Abstract

Driven by technological advances as well as user needs, the field of distributed computing is a natural evolution in computing history. With the distribution of control over many widely separated sites, the problem of deadlocks, resource allocation, mutual exclusion etc., become much more complicated and require quite a different approach to solve them than in the traditional Centralised Systems. The problem of mutual exclusion in a Distributed System becomes very complex because at a given site there is only a partial view of the total system and the ordering of events at any specific site is only temporal due to lack of global clock. Due to the lack of consistency in viewing the system by different sites, it is necessary to communicate with all the sites in the system before a site decides to enter the Critical Section (CS). This problem becomes further complex due to unpredictable communication delays, site or communication link failures. This thesis deals with the development of Delay-Optimal mutual exclusion algorithms in distributed systems.

The effect of varying the degree of connectivity of the network topology on logical structure token based mutual exclusion algorithms is studied and a detailed performance comparison is done. A new delay optimal token based algorithm is presented. A performance comparison is made with existing token based algorithms and shown how the proposed algorithm achieves lower time delay. Further, two existing algorithms are modified to achieve better delay performance. Priority serialization discipline like Shortest Job First (SJF) leads to improvement in response time (Delay) as compared to FCFS serialization. Therefore, a general scheme for inserting priority serialization in token and tree based algorithms is developed. A new Broadcast based - Token based algorithm is also proposed which supports priority serialization.