instructions, memory access, and hard disk I/O access, respectively.

The simulation results data are analyzed based on two parameters: program execution time and load distribution in parallel system. Two methods are used to analyze the data. Firstly, general analysis method using charts and tables is used to analyze the data. Then, ANOVA method is used to analyze the data.
From the result of the data analysis, it can be concluded that, static algorithm that is used, has significant effects to system performance. By considering program execution time, it can be concluded that, Central Manager algorithm that use CPU or I/O hard disk as load index is the best algorithm that gives the fastest program execution time. On the other hand, by considering load distribution on parallel system, it can be concluded that, Central Manager and Threshold algorithm that use memory, CPU, or hard disk I/O as load index, are two best algorithms that able to balance loads well.